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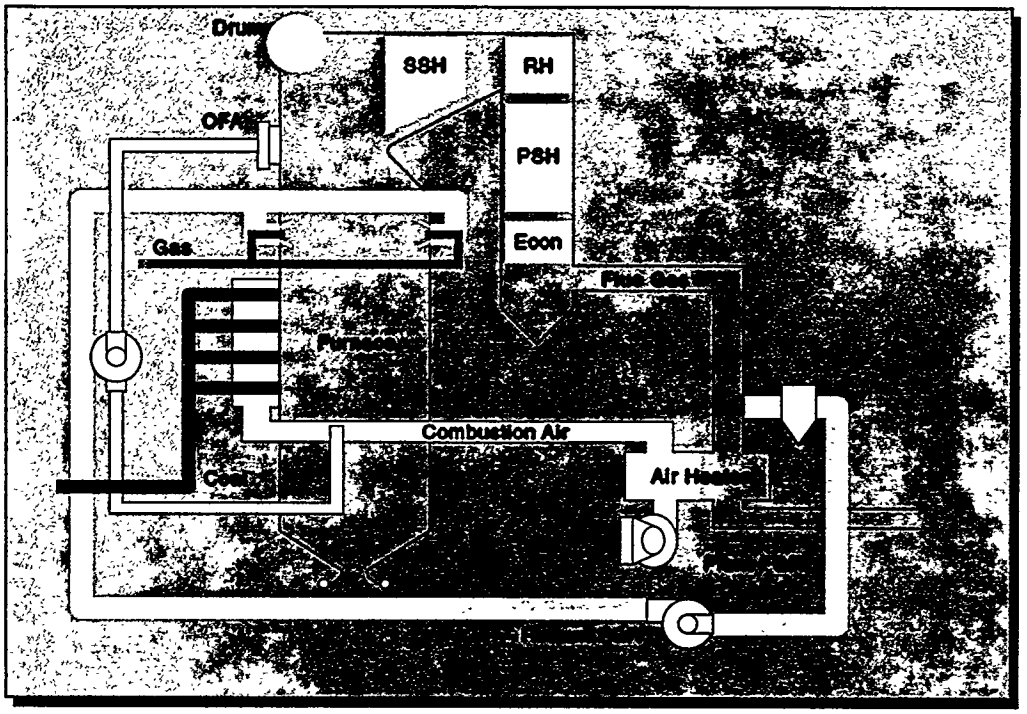
BPACK — A Computer Model Package for Boiler Reburning / Co-Firing Performance Evaluations

User's Manual, Volume II



Developed for:

U.S. DOE / PETC, AEM Italy, ENEL Italy

Prepared by:

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June, 1992

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1.0 INTRODUCTION

This volume of the user's manual records detail model set-up procedures for five example cases. The contents of the input and the output files associated with the execution of the six computer codes (BPACK), for the five example cases defined, are also documented in detail. After familiarizing himself with the background information provided in Volume I of this user's manual, the user is encouraged to follow the information given here and to reproduce the example results initially, before he commences his model applications.

Case Definition

The five example cases were selected to illustrate the versatility and usefulness of the BPACK codes. These cases were defined for boilers firing oil, gas, and coal, respectively, and the reburning application was defined for an oil fired boiler. Two types of boilers were considered: one was front wall fired (Boiler 1), and the other was tangentially fired (Boiler 2).

The wall-fired boiler has a net generating capacity of 75 MW_e, and the steam generated is at 1004 °F and 1920 psig. The boiler furnace was designed to be capable of firing both fuel oil and coal through a three-by-four array of burners mounted on the front wall. Although access was provided for four elevations of burners, only the upper three elevations were installed for operation of the unit on fuel oil or natural gas. A 2D representation of the Boiler 1 is shown in Figure 1.1. The 2D zone-arrangement used a 19 x 4 computational grid, and the burners were located at zone layers I = 3, 4, 5, and 6. Zone layer 7 was used for reburning gas injections, and the over fire air injection ports were located at I = 9. The boiler tube banks were placed in zone layers I = 11 to 19, as indicated by the shaded areas in the figure. This boiler configuration was used in Cases 1 through 4.

The tangentially-fired boiler has a net generating capacity of 71 MW_e, and the steam generated is at 1005 °F and 1500 psig. Pulverized coals were fired through four corner-mounted burner arrays, with each contains three coal nozzles. The coal used was from a Illinois bituminous seam. The coal is pulverized so that at least 70 % will pass through a 200 mesh U.S. standard sieve. 2D representation of the Boiler 2 has been shown in Volume I (Figure 5.2) for other discussion purposes. However, for the completeness of this volume, it is re-represented and named as Figure 1.2. The 2D zone-arrangement used a 22 x 4 computational grid, and the burners were located at zone layers I = 5, 6, and 7. The boiler tube banks were located in zone layers I = 19 to 22, as indicated by the shaded areas in Figure 1.2. This boiler was only used for the demonstration of Case 5. The indicated reburning and over-fire-air layers (I = 9, 11) were not used in the example. The user may try the reburning application after he masters the set-up of the five cases.

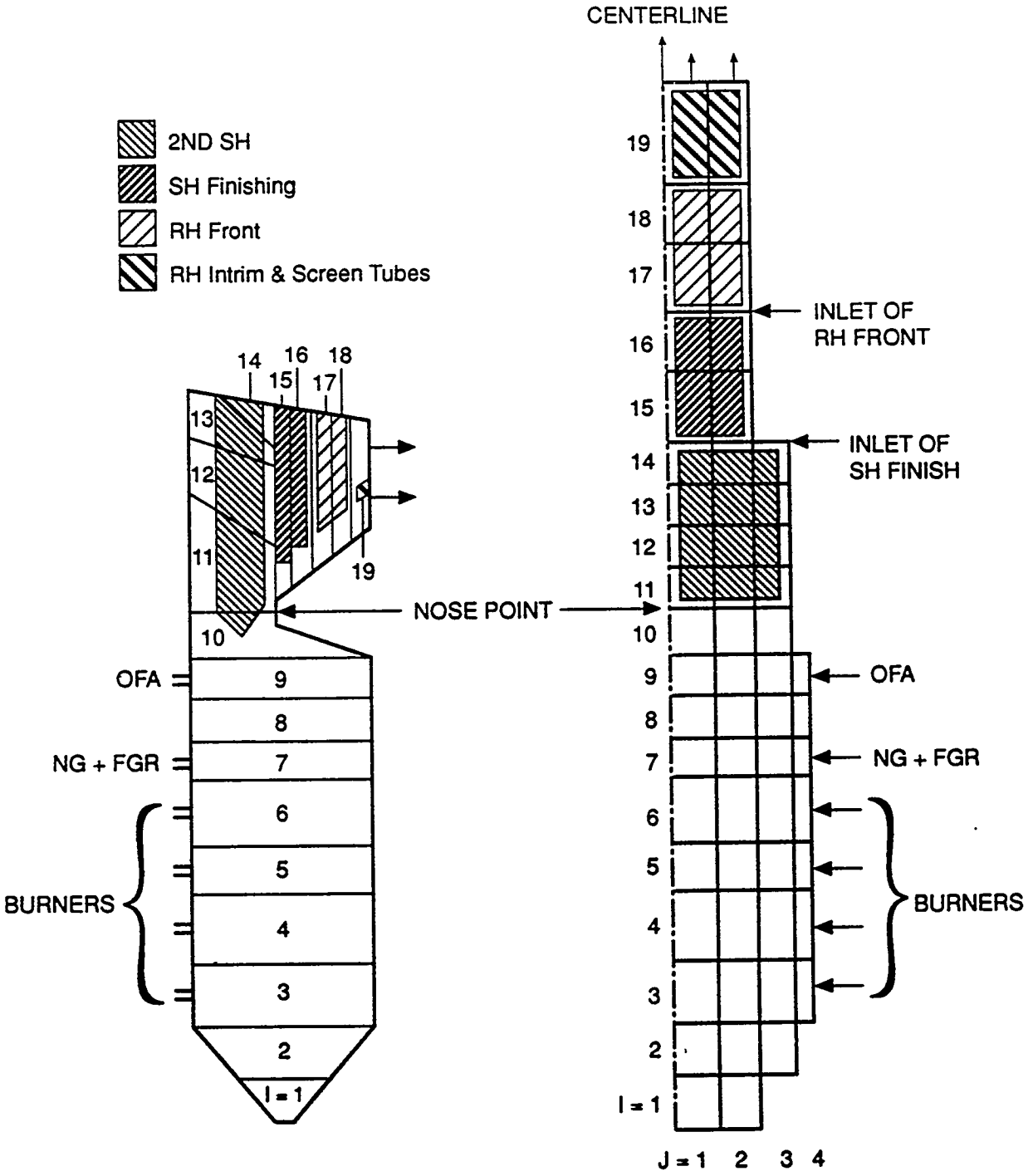

Figure 1.1. 2D zone arrangement of the front wall fired boiler (Boiler 1).

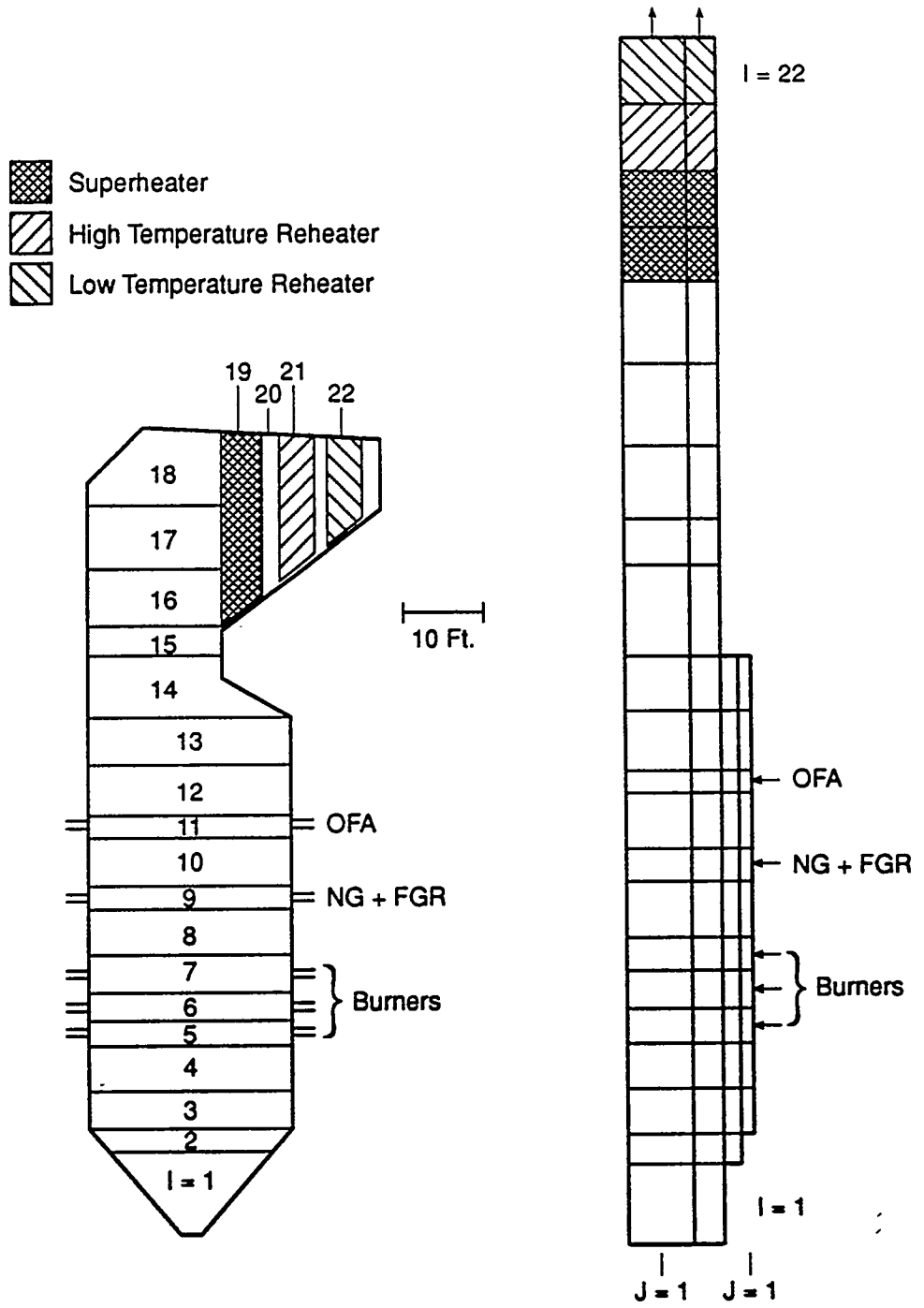

Figure 1.2. 2D zone arrangement of the tangentially fired boiler (Boiler 2).

A summary of the cases defined is shown below:

- Case 1: Oil fired, 100 % load, no reburning, boiler 1.
- Case 2: Oil fired, 75 % load, reburning, clean furnace walls, boiler 1.
- Case 3: Oil fired, 75 % load, reburning, dirtier furnace walls, boiler 1.
- Case 4: Gas fired, 100 % load, no reburning, boiler 1.
- Case 5: Coal fired, 100 % load, no reburning, boiler 2.

The model's ability of handling a variety of fuels is demonstrated through Cases 1, 4, and 5, where oil, gas, and coal were used as fuels, respectively. Case 2 demonstrates the model's usefulness in boiler reburning applications. Case 3 was set to show the user how to carry out a parametric run starting from the output-array-file of Case 2. All cases defined above used the 2DINPT and the 2DHT codes for furnace performance predictions. Case 2 also used the RBINPT, RBNOX, BPINPT, and the BPM codes for reburning NO_x and boiler efficiency predictions.

The user should keep in mind that the case examples shown here are only illustrative, limited by the enormous effort required to prepare the documents. Many other applications combinations are possible. For example, the model package can be used for fuel co-firing applications, which have not been shown in Volume II. Possible fuel combinations are: coal/gas, oil/gas, and gas/gas co-firing. In this instance, the option of reburn fuel injection will be used to describe the injection locations and the properties of the second fuel co-fired. The flue gas recirculation rate may be set to zero, when co-firing is exercised under the reburning option provided by the 2DINPT code. The gas/gas co-firing combination may be used to model a boiler which fires two different kinds of gaseous fuels, for example, natural gas and blast furnace gas.

Case Files

In the following, the input and the output files of the defined five cases are presented in Chapters 2 to 6. Each chapter devotes to one particular case. The files presented for each case contain: (a) Captured screen files --- A screen file is the output file that had been directed to the user's terminal screen. The captured screen files were generated by the interactive input sessions using one of the three input codes (2DINPT, RBINPT, BPINPT), or by the execution of the three main codes (2DHT, RBNOX, BPM); (b) Input files --- An input file is the file required to run one of the three main codes. These files were created by the execution of the three input codes; (c) Output files --- An output file is the file created by the execution of one of the main codes. These files were generated by the execution of the three main codes.

Chapter 2

2.0 CASE 1 FILES

This chapter documents all the input and output files associated with the execution of the Case 1 example as defined in Chapter 1. Case 1 example demonstrates model set-up using the 2DINPT code, and the results obtained from the 2DHT code, for the wall-fired boiler (Boiler 1) which uses *oil* as fuel. This case does not include gaseous fuel reburning applications, therefore, the RBINPT and the RBNOX codes were not used. The user may refer to Figure 1.1 for the 2D boiler zone-arrangement. Files included in this chapter are as follows:

- The record of the 2DINPT interactive session (Listing 2.1). --- This record shows the procedures of creating an input data file step-by-step. The input file created for the 2DHT code has a file name as 2DIN0101.100. Note that the 2DINPT code was operated under the file "creation" mode, which means that the input data file had not existed and was created from scratch.

- The contents of file FORWA.DAT (Listing 2.2). --- This file was created upon completion of the 2DINPT code execution. The user is suggested to save this file under a different name (e.g., FORW0101.100) if he wishes to reproduce the results of this case, as this file will be over-written every time the 2DINPT code is executed. This file contains the user-specified information for the creation of the boiler forward mass fluxes. This file was later used in the preparation of other input files (i.e., 2DIN0201.075 and 2DIN0401.100).

- The contents of file RECIR.DAT (Listing 2.3). --- This file was created upon completion of the 2DINPT code execution. The user is suggested to save this file under a different name (e.g., RECI0101.100) if he wishes to reproduce the Case 1 results, as this file will be over-written every time the 2DINPT code is executed. This file contains the user-specified information for the creation of the boiler recirculating mass fluxes. This file was also used in the preparation of input files 2DIN0201.075 and 2DIN0401.100.

- The contents of the file 2DIN0101.100 (Listing 2.4).

- The contents of the computer-terminal outputs (Listing 2.5). --- This was the outputs directed to the computer terminal screen, showing the progress of the 2DHT code execution.

- The contents of file 2DOT0101.100 (Listing 2.6). --- File 2DOT0101.100 was created upon completion of the 2DHT furnace-code execution. This file contains the predicted boiler thermal-performance information as defined by the Case 1 boiler operating conditions.

- The contents of file BOILER.DAT (Listing 2.7). --- Again, this file was created upon completion of the 2DHT code execution, and may be used for later boiler performance predictions by executing the BPM code. The user is suggested to save this file under a different name (e.g., BOIL0101.100) if he wishes to reproduce the Case 1 results, as this file will be over-written everytime the 2DHT code is executed. This case example does not include the demonstration of the BPM code execution. The user should refer to Case 2 example if he is interested in running the BPM code for this case.

Listing 2.1. Record of 2DINPT interactive session (Case 1).

```
2DINPT

-- This is an interactive program (2DINPT) to create
   or update a data file which is required to run the
   EER two-dimensional heat transfer code (2DHT).
-- Version 1.70, May, 1992


********************** Attention *********************
 This interactive program accepts inputs from keyboard
 in UPPER case only.
 -- Please set your keyboard to the UPPER case symbols
    (i.e., Caps Lock !).
 -- To continue, type C and press Return (or Enter).
******************************************************

C

STATUS OF INPUT FILE:
---------------------
To Create an input file, Press: C
To Update an input file,        Return  C

You chose to create an input file.

Please wait, writing blank data file ...
Press Return to continue


 Chapter 1 :
------------
INPUT/OUTPUT SPECIFICATIONS AND PARAMETERS WHICH
CONTROL THE EXTENT OF NUMERICAL CALCULATIONS

          Press: P to by-pass this chapter
                 Return to proceed through

Specify the name (BOLNAM) of the boiler:
-- Maximum characters allowed: 24
-- Characters can be alphabetic or numeric

          Press: C to change
                 Return to continue  C
BOILER 1

Specify a two-digit case number (NRCS) for
current run (e.g., 01, 02, or 03):
-- Case number can be used to distinguish the boiler operating
   conditions, or parametric parameters being studied

          Press: C to change
                 Return to continue  C
01

Specify a two-digit version number (NRVS) for
current run (e.g., 01, 02, or 03):
-- Version number can be used to further document cases run
   under the same case number as specified above

          Press: C to change
                 Return to continue  C
01
```

```
Specify boiler load (CLOAD) for current run:
-- Boiler load may be described as 60.5, 90.0, or 100.0,
   to show the % of current load relative to the boiler MCR

         Press: C to change
                Return to continue  C
100.0

Name of output file (FINPT) from this program:   2DINcsvs.111
-- Default file name is 2DINcsvs.LLL
-- csvs represents the case number and the version numbers
-- LLL shows the boiler load percentage

         Press: D for default values
                C to change
                Return to continue  D

Name of input array file (FINPTAR):
-- The default name has format as IARRcsvs.LLL
-- IARR denotes "input array" for the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output array file (FINPTAR):
-- The default name has format as OARRcsvs.LLL
-- OARR denotes "output array" from the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output file (FHDOPT) from the 2DHT code:
-- The default name has format as 2DOTcsvs.LLL
-- 2DOT denotes "output file" from the 2DHT code

         Press: D for the default file name
                C to change the file name
                B to direct the file to your monitor
                Return to continue  D

Specification of output level (LOUTPUT) :
Current output level is    1
-- DEFAULT setting is most useful and recommended.
-- In addition to the default setting, you can choose from
   four other output levels : 1, 2, 3, and 4.
-- Higher output levels give more comprehehsive information.

         Press: D for default values
                C to change
                Return to continue  D

You can include your comments on the front page
of the printout :
-- Comment block may consist of 10 lines
-- Each line may have a max. of 78 characters
To continue, press Return

Current comments are:
* Line  1 is blank *
* Line  2 is blank *
* Line  3 is blank *
* Line  4 is blank *
```

```
* Line  5 is blank *
* Line  6 is blank *
* Line  7 is blank *
* Line  8 is blank *
* Line  9 is blank *
* Line 10 is blank *

         Press: C to change
                Return to continue  C

* Line  1 is blank *

         Press: C to change
                Return to continue  C
FRONT WALL FIRED BURNERS, BOILER FIRING OIL AT 100% LOAD

* Line  2 is blank *

         Press: C to change
                Return to continue  C
USE SOME DEFAULT PARAMETERS

* Line  3 is blank *

         Press: C to change
                Return to continue

* Line  4 is blank *

         Press: C to change
                Return to continue

* Line  5 is blank *

         Press: C to change
                Return to continue

* Line  6 is blank *

         Press: C to change
                Return to continue

* Line  7 is blank *

         Press: C to change
                Return to continue

* Line  8 is blank *

         Press: C to change
                Return to continue

* Line  9 is blank *

         Press: C to change
                Return to continue

* Line 10 is blank *

         Press: C to change
                Return to continue

Maximum number of iterations for this run
NIMAX=  1
```

```
-- During the test phase, set NIMAX =1
-- For production runs, use NIMAX values between 30 and 100

         Press: C to change
                Return to continue  C
100

Number of iterations at which the averaging procedure
is initialized to smooth-out the Monte Carlo effects :
NITACC=  1
-- For runs without averaging, set NITACC = NIMAX.
-- For complete averaging, set NITACC =1.
-- For typical runs, set NITACC = NIMAX - 30.

         Press: C to change
                Return to continue  C
71

Number of sub-iterations for fixed carbon mass
balances per iteration of total heat balance :
NIMX=  1
-- During test phase, set NIMX=1
-- For coal combustion, set NIMX between 5 and 10
-- For gaseous and oil fuels, set NIMX=1

         Press: C to change
                Return to continue

(a) Number of divisions on the largest linear dimension
    of volume zones: NMAX= 1
(b) Divisions of polar angle: NPHI= 2
(c) Cut-off value for beam tracking: EXACT=0.001000
Default values are: NMAX  = 2
                    NPHI  = 4
                    EXACT = 0.0001
NMAX and NPHI must be even numbers

         Press: D for default values
                C to change
                Return to continue  D

Number of iterations after which field variables
of total heat balances are printed :
NPRIN=   1
-- Default value is NPRIN=NIMAX (recommended)

         Press: D for default values
                C to change
                Return to continue  D

Switches to print detailed outputs of:
-- total energy balance for volume and surface zones
-- mass balance for volume zones
Currently, switches are NOT set to print the above information.

         Enter: C to change
                Return to continue  C

You chose to print the information
Press Return to continue

Switches to write or read files to/from hard disk :
NWRTE: Switch to save data file at the end of the 2DHT run
       Currently, NWRTE= 0
```

```
NREAD: Switch to read variable values from a restarting
       file at the beginning of the 2DHT run
       Currently, NREAD= 0
-- For trial runs     , set NWRTE=1 and NREAD=0.
-- For continued runs, set NWRTE=1 and NREAD=1.

         Press: C to change
                Return to continue  C
1,0

NWRTE= 1, NREAD= 0, Are these values O.K. ?

         Press: C to change
                Return to continue

 Chapter 2 :
-------------
BOILER FURNACE OPERATING DATA

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

FUEL TYPE:
For gaseous fuels, set NGAS= 1, NLIQ= 0, NSLL= 0.
For liquid  fuels, set NGAS= 0, NLIQ= 1, NSLL= 0.
For solid   fuels, set NGAS= 0, NLIQ= 0, NSLL= 1.
Currently, NGAS= 0 NLIQ= 0 NSLL= 0

         Press: C to change
                Return to continue  C
0 1 0

You chose oil as fuel
Press Return to continue

Do you want to change fuel oil composition ?

         Press: C to change
                Return to continue  C

Fuel oil ultimate analysis, in kg/kg(dry) fuel :
    C          H          N          O          S          ASH
 0.000000  0.000000  0.000000  0.000000  0.000000  0.000000


         Press: C to change
                Return to continue  C

Type in weight fractions of the following species :
    C          H          N          O          S          ASH
0.8603 0.1174 0.0061 0.0061 0.01 0.0001

Check the fuel compositions one more time ?

         Press: C to check
                Return to continue

Fuel oil moisture content, in kg-water/kg(wet) fuel :  0.0000

         Press: C to change
                Return to continue  C
0.02
```

```
Fuel oil fixed carbon content, in kg-C/kg(wet) fuel :  0.0000

         Press: C to change
                Return to continue  C
0.0001

The following is only information

Equivalent proximate analysis of fuel in kg/kg wet
PCFX=0.0001  PVOL=0.9798  PMOI=0.0200  PASH=0.0001

Press Return to continue

Temperature of atomizing steam, in K :   525.00
Default is 525 K

         Press: D for default values
                C to change
                Return to continue

Equivalent heat capacity of atomizing steam, in kj/kg-K :     0.0000
Default is 1.6026

         Press: D for default values
                C to change
                Return to continue

Ratio of atomizing steam/fuel oil flow rates :     0.0000
Default is 0.02 kg-steam/kg-dry fuel

         Press: D for default values
                C to change
                Return to continue

Inherent sulfur capture by ash:   0.0000 % of total sulfur
Default value is 0.0 % (i.e., all sulfur is converted to SO2)

         Press: D for default values
                C to change
                Return to continue

Gross (higher) heating value of fuel in kj/kg wet :
HUSW=     0.0

         Press: C to change
                Return to continue  C
42262.8

Fuel flow rate in kg wet / sec :
FUSW=  0.0000

         Press: C to change
                Return to continue  C
4.6944

Gross fuel heat input is   198398.5 kw

         Press: C to change
                Return to continue

Temperature of fuel oil in K :
TFS=    0.00

         Press: C to change
```

```
                Return to continue  C
373.15

Specific heat of fuel oil in kj/kg dry K :
CPFS=  0.0000
Default value is 1.8334 for oil

          Press: D for default values
                 C to change
                 Return to continue  C
2.0781

Air Flow Rates and Properties
Current settings:
  Total air (wet, kg/sec) flow rate =   0.0000
  Total stochiometric air ratio =   0.0000
  O2 % (dry) in flue gas =   0.0000

You have three options to choose:
  Option A -- Specify total air flow rate (wet) in kg/sec
  Option B -- Specify total stochiometric air ratio
  Option C -- Specify O2 % (dry) in the flue gas

          Press: A, B, or C for your option
                 Return to continue  B

Air ratio AIRNR=  0.0000

          Press: C to change
                 Return to continue  C
1.06

 DMA2W =   0.0000
 AIRNR =   1.0600
 FLUO2D=   0.0000
Are these final settings O.K. ?

          Press: C to change
                 Return to continue

Water vapor content in air
(a) Relative humidity in % : RELHA2=  0.0000
(b) Saturation pressure in bar : PSH2A2=  0.0000
Default values are 50 % and 0.0317 bar at 298.15 K

          Press: D for default values
                 C to change
                 Return to continue  D

Temperature of secondary air in K :
TA2=    0.00

          Press: C to change
                 Return to continue  C
491.

Amount of primary air in % of stoichiometric air :
PASTCH= 0.0
Default value is 20%

          Press: D for default values
                 C to change
                 Return to continue
```

```
Convective heat transfer coefficient at furnace walls
in kw/m**2 K : ALPHA=  0.0000
Default value is 0.0116 kw/m**2 K

         Press: D for default values
                C to change
                Return to continue  C
0.0174

Cool side temperature of furnace walls in K :
TOUT=  0.00
Default value is 750.0 K

         Press: D for default values
                C to change
                Return to continue  C
611.1

 Chapter 3 :
-------------
INITIAL PARTICLE SIZE DISTRIBUTION

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Initial diameter XMN0(L) of particles (oil droplets or coal)
in 10 size classes, in microns :
       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0
-- Default distribution recommended for oil droplets

         Press: D for default values
                C to change
                Return to continue  D

Default has been assigned
-------------------------
Initial diameter XMN0(L) of particles (oil droplets or coal)
in 10 size classes, in microns :
      50.0      70.0      90.0     110.0     130.0     150.0     170.0     190.0
   210.0     230.0
-- Default distribution recommended for oil droplets

         Press: D for default values
                C to change
                Return to continue

Initial mass fraction CMFR(L) of particles (coal or oil droplets)
in 10 size classes :
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000

         Press: D for default values
                C to change
                Return to continue  D

Default has been assigned
-------------------------
Initial mass fraction CMFR(L) of particles (coal or oil droplets)
in 10 size classes :
  0.0130  0.0567  0.1542  0.2110  0.1981  0.1510  0.0974  0.0617
  0.0471  0.0098
```

```
         Press: D for default values
                C to change
                Return to continue

Initial mass mean diameter of particles is
XMEAN=  130.54 microns.

         Press: C to change
                Return to continue

 Chapter 4 :
-------------
PARAMETERS FOR CHAR AND VOLATILE BURN-OUT

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Parameters for Fixed Carbon Burn-Out Model
Current settings are :
(a) Activation energy in kj/kmole : ACENER=     0.00
(b) Frequency factor in kg/m**2 s bar O2 : FREQFC =      0.00

Default values (for carbon in oil) are:
ACENER=179000.0, FREQFC=61000.0

         Press: D for default values
                C to change
                Return to continue  D

The following is only for information:
-- absorption efficiency of ash cloud is assumed to be 0.1
-- mass mean diameter of fixed carbon is  43.5 microns.
-- radiation mean diameter of ash is  5.0 microns.
Press Return to continue

Specific absorption coefficient of oil ash : SKASH=  0.0000  1/((kg/m**3)m)
-- Default value is  13.6364  1/((kg/m**3)m)

         Press: D for default values
                C to change
                Return to continue  D

Fuel "Volatile" Burnout Characteristics
"Volatile" burnout time in sec : TLFMAX=  0.00
-- Default values are 0.7 sec
-- For highly swirling flow, set TLFMAX=0.4
-- For delayed mixing flame such for T-fired
   boiler, set TLFMAX=1.4

         Press: D for default values
                C to change
                Return to continue  C
0.15

Number of lumps used to represent fuel "volatile"
combustion : NVLTOT=      0.
-- Default value is 10000.

         Press: D for default values
                C to change
                Return to continue  D

Fractional conversion of "volatile" carbon to soot :
```

```
CMCVLS=  0.00
-- Default value is 0.1 (for high volatile bituminous flames)
-- For lignite flames, set to 0.05
-- For heavy oil flames, set to 0.2
-- For non-luminous gaseous flames, set to 0.0

         Press: D for default values
                C to change
                Return to continue  C
0.2

 Chapter 5 :
-------------
PARAMETERS FOR ASH REACTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Fraction of total sulfur as pyritic sulfur :
PRSULF=  0.0000
-- Default value is 0.0
-- For gas and oil firing, may set to 0.0

         Press: D for default values
                C to change
                Return to continue

 Chapter 7 :
-------------
SPECIFICATION OF FURNACE MODEL GEOMETRY

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Number of volume zones in X-direction, NX=30

         Press: C to change
                Return to continue  C
19

Number of volume zones in Y-direction, NY=10

         Press: C to change
                Return to continue  C
4

Zone extension in X-direction DX(i) in m :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue  C

DX( 1)=  0.0000

         Press: C to change
                Return to continue  C
1.976

DX( 2)=  0.0000

         Press: C to change
```

```
                Return to continue  C
1.9759

DX( 3)=  0.0000

          Press: C to change
                 Return to continue  C
1.92

DX( 4)=  0.0000

          Press: C to change
                 Return to continue  C
1.8

DX( 5)=  0.0000

          Press: C to change
                 Return to continue  C
1.15

DX( 6)=  0.0000

          Press: C to change
                 Return to continue  C
1.8

DX( 7)=  0.0000

          Press: C to change
                 Return to continue  C
1.3851

DX( 8)=  0.0000

          Press: C to change
                 Return to continue  C
1.3851

DX( 9)=  0.0000

          Press: C to change
                 Return to continue  C
1.5851

DX(10)=  0.0000

          Press: C to change
                 Return to continue  C
1.2621

DX(11)=  0.0000

          Press: C to change
                 Return to continue  C
1.3601

DX(12)=  0.0000

          Press: C to change
                 Return to continue  C
1.3601

DX(13)=  0.0000
```

```
          Press: C to change
                 Return to continue  C
1.3601

DX(14)=  0.0000

          Press: C to change
                 Return to continue  C
1.3601

DX(15)=  0.0000

          Press: C to change
                 Return to continue  C
1.6430

DX(16)=  0.0000

          Press: C to change
                 Return to continue  C
1.6430

DX(17)=  0.0000

          Press: C to change
                 Return to continue  C
1.7361

DX(18)=  0.0000

          Press: C to change
                 Return to continue  C
1.7361

DX(19)=  0.0000

          Press: C to change
                 Return to continue  C
2.3079

Furnace extension in X-direction in m : 30.7458

          Press: C to change
                 Return to continue

Zone extension in Y-direction DY(j) in m :
 0.0000  0.0000  0.0000  0.0000

          Press: C to change
                 Return to continue  C

DY( 1)=  0.0000

          Press: C to change
                 Return to continue  C
1.1534

DY( 2)=  0.0000

          Press: C to change
                 Return to continue  C
1.1534

DY( 3)=  0.0000
```

```
         Press: C to change
                Return to continue  C
1.2514

DY( 4)=  0.0000

         Press: C to change
                Return to continue  C
0.4879

Furnace extension in Y-direction in m :  4.0461

         Press: C to change
                Return to continue

Minimum I-indices :
  0    0    0    0

         Press: C to change
                Return to continue  C

IMI( 1)= 0

         Press: C to change
                Return to continue  C
1

IMI( 2)= 0

         Press: C to change
                Return to continue  C
1

IMI( 3)= 0

         Press: C to change
                Return to continue  C
2

IMI( 4)= 0

         Press: C to change
                Return to continue  C
3

Maximum I-indices :
  0    0    0    0

         Press: C to change
                Return to continue  C

IMX( 1)= 0

         Press: C to change
                Return to continue  C
19

IMX( 2)= 0

         Press: C to change
                Return to continue  C
19

IMX( 3)= 0
```

```
          Press: C to change
                 Return to continue  C
14

IMX( 4)= 0

          Press: C to change
                 Return to continue  C
9

All minimum J-indices, JMI(i), have been set to 1
Press Return to continue

Maximum J-indices :
  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0

          Press: C to change
                 Return to continue  C

JMX( 1)= 0

          Press: C to change
                 Return to continue  C
2

JMX( 2)= 0

          Press: C to change
                 Return to continue  C
3

JMX( 3)= 0

          Press: C to change
                 Return to continue  C
4

JMX( 4)= 0

          Press: C to change
                 Return to continue  C
4

JMX( 5)= 0

          Press: C to change
                 Return to continue  C
4

JMX( 6)= 0

          Press: C to change
                 Return to continue  C
4

JMX( 7)= 0

          Press: C to change
                 Return to continue  C
4

JMX( 8)= 0

          Press: C to change
```

```
                Return to continue  C
4

JMX( 9)= 0

          Press: C to change
                 Return to continue  C
4

JMX(10)= 0

          Press: C to change
                 Return to continue  C
3

JMX(11)= 0

          Press: C to change
                 Return to continue  C
3

JMX(12)= 0

          Press: C to change
                 Return to continue  C
3

JMX(13)= 0

          Press: C to change
                 Return to continue  C
3

JMX(14)= 0

          Press: C to change
                 Return to continue  C
3

JMX(15)= 0

          Press: C to change
                 Return to continue  C
2

JMX(16)= 0

          Press: C to change
                 Return to continue  C
2

JMX(17)= 0

          Press: C to change
                 Return to continue  C
2

JMX(18)= 0

          Press: C to change
                 Return to continue  C
2

JMX(19)= 0
```

```
         Press: C to change
                Return to continue  C
2

 Chapter 8 :
-------------
PARAMETERS FOR REBURNING OR CO-FIRING

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Switch for reburning or co-firing
0: to turn-off, 1: to turn-on this option
Currently, NREB=     0

         Press: C to change
                Return to continue

 Chapter 9 :
-------------
SPECIFICATION OF HEAT EXTRACTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Heat Extraction by Heat Sinks
Option A: No additional surface area.
Option B: Cooled surface area located at
          circumferential walls (M=4) of
          a refractory covered furnace.
Option C: Simulation of radiant heat exchangers
          in upper furnace.

Currently option A is exercised.

         Press: C to change
                Return to continue  C

Please type A, B or C for your option  C

--- Simulation of Radiant Heat Exchangers ---

         Press: P to by-pass this section
                R to save file and exit 2DINPT
                Return to proceed through

(a) Lower index of I zone layers occupied by the
    simulated heat exchangers: ISHL= 0
(b) Upper index of I zone layers occupied by the
    simulated heat exchangers: ISHU= 0

         Press: C to change
                Return to continue  C
10 19

Heat exchanger geometric configurations

         Press: P to by-pass this subsection
                Return to proceed through

---------------- ZONE LAYER I =10 ---------------
```

```
Total heat sink surface area (m**2)
at I=10 is     0.0000
-- Set to 0.0 if it is a cavity.

          Press: C to change
                 Return to continue  C
13.0002

Outer diameter of exchanger tubes (m)
at I = 10 is 0.000000

          Press: C to change
                 Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 10
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=10 is    0

          Press: C to change
                 Return to continue  C
24

Equidistant radial panel spacing (m)
at I=10 is    0.0000

          Press: C to change
                 Return to continue  C
0.5402

At zone layer I= 10
Number of panels=    1
Distance between panels=  0.5402
Number of tubes per panel=  24

          Press: C to change
                 Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=10 is    0.9660

---------------- ZONE LAYER I =11 ---------------
Total heat sink surface area (m**2)
at I=11 is     0.0000
-- Set to 0.0 if it is a cavity.

          Press: C to change
                 Return to continue  C
132.6299

Outer diameter of exchanger tubes (m)
```

```
at I = 11 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 11
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

         Press the corresponding key for your option
         To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=11 is    0

         Press: C to change
                Return to continue  C
21

Equidistant radial panel spacing (m)
at I=11 is    0.0000

         Press: C to change
                Return to continue  C
1.0497

At zone layer I= 11
Number of panels=    3
Distance between panels=  1.0497
Number of tubes per panel=  21

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=11 is    0.7844

---------------- ZONE LAYER I =12 ---------------
Total heat sink surface area (m**2)
at I=12 is     0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
132.6299

Outer diameter of exchanger tubes (m)
at I = 12 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 12
You have three options :
Option A: Specify number of cylindrical panels,
```

```
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=12 is    0

          Press: C to change
                 Return to continue  C
21

Equidistant radial panel spacing (m)
at I=12 is    0.0000

          Press: C to change
                 Return to continue  C
1.0497

At zone layer I= 12
Number of panels=    3
Distance between panels=  1.0497
Number of tubes per panel=  21

          Press: C to change
                 Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=12 is    0.7844

---------------- ZONE LAYER I =13 ---------------
Total heat sink surface area (m**2)
at I=13 is     0.0000
-- Set to 0.0 if it is a cavity.

          Press: C to change
                 Return to continue  C
66.3215

Outer diameter of exchanger tubes (m)
at I = 13 is 0.000000

          Press: C to change
                 Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 13
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B

You chose option B
```

```
Press Return to continue

Number of tube per cylndrical panel
at I=13 is    0

         Press: C to change
                Return to continue  C
21

Equidistant radial panel spacing (m)
at I=13 is    0.0000

         Press: C to change
                Return to continue  C
3.1495

At zone layer I= 13
Number of panels=    1
Distance between panels=  3.1495
Number of tubes per panel=  21

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=13 is    0.7844

---------------- ZONE LAYER I =14 ---------------
Total heat sink surface area (m**2)
at I=14 is     0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
66.3215

Outer diameter of exchanger tubes (m)
at I = 14 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 14
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=14 is    0

          Press: C to change
                 Return to continue  C
21
```

```
Equidistant radial panel spacing (m)
at I=14 is   0.0000

         Press: C to change
                Return to continue  C
3.1495

At zone layer I= 14
Number of panels=   1
Distance between panels=  3.1495
Number of tubes per panel=  21

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=14 is   0.7844

---------------- ZONE LAYER I =15 ---------------
Total heat sink surface area (m**2)
at I=15 is    0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
177.0809

Outer diameter of exchanger tubes (m)
at I = 15 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 15
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

         Press the corresponding key for your option
         To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=15 is   0

         Press: C to change
                Return to continue  C
22

Equidistant radial panel spacing (m)
at I=15 is   0.0000

         Press: C to change
                Return to continue  C
0.2867

At zone layer I= 15
Number of panels=   7
```

```
Distance between panels=  0.2867
Number of tubes per panel=  22

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=15 is    0.6802

---------------- ZONE LAYER I =16 ---------------
Total heat sink surface area (m**2)
at I=16 is     0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
177.0809

Outer diameter of exchanger tubes (m)
at I = 16 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 16
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

         Press the corresponding key for your option
         To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=16 is    0

         Press: C to change
                Return to continue  C
22

Equidistant radial panel spacing (m)
at I=16 is    0.0000

         Press: C to change
                Return to continue  C
0.2867

At zone layer I= 16
Number of panels=    7
Distance between panels=  0.2867
Number of tubes per panel=  22

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=16 is    0.6802
```

```
---------------- ZONE LAYER I =17 ---------------
Total heat sink surface area (m**2)
at I=17 is     0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
249.3792

Outer diameter of exchanger tubes (m)
at I = 17 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 17
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

         Press the corresponding key for your option
         To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=17 is    0

         Press: C to change
                Return to continue  C
24

Equidistant radial panel spacing (m)
at I=17 is    0.0000

         Press: C to change
                Return to continue  C
0.2303

At zone layer I= 17
Number of panels=    9
Distance between panels=  0.2303
Number of tubes per panel=  24

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=17 is    0.7023

---------------- ZONE LAYER I =18 ---------------
Total heat sink surface area (m**2)
at I=18 is     0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
249.3792
```

```
Outer diameter of exchanger tubes (m)
at I = 18 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 18
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

         Press the corresponding key for your option
         To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=18 is   0

         Press: C to change
                Return to continue  C
24

Equidistant radial panel spacing (m)
at I=18 is   0.0000

         Press: C to change
                Return to continue  C
0.2303

At zone layer I= 18
Number of panels=   9
Distance between panels=  0.2303
Number of tubes per panel=  24

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=18 is   0.7023

---------------- ZONE LAYER I =19 ---------------
Total heat sink surface area (m**2)
at I=19 is    0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
84.2278

Outer diameter of exchanger tubes (m)
at I = 19 is 0.000000

         Press: C to change
                Return to continue  C
0.0508

Simulation of heat exchanger arrangement at I= 19
You have three options :
```

```
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=19 is    0

          Press: C to change
                 Return to continue  C
30

Equidistant radial panel spacing (m)
at I=19 is    0.0000

          Press: C to change
                 Return to continue  C
0.9333

At zone layer I= 19
Number of panels=    2
Distance between panels=  0.9333
Number of tubes per panel=  30

          Press: C to change
                 Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=19 is   0.6603

Initial Values of Heat Exchanger Surface Temperatures (Gas Side, in K)
In volume zone layer I=10 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00; J= 3 TWSINK=     0.00
In volume zone layer I=11 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00; J= 3 TWSINK=     0.00
In volume zone layer I=12 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00; J= 3 TWSINK=     0.00
In volume zone layer I=13 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00; J= 3 TWSINK=     0.00
In volume zone layer I=14 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00; J= 3 TWSINK=     0.00
In volume zone layer I=15 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00
In volume zone layer I=16 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00
In volume zone layer I=17 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00
Press Return to continue

In volume zone layer I=18 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00
In volume zone layer I=19 :
  J= 1 TWSINK=     0.00; J= 2 TWSINK=     0.00
Press Return to continue

-- Default values are 800.00 K
```

```
         Press: D for default values
                C to change
                Return to continue  D

Emissivities of heat exchanger surfaces
In volume zone layer I=10 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000; J= 3 EWSINK=  0.0000
In volume zone layer I=11 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000; J= 3 EWSINK=  0.0000
In volume zone layer I=12 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000; J= 3 EWSINK=  0.0000
In volume zone layer I=13 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000; J= 3 EWSINK=  0.0000
In volume zone layer I=14 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000; J= 3 EWSINK=  0.0000
In volume zone layer I=15 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
In volume zone layer I=16 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
In volume zone layer I=17 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
Press Return to continue

In volume zone layer I=18 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
In volume zone layer I=19 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
Press Return to continue

-- Default values are 0.7

         Press: D for default values
                C to change
                Return to continue  D

Values of deposit conductivity/thickness ratios in kw/m**2 K
In volume zone layer I=10 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000; J= 3 CSSINK=  0.0000
In volume zone layer I=11 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000; J= 3 CSSINK=  0.0000
In volume zone layer I=12 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000; J= 3 CSSINK=  0.0000
In volume zone layer I=13 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000; J= 3 CSSINK=  0.0000
In volume zone layer I=14 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000; J= 3 CSSINK=  0.0000
In volume zone layer I=15 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
In volume zone layer I=16 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
In volume zone layer I=17 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
Press Return to continue

In volume zone layer I=18 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
In volume zone layer I=19 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
Press Return to continue

-- Default values are 0.4, 0.6, and 1.0 for coal,
   oil, and gas-fired furnaces, respectively

         Press: D for default values
```

```
                C to change
                Return to continue  C

CSSINK(10, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.8

CSSINK(11, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(11, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(11, 3)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(12, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(12, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(12, 3)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(13, 3)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(14, 3)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(15, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(15, 2)=  0.0000 kw/m**2 K
```

```
         Press: C to change
                Return to continue  C
0.4

CSSINK(16, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(16, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.4

CSSINK(17, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.6

CSSINK(17, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.6

CSSINK(18, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.6

CSSINK(18, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.6

CSSINK(19, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.6

CSSINK(19, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.6

Convective heat transfer coefficients (ALSH) at heat
exchanger surfaces in zone layers I=10 to 19,
in kw/m**2 K (total surface area) :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
-- Default values are 0.0500.

         Press: D for default values
                C to change
                Return to continue  C

At I = 10, ALSH(10) =   0.0000
```

```
         Press: C to change
                Return to continue  C
0.02

At I = 11, ALSH(11) =   0.0000

         Press: C to change
                Return to continue  C
0.02

At I = 12, ALSH(12) =   0.0000

         Press: C to change
                Return to continue  C
0.02

At I = 13, ALSH(13) =   0.0000

         Press: C to change
                Return to continue  C
0.02

At I = 14, ALSH(14) =   0.0000

         Press: C to change
                Return to continue  C
0.02

At I = 15, ALSH(15) =   0.0000

         Press: C to change
                Return to continue  C
0.02

At I = 16, ALSH(16) =   0.0000

         Press: C to change
                Return to continue  C
0.02

At I = 17, ALSH(17) =   0.0000

         Press: C to change
                Return to continue  C
0.05

At I = 18, ALSH(18) =   0.0000

         Press: C to change
                Return to continue  C
0.05

At I = 19, ALSH(19) =   0.0000

         Press: C to change
                Return to continue  C
0.05

Heat exchanger steam or water side temperatures
(TOUTSH) in zone layers I=10 to 19, in K
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
-- Default values are 750.0 K.

         Press: D for default values
```

```
                C to change
                Return to continue  C

At I = 10, TOUTSH(10) =      0.00

          Press: C to change
                 Return to continue  C
720

At I = 11, TOUTSH(11) =      0.00

          Press: C to change
                 Return to continue  C
720

At I = 12, TOUTSH(12) =      0.00

          Press: C to change
                 Return to continue  C
720

At I = 13, TOUTSH(13) =      0.00

          Press: C to change
                 Return to continue  C
720

At I = 14, TOUTSH(14) =      0.00

          Press: C to change
                 Return to continue  C
720

At I = 15, TOUTSH(15) =      0.00

          Press: C to change
                 Return to continue  C
786.39

At I = 16, TOUTSH(16) =      0.00

          Press: C to change
                 Return to continue  C
786.39

At I = 17, TOUTSH(17) =      0.00

          Press: C to change
                 Return to continue  C
765.56

At I = 18, TOUTSH(18) =      0.00

          Press: C to change
                 Return to continue  C
765.56

At I = 19, TOUTSH(19) =      0.00

          Press: C to change
                 Return to continue  C
765.56

 Chapter 11 :
```

```
--------------
RELATIVE MASS FLOW RATE DISTRIBUTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

--- Prescription of Relative Inlet Mass Flows ---
Relative inlet mass flow rates in positive X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative inlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue  C

DM4( 1, 3) =   0.0000

         Press: C to change
                Return to continue

DM4( 2, 4) =   0.0000

         Press: C to change
                Return to continue

DM4( 3, 5) =   0.0000

         Press: C to change
                Return to continue  C
0.3333

DM4( 4, 5) =   0.0000

         Press: C to change
                Return to continue  C
0.3333

DM4( 5, 5) =   0.0000

         Press: C to change
                Return to continue  C
0.3334

DM4( 6, 5) =   0.0000

         Press: C to change
                Return to continue

DM4( 7, 5) =   0.0000

         Press: C to change
                Return to continue

DM4( 8, 5) =   0.0000

         Press: C to change
                Return to continue
```

```
DM4( 9, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4(10, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4(11, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4(12, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4(13, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4(14, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4(15, 3) =   0.0000

          Press: C to change
                 Return to continue

DM4(16, 3) =   0.0000

          Press: C to change
                 Return to continue

DM4(17, 3) =   0.0000

          Press: C to change
                 Return to continue

DM4(18, 3) =   0.0000

          Press: C to change
                 Return to continue

DM4(19, 3) =   0.0000

          Press: C to change
                 Return to continue

Press Return to continue.

--- Prescription of Relative Outlet Mass Flows ---
Relative outlet mass flow rates in negative X-direction :
 0.0000  0.0000  0.0000  0.0000

          Press: C to change
                 Return to continue
```

```
Relative outlet mass flow rates in positive X-direction :
 0.0000  0.0000

You have two options to modify outlet flow in the
positive X-direction:
   Option A -- Zonewise prescription
   Option B -- Use profile factors
-- Default is plug flow

         Press: A for option A
                B for option B
                D for the default
                Return to continue  A

DM1(20, 1) =   0.0000

         Press: C to change
                Return to continue  C
0.25

DM1(20, 2) =   0.0000

         Press: C to change
                Return to continue  C
0.75

Relative outlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative outlet mass flow rates in positive Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

--- Prescription of Relative Zonal Mass Flow Rates ---

You have two options.
-- Option A: Direct (i.e., zone by zone) prescription
-- Option B: Computer aided prescription (recommended)

         Press: A for option A
                B for option B
                Return to continue  B

You chose option B.
To continue, press Return

Normalized velocities in X-direction :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
```

```
J= 4      0.0000   0.0000
J= 3      0.0000   0.0000
J= 2      0.0000   3.0765
J= 1      0.0000   3.0765
          I=19     I=20
You chose option B.
To continue, press Return


--- Computer aided zonal mass prescription ---
Default distribution is plug flow in positive X-direction,
and superimpose recirculation flows latter.

          Press: D for default distribution
                 Return to continue

--- Computer aided zonal mass prescription ---
You have two options to specify the mass flows
in X-direction.
 Option A: Prescribe forward velocity profiles using
           profile factors, then superimpose recirculation
           flows later (recommended).
 Option B: Prescribe complete velocity profiles (i.e., zonal
           velocity normalized with mean velocity over the
           largest furnace cross-section in the X-direction).

          Press: A for option A
                 B for option B
                 Return to continue  A

Profile factors in X-direction at cross-section I=  2

          Press: C to change
                 Return to continue  C

Type profile factors for cross-section I= 2,
from J= 1 thru J= 2 :
1 1

Profile factors in X-direction at cross-section I=  3

          Press: C to change
                 Return to continue  C

Type profile factors for cross-section I= 3,
from J= 1 thru J= 3 :
1 1 1

Profile factors in X-direction at cross-section I=  4

          Press: C to change
                 Return to continue  C

Type profile factors for cross-section I= 4,
from J= 1 thru J= 4 :
1 1 1 1

Profile factors in X-direction at cross-section I=  5

          Press: C to change
                 Return to continue  C

Type profile factors for cross-section I= 5,
from J= 1 thru J= 4 :
```

```
1 1 1 1

Profile factors in X-direction at cross-section I=  6

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I= 6,
from J= 1 thru J= 4 :
1 1 1 1

Profile factors in X-direction at cross-section I=  7

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I= 7,
from J= 1 thru J= 4 :
1 1 1 1

Profile factors in X-direction at cross-section I=  8

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I= 8,
from J= 1 thru J= 4 :
1 1 1 1

Profile factors in X-direction at cross-section I=  9

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I= 9,
from J= 1 thru J= 4 :
1 1 1 1

Profile factors in X-direction at cross-section I= 10

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=10,
from J= 1 thru J= 3 :
1 1 1

Profile factors in X-direction at cross-section I= 11

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=11,
from J= 1 thru J= 3 :
1 1 1

Profile factors in X-direction at cross-section I= 12

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=12,
from J= 1 thru J= 3 :
1 1 1
```

```
Profile factors in X-direction at cross-section I= 13

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=13,
from J= 1 thru J= 3 :
1 1 1

Profile factors in X-direction at cross-section I= 14

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=14,
from J= 1 thru J= 3 :
1 1 1

Profile factors in X-direction at cross-section I= 15

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=15,
from J= 1 thru J= 2 :
1 1

Profile factors in X-direction at cross-section I= 16

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=16,
from J= 1 thru J= 2 :
1 1

Profile factors in X-direction at cross-section I= 17

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=17,
from J= 1 thru J= 2 :
1 1

Profile factors in X-direction at cross-section I= 18

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=18,
from J= 1 thru J= 2 :
1 1

Profile factors in X-direction at cross-section I= 19

         Press: C to change
                Return to continue  C

Type profile factors for cross-section I=19,
from J= 1 thru J= 2 :
1 1

Profile factors are saved in an newly created file : FORWA.DAT
```

```
To continue, press Return

Normalized velocities in Y-direction
J= 5     0.0000  0.0000 -0.3512 -0.3746 -0.5865  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000 -0.3088 -0.3294 -0.5158  0.0000  0.0000  0.0000 -0.3289
J= 3     0.0000  0.0000 -0.2002 -0.2136 -0.3344  0.0000  0.0000  0.0000 -0.2132
J= 2     0.0000  0.0000 -0.1001 -0.1068 -0.1672  0.0000  0.0000  0.0000 -0.1066
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000 -1.5124  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000 -0.7562  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19    I=
To continue, press Return

Residual of total mass balance for volume zones
as fraction of total input mass flow :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19
To continue, press Return

 Chapter 12 :
--------------
PRESCRIPTION OF RECIRCULATING FLOW FIELD

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Recirculating flow over cross-section I= 2
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
40

Type profile factors in pos. and neg. X-directions
over cross-section I= 2 and J= 1 :  0 10

Type profile factors in pos. and neg. X-directions
```

```
over cross-section I= 2 and J= 2 :  10 0

Recirculating flow over cross-section I= 3
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
30

Type profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 1 :  0 6

Type profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 2 :  0 4

Type profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 3 :  10 0

Recirculating flow over cross-section I= 4
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
20

Type profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 1 :  0 6

Type profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 2 :  0 4

Type profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 3 :  4 0

Type profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 4 :  6 0

Recirculating flow over cross-section I= 5
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
20

Type profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 1 :  0 6

Type profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 2 :  0 4

Type profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 3 :  6 0

Type profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 4 :  4 0
```

```
Recirculating flow over cross-section I= 6
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
45

Type profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 1 :  0 6

Type profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 2 :  0 4

Type profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 3 :  4 0

Type profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 4 :  6 0

Recirculating flow over cross-section I= 7
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
30

Type profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 1 :  0 6

Type profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 2 :  0 4

Type profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 3 :  4 0

Type profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 4 :  6 0

Recirculating flow over cross-section I= 8
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
15

Type profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 1 :  0 5

Type profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 2 :  0 5

Type profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 3 :  5 0

Type profile factors in pos. and neg. X-directions
```

```
over cross-section I= 8 and J= 4 :  5 0

Recirculating flow over cross-section I= 9
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=10
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=11
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
20

Type profile factors in pos. and neg. X-directions
over cross-section I=11 and J= 1 :  0 6

Type profile factors in pos. and neg. X-directions
over cross-section I=11 and J= 2 :  0 4

Type profile factors in pos. and neg. X-directions
over cross-section I=11 and J= 3 :  10 0

Recirculating flow over cross-section I=12
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=13
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=14
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=15
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=16
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
```

```
over this cross-section in % of inlet mass flow :
20

Type profile factors in pos. and neg. X-directions
over cross-section I=16 and J= 1 :  10 0

Type profile factors in pos. and neg. X-directions
over cross-section I=16 and J= 2 :  0 10

Recirculating flow over cross-section I=17
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=18
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=19
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Profile factors are saved in an newly created file : RECIR.DAT
To continue, press Return


Normalized velocities in Y-direction
J= 5     0.0000  0.0000 -0.3512 -0.3746 -0.5865  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000 -0.2055 -0.3294 -0.3001 -0.0827 -0.1312 -0.0837 -0.3289
J= 3     0.0000  0.5388 -0.3850 -0.2136  0.4370 -0.2957 -0.3843 -0.3843 -0.2132
J= 2     1.4366 -1.0775 -0.2233 -0.1068  0.3471 -0.1971 -0.3202 -0.1921 -0.1066
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.5623 -0.5218  0.0000  0.0000 -1.5124  0.0000  0.0000  0.0000  0.0000
J= 2     0.3749 -0.3479  0.0000  0.0000 -0.7562 -0.8639  0.8639  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19    I=
To continue, press Return

 Chapter 13 :
--------------
PRESCRIPTION OF TURBULENT MASS FLUX VECTORS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

This is the current relative turbulent mass flux
field with respect to the X-direction :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
J= 2     0.0000  0.0000  0.0000  0.0813  0.1333  0.2438  0.2000  0.1125  0.0000
J= 1     0.0000  0.0000  0.0000  0.0271  0.0542  0.0813  0.0813  0.0375  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.1333  0.0000  0.0000  0.0000  0.0000  0.2000  0.0000  0.0000
J= 1     0.0000  0.0667  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000
J= 3     0.0000  0.0000
J= 2     0.0000  0.0000
J= 1     0.0000  0.0000
         I=19    I=20    I=
To continue, press Return

This is the current turbulent mass flux field
with respect to the Y-direction :
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0863  0.0000  0.1078  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.1084  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0271  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19    I=
To continue, press Return

You have three options to modify the turbulent field.
Option A : Default distribution calculated by the
           2DHT program (recommended).
Option B : No turbulence at all.
Option C : Column- and row-wise prescriptions.

         Press: a corresponding key for your option
                Return to continue  A

You chose option A.

         Press: C to clear existing turbulence (if any),
                Return to continue

You have to prescribe two constants, CTUR1 and CTUR2,
so that the 2DHT program can calculate default turbulent fluxes.
Current values are : CTUR1=  0.00 %
                     CTUR3=  0.00 %
-- Defaults are     : CTUR1= 10.00 %
                     CTUR3=  5.00 %
-- CTUR1 is a proportionality constant for a turbulent
   velocity component calculated from the local velocity
   vector.
-- CTUR3 is another proportionality constant for a
   turbulent velocity component calculated from the mean
   velocity over the largest furnace cross-section.
```

```
         Press: D for default values
                C to change
                Return to continue  C
30 15

Fractional reduction of turbulence in furnace zones
with heat exchangers:
Current reduction =   1.0000
-- Default reduction is 0.5

         Press: D for default values
                C to change
                Return to continue

Residual of total mass balance for volume zones
as fraction of total input mass flow :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19
To continue, press Return


 Chapter 14 :
--------------
FUEL INLET FLOWS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Relative Fuel Inlet Flow Rates :
Default distribution assumes fuel inlet flows are
proportional to total mass flow rates, i.e., burners
are fired at same stoichiometry.

         Press: D for default distribution
                Return to continue  D

Relative fuel inlet flow rates in pos. X-direction :
 0.0000  0.0000  0.0000  0.0000
Relative fuel inlet flow rates in neg. Y-direction :
 0.0000  0.0000  0.3333  0.3333  0.3334  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000


 Chapter 15 :
--------------
DATA FOR INITIAL VOLUME AND SURFACE ZONE TEMPERATURES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through
```

```
--- Specification of Initial Volume-Zone Temperatures ---

         Press: P to by-pass this subsection
                Return to proceed through

Initial temperature T(i,j) for volume zones
in degree K :
-- Default values are T(i,j)=1600 K
-- If you intend to read these data from disk (i.e.,NREAD=1),
   initial data of T(i,j) can be arbitrary

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  D

Initial data for volume zone temperatures T(i,j)
in degree K :
J= 4       1.00    1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
J= 3       1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
J= 2    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
J= 1    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
          I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4       1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00
J= 3    1600.00 1600.00 1600.00 1600.00 1600.00    1.00    1.00    1.00    1.00
J= 2    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
J= 1    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
          I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4       1.00
J= 3       1.00
J= 2    1600.00
J= 1    1600.00
          I=19

         To change the inital data column by column
         press C; else press Return


--- Specification of Initial Surface-Zone Temperatures ---

         Press: P to by-pass this subsection
                Return to proceed through

Initial temperature TW(i,j) for surface zones
in degree K :
-- Default values are TW(*,*)=1200. K, except at outlets,
   where you have to specify equivalent surface temperatures.

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  D

Surface temperatures TW(*,1) in K :
1200.00 1200.00 1200.00 1200.00

         Press: C to change
                Return to continue  C

At J =  1, TW(J,1) =  1200.00

         Press: C to change
                Return to continue  C
```

```
350

At J =  2, TW(J,1) =  1200.00

         Press: C to change
                Return to continue

At J =  3, TW(J,1) =  1200.00

         Press: C to change
                Return to continue

At J =  4, TW(J,1) =  1200.00

         Press: C to change
                Return to continue

Surface temperatures TW(*,3) in K :
   0.00    0.00 1200.00 1200.00

         Press: C to change
                Return to continue  C

At J =  1, TW(J,3) =     0.00

         Press: C to change
                Return to continue  C
800

At J =  2, TW(J,3) =     0.00

         Press: C to change
                Return to continue  C
800

At J =  3, TW(J,3) =  1200.00

         Press: C to change
                Return to continue

At J =  4, TW(J,3) =  1200.00

         Press: C to change
                Return to continue

Surface temperatures TW(*,2) in K :
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00

         Press: C to change
                Return to continue

Surface temperatures TW(*,4) in K :
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00

         Press: C to change
                Return to continue


--- Specification of Equivalent Surface Temperatures for Furnace Outlets ---

         Press: P to by-pass this subsection
                Return to proceed through
```

```
Equivalent surface temperature (K) at outlet
J= 1, I=19 : TW(*,*)=  800.00

         Press: C to change
                Return to continue

Equivalent surface temperature (K) at outlet
J= 2, I=19 : TW(*,*)=  800.00

         Press: C to change
                Return to continue

         Press: C to check outlet-zone surface temperatures one more time
                Return to continue without checking

 Chapter 16 :
--------------
DATA FOR EMISSIVITIES AND DEPOSIT CONDUCTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through


--- Specification of Surface Zone Emissivities ---

         Press: P to by-pass this subsection
                Return to proceed through

Emissivity EW(*,*) for various furnace wall sections :
-- Default values are EW(*,*)=0.7, except at outlets,
   where EW(*,*)=1.0

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  D

Surface emissivities EW(*,1) :
 0.7000  0.7000  0.7000  0.7000

         Press: C to change
                Return to continue  C

At J =  1, EW(J,1) =   0.7000

         Press: C to change
                Return to continue  C
1.0

At J =  2, EW(J,1) =   0.7000

         Press: C to change
                Return to continue

At J =  3, EW(J,1) =   0.7000

         Press: C to change
                Return to continue

At J =  4, EW(J,1) =   0.7000

         Press: C to change
                Return to continue
```

```
Surface emissivities EW(*,3) :
 1.0000  1.0000  0.7000  0.7000

         Press: C to change
                Return to continue

Surface emissivities EW(*,2) :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Surface emissivities EW(*,4) :
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000

         Press: C to change
                Return to continue

         Press: C to check surface-zone EW(*,*) values one more time
                Return to continue without checking


--- Specification of Surface Emissivity for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through

Emissivities at outlet
J= 1, I=19 : EW(*,*)=  1.0000

         Press: C to change
                Return to continue

Emissivities at outlet
J= 2, I=19 : EW(*,*)=  1.0000

         Press: C to change
                Return to continue

         Press: C to check outlet-zone EW(*,*) values one more time
                Return to continue without checking


--- Specification of Deposit Conductivity/Thickness Ratios ---

         Press: P to by-pass this subsection
                Return to proceed through

Deposit thermal-conductivity/thickness ratios
CS(*,*) for surface zones in kw/m**2 K :
-- Default values for non-outlet zones are: 0.4, 0.8 and 1.0
   for coal, oil and gas fired furnaces, respectively
-- Default values for outlet zones are 0.0

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  D

Deposit thermal conductivity to thickness ratios
CS(*,1) in kw/m**2 K :
 0.8000  0.8000  0.8000  0.8000
```

```
         Press: C to change
                Return to continue  C

For clean surfaces with constant temperatures
set CS(*,*)=0.
At J =  1, CS(J,1) =   0.8000

         Press: C to change
                Return to continue  C
0.0

At J =  2, CS(J,1) =   0.8000

         Press: C to change
                Return to continue

At J =  3, CS(J,1) =   0.8000

         Press: C to change
                Return to continue

At J =  4, CS(J,1) =   0.8000

         Press: C to change
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,3) in kw/m**2 K :
 0.0000  0.0000  0.8000  0.8000

         Press: C to change
                Return to continue  C

For clean surfaces with constant temperatures
set CS(*,*)=0.
At J =  1, CS(J,3) =   0.0000

         Press: C to change
                Return to continue

At J =  2, CS(J,3) =   0.0000

         Press: C to change
                Return to continue

At J =  3, CS(J,3) =   0.8000

         Press: C to change
                Return to continue  C
0.4

At J =  4, CS(J,3) =   0.8000

         Press: C to change
                Return to continue  C
0.4

Deposit thermal conductivity to thickness ratios
CS(*,2) in kw/m**2 K :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue
```

```
Deposit thermal conductivity to thickness ratios
CS(*,4) in kw/m**2 K :
 0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000
 0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000

         Press: C to change
                Return to continue  C

For clean surfaces with constant temperatures
set CS(*,*)=0.
At I =  1, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  2, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  3, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  4, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  5, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  6, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  7, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  8, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I =  9, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I = 10, CS(I,4) =   0.8000

         Press: C to change
                Return to continue

At I = 11, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
```

```
0.4

At I = 12, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.4

At I = 13, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.4

At I = 14, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.4

At I = 15, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.4

At I = 16, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.4

At I = 17, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.6

At I = 18, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.6

At I = 19, CS(I,4) =   0.8000

         Press: C to change
                Return to continue  C
0.6

         Press: C to check surface-zone CS(*,*) values one more time
                Return to continue without checking


--- Specification of Deposit Conductivity/Thickness Ratios for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through

Deposit thermal conductivity/thickness ratios
for furnace outlet surfaces
-- Default is CS(*,*)= 0.0 (recommended)

         Press: D for default values
```

```
                C to change
                Return to continue

NOTE:
-- Output file was saved as file 2DIN0101.100
-- To update 2DIN0101.100 further, you have to copy file 2DIN0101.100
   to file INPUT.DAT under DOS, then rerun 2DINPT.EXE
-- If you want to save the original contents of file
   INPUT.DAT, make sure you save it with a different name
```

Listing 2.2. Contents of file FORWA.DAT (Case 1).

```
    1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
    1   1   1
c --
    2   1   2
  1.000  1.000
c --
    3   1   3
  1.000  1.000  1.000
c --
    4   1   4
  1.000  1.000  1.000  1.000
c --
    5   1   4
  1.000  1.000  1.000  1.000
c --
    6   1   4
  1.000  1.000  1.000  1.000
c --
    7   1   4
  1.000  1.000  1.000  1.000
c --
    8   1   4
  1.000  1.000  1.000  1.000
c --
    9   1   4
  1.000  1.000  1.000  1.000
c --
   10   1   3
  1.000  1.000  1.000
c --
   11   1   3
  1.000  1.000  1.000
c --
   12   1   3
  1.000  1.000  1.000
c --
   13   1   3
  1.000  1.000  1.000
c --
   14   1   3
  1.000  1.000  1.000
c --
   15   1   2
  1.000  1.000
c --
   16   1   2
  1.000  1.000
c --
   17   1   2
  1.000  1.000
c --
   18   1   2
  1.000  1.000
c --
   19   1   2
  1.000  1.000
```

Listing 2.3. Contents of file RECIR.DAT (Case 1).

```
    1    1    1    1    1    1    1    0    0    1    0    0    0    0    1
    0    0    0
c --
    2    1    2
  0.000 10.000
 10.000  0.000
c --
    3    1    3
  0.000  0.000 10.000
  6.000  4.000  0.000
c --
    4    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    5    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    6    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    7    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    8    1    4
  0.000  0.000  5.000  5.000
  5.000  5.000  0.000  0.000
c --
   11    1    3
  0.000  0.000 10.000
  6.000  4.000  0.000
c --
   16    1    2
 10.000  0.000
  0.000 10.000
```

Listing 2.4. Contents of file 2DIN0101.100 (Case 1).

```
BOILER 1
01
01
100.0   100
2DIN0101.100
IARR0101.100
OARR0101.100
GRAF
2DOT0101.100
   4   1
c FRONT WALL FIRED BURNERS, BOILER FIRING OIL AT 100% LOAD
c USE SOME DEFAULT PARAMETERS
c
c
c
c
c
c
c
c
 100
    09999.000009999.00000
  71
   1
   2   40.000100
 100
   0
   1   1
   1   0
   0
   0   1   0
  0.0001  0.9798  0.0200  0.0001
  0.8603  0.1174  0.0061  0.0061  0.0100  0.0001
525.000000  0.000000  0.000000
  0.0000
 42262.8
  4.6944
  373.15
  2.0781
    0.0000
  1.0600
  0.0000
 50.0000  0.0317
  491.00
  0.0000     0.0
  0.0174
  611.10
 0.0000167 0.0000233 0.0000300 0.0000367 0.0000433 0.0000500 0.0000567 0.0000633
 0.0000700 0.0000767
  0.0130  0.0567  0.1542  0.2110  0.1981  0.1510  0.0974  0.0617  0.0471  0.0098
   1045.00    690.00
 179000.00  61000.00      1.00
 13.6364  545.45
  0.1500  10000.
  0.2000
  0.300000  0.300000  0.002917  0.002917
   0
   0   1   0   0
    0.0000
   0    0.000000    0.000000   74.094742    0.000000    0.000000
    0.000000    0.000000    0.000000    0.000000
   5
0.00000000000.00000000000.00000000000.00000000000.0000000000
  0.000000  0.000000  0.000000  0.000000  0.000000
    0.00    0.00    0.00    0.00    0.00
    0.00    0.00    0.00
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
  0
0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
0.0000000 0.0000000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.0000
  0
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000000
0.1000000
 19   4
  1  10  19
   0.0000  0.0000
 0.0000
   0.00
  0
 1.9760  1.9759  1.9200  1.8000  1.1500  1.8000  1.3851  1.3851  1.5851  1.2621
 1.3601  1.3601  1.3601  1.3601  1.6430  1.6430  1.7361  1.7361  2.3079
 1.1534  1.1534  1.2514  0.4879
  1   1   2   3
 19  19  14   9
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  2   3   4   4   4   4   4   4   4   3   3   3   3   3   2   2   2   2   2
  0   0   0
 0.0000  300.00
 0.0000
 300.00
 0.0000
    0.0
 0.0000
 0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
 0.000000  0.000000  0.000000
0.0000000 0.0000000
 0.0000       0.
 0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0   0
300.00000   0.00000   0.00000
  0.00000   0.00000   0.00000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  2.4646
 3.8887  3.8887  0.0000  0.0000  9.2101  9.2101 11.4566 11.4566  2.9108
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.5925  2.5925  0.0000  0.0000  5.5261  5.5261  7.6377  7.6377  1.9405
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.1146  2.1146  2.1148  2.1148  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  800.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00  800.00  800.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.7000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.7000  0.7000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.8000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.4000  0.4000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
 0    0    0    0    0    0    0    0    0    1    3    3    1    1    7    7    9    9    2
 0    0    0    0    0    0    0    0    0   24   21   21   21   21   22   22   24   24   30
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0508
0.0508  0.0508  0.0508  0.0508  0.0508  0.0508  0.0508  0.0508  0.0508
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.5402
1.0497  1.0497  3.1495  3.1495  0.2867  0.2867  0.2303  0.2303  0.9333
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.9660
0.7844  0.7844  0.7844  0.7844  0.6802  0.6802  0.7022  0.7022  0.6603
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0200
0.0200  0.0200  0.0200  0.0200  0.0200  0.0200  0.0500  0.0500  0.0500
  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  720.00
720.00  720.00  720.00  720.00  786.39  786.39  765.56  765.56  765.56
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  1.0000
1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
 0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
0.0000  0.0000  0.0000  0.0000
0.0000  0.4000  0.0000  0.0000
0.0000  0.0000  0.3000  0.0000
0.0271  0.0813  0.2632  0.1618
0.0542  0.1625  0.4126  0.2373
0.0813  0.2438  0.7043  0.4207
0.0813  0.2438  0.6189  0.3560
0.0813  0.2438  0.5480  0.2770
0.0813  0.2438  0.4483  0.2266
0.1051  0.3152  0.5797  0.0000
0.1051  0.3152  0.7797  0.0000
0.1051  0.3152  0.5797  0.0000
0.1051  0.3152  0.5797  0.0000
0.1051  0.3152  0.5797  0.0000
0.2500  0.7500  0.0000  0.0000
0.4500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.4000  0.0000  0.0000  0.0000
0.1000  0.2000  0.0000  0.0000
0.0667  0.1333  0.0000  0.0000
0.0667  0.1333  0.0000  0.0000
0.1500  0.3000  0.0000  0.0000
0.1000  0.2000  0.0000  0.0000
0.0375  0.1125  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0667  0.1333  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.2000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.4000  0.0000  0.0000  0.0000  0.0833  0.0000  0.0000  0.0000  0.0000  0.0667
0.0000  0.0000  0.0000  0.0000  0.0000  0.2000  0.0000  0.0000  0.0000
0.0000  0.3000  0.0000  0.0000  0.2500  0.0000  0.0000  0.0000  0.0000  0.2000
```

```
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0863  0.0000  0.1078  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.3000  0.0604  0.0271  0.0271  0.0500  0.0625  0.0375  0.0238  0.0000
0.0667  0.0000  0.0000  0.1449  0.2000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.2083  0.1083  0.1084  0.1500  0.1500  0.1500  0.0953  0.0000
0.2000  0.0000  0.0000  0.5797  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.2578  0.2578  0.2578  0.0647  0.0790  0.0504  0.2266  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.3333  0.3333  0.3334  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000 -0.3333 -0.3333 -0.3334  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
   1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00    1.00    1.00    1.00    1.00    1.00
   1.00    1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00    1.00
   1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00
 350.00 1200.00 1200.00 1200.00
 800.00  800.00 1200.00 1200.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00
 1.0000  0.7000  0.7000  0.7000
 1.0000  1.0000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.8000  0.8000  0.8000
 0.0000  0.0000  0.4000  0.4000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000
 0.4000  0.4000  0.4000  0.4000  0.4000  0.4000  0.6000  0.6000  0.6000
 100.00  100.00
```

Listing 2.5. Screen output from the 2DHT code (Case 1).

2DHT

```
iter.no.=  1, act.err.= -64.739 %, avg.err.= -64.739 %, 20 it.err.= -64.739 %,
              hb. err.=   8.767 %
iter.no.=  2, act.err.= -26.971 %, avg.err.= -45.855 %, 20 it.err.= -45.855 %,
              hb. err.=   7.570 %
iter.no.=  3, act.err.= -19.460 %, avg.err.= -37.057 %, 20 it.err.= -37.057 %,
              hb. err.=   5.318 %
iter.no.=  4, act.err.= -14.014 %, avg.err.= -31.296 %, 20 it.err.= -31.296 %,
              hb. err.=   2.777 %
iter.no.=  5, act.err.=  -9.894 %  avg.err.= -27.016 %, 20 it.err.= -27.016 %,
              hb. err.=   1.108 %
iter.no.=  6, act.err.=  -6.023 %, avg.err.= -23.517 %, 20 it.err.= -23.517 %,
              hb. err.=   0.064 %
iter.no.=  7, act.err.=  -4.054 %, avg.err.= -20.737 %, 20 it.err.= -20.737 %,
              hb. err.=  -0.195 %
iter.no.=  8, act.err.=  -2.851 %, avg.err.= -18.501 %, 20 it.err.= -18.501 %,
              hb. err.=  -0.834 %
iter.no.=  9, act.err.=  -0.817 %, avg.err.= -16.536 %, 20 it.err.= -16.536 %,
              hb. err.=  -1.429 %
iter.no.= 10, act.err.=   0.296 %, avg.err.= -14.853 %, 20 it.err.= -14.853 %,
              hb. err.=  -1.162 %
iter.no.= 11, act.err.=  -0.072 %, avg.err.= -13.509 %, 20 it.err.= -13.509 %,
              hb. err.=  -0.139 %
iter.no.= 12, act.err.=   1.158 %, avg.err.= -12.287 %, 20 it.err.= -12.287 %,
              hb. err.=  -1.726 %
iter.no.= 13, act.err.=   1.646 %, avg.err.= -11.215 %, 20 it.err.= -11.215 %,
              hb. err.=  -1.892 %
iter.no.= 14, act.err.=   1.817 %, avg.err.= -10.284 %, 20 it.err.= -10.284 %,
              hb. err.=  -0.961 %
iter.no.= 15, act.err.=   2.199 %, avg.err.=  -9.452 %, 20 it.err.=  -9.452 %,
              hb. err.=  -1.672 %
iter.no.= 16, act.err.=   0.320 %, avg.err.=  -8.841 %, 20 it.err.=  -8.841 %,
              hb. err.=  -0.378 %
iter.no.= 17, act.err.=   0.734 %, avg.err.=  -8.278 %, 20 it.err.=  -8.278 %,
              hb. err.=  -0.718 %
iter.no.= 18, act.err.=   2.900 %, avg.err.=  -7.657 %, 20 it.err.=  -7.657 %,
              hb. err.=  -1.480 %
iter.no.= 19, act.err.=   0.905 %, avg.err.=  -7.206 %, 20 it.err.=  -7.206 %,
              hb. err.=  -0.820 %
iter.no.= 20, act.err.=   2.209 %, avg.err.=  -6.736 %, 20 it.err.=  -6.736 %,
              hb. err.=  -0.994 %
iter.no.= 21, act.err.=  -0.011 %, avg.err.=  -6.415 %, 20 it.err.=  -3.499 %,
              hb. err.=   0.296 %
iter.no.= 22, act.err.=   0.602 %, avg.err.=  -6.096 %, 20 it.err.=  -2.121 %,
              hb. err.=  -0.002 %
iter.no.= 23, act.err.=   1.970 %, avg.err.=  -5.746 %, 20 it.err.=  -1.049 %,
              hb. err.=  -1.156 %
iter.no.= 24, act.err.=   0.568 %, avg.err.=  -5.483 %, 20 it.err.=  -0.320 %,
              hb. err.=  -0.231 %
iter.no.= 25, act.err.=  -0.040 %, avg.err.=  -5.265 %, 20 it.err.=   0.173 %,
              hb. err.=  -0.184 %
iter.no.= 26, act.err.=   2.093 %, avg.err.=  -4.982 %, 20 it.err.=   0.578 %,
              hb. err.=  -1.008 %
iter.no.= 27, act.err.=  -0.191 %, avg.err.=  -4.805 %, 20 it.err.=   0.772 %,
              hb. err.=   1.035 %
iter.no.= 28, act.err.=   0.572 %, avg.err.=  -4.613 %, 20 it.err.=   0.943 %,
              hb. err.=  -0.394 %
iter.no.= 29, act.err.=   0.799 %, avg.err.=  -4.426 %, 20 it.err.=   1.024 %,
              hb. err.=  -0.469 %
iter.no.= 30, act.err.=  -0.395 %, avg.err.=  -4.292 %, 20 it.err.=   0.989 %,
              hb. err.=   0.193 %
iter.no.= 31, act.err.=  -0.790 %, avg.err.=  -4.179 %, 20 it.err.=   0.953 %,
              hb. err.=  -0.622 %
iter.no.= 32, act.err.=  -0.466 %, avg.err.=  -4.063 %, 20 it.err.=   0.872 %,
              hb. err.=   0.408 %
iter.no.= 33, act.err.=   1.155 %, avg.err.=  -3.904 %, 20 it.err.=   0.848 %,
              hb. err.=  -0.636 %
iter.no.= 34, act.err.=  -0.531 %, avg.err.=  -3.805 %, 20 it.err.=   0.730 %,
              hb. err.=   0.443 %
iter.no.= 35, act.err.=   0.432 %, avg.err.=  -3.684 %, 20 it.err.=   0.642 %,
              hb. err.=  -0.136 %
```

```
iter.no.= 36, act.err.=   0.956 %, avg.err.=  -3.555 %, 20 it.err.=   0.674 %,
              hb. err.=  -1.037 %
iter.no.= 37, act.err.=  -0.355 %, avg.err.=  -3.469 %, 20 it.err.=   0.619 %,
              hb. err.=   0.811 %
iter.no.= 38, act.err.=   0.101 %, avg.err.=  -3.375 %, 20 it.err.=   0.479 %,
              hb. err.=  -0.063 %
iter.no.= 39, act.err.=  -0.473 %, avg.err.=  -3.300 %, 20 it.err.=   0.410 %,
              hb. err.=   0.331 %
iter.no.= 40, act.err.=  -0.440 %, avg.err.=  -3.229 %, 20 it.err.=   0.278 %,
              hb. err.=   0.285 %
iter.no.= 41, act.err.=   0.590 %, avg.err.=  -3.136 %, 20 it.err.=   0.308 %,
              hb. err.=  -0.119 %
iter.no.= 42, act.err.=   0.637 %, avg.err.=  -3.046 %, 20 it.err.=   0.310 %,
              hb. err.=  -0.915 %
iter.no.= 43, act.err.=  -0.694 %, avg.err.=  -2.991 %, 20 it.err.=   0.176 %,
              hb. err.=   0.732 %
iter.no.= 44, act.err.=   0.601 %, avg.err.=  -2.910 %, 20 it.err.=   0.178 %,
              hb. err.=  -0.831 %
iter.no.= 45, act.err.=  -0.262 %, avg.err.=  -2.851 %, 20 it.err.=   0.167 %,
              hb. err.=   0.265 %
iter.no.= 46, act.err.=   1.351 %, avg.err.=  -2.759 %, 20 it.err.=   0.130 %,
              hb. err.=  -0.795 %
iter.no.= 47, act.err.=  -0.718 %, avg.err.=  -2.716 %, 20 it.err.=   0.104 %,
              hb. err.=   0.596 %
iter.no.= 48, act.err.=   1.513 %, avg.err.=  -2.628 %, 20 it.err.=   0.151 %,
              hb. err.=  -0.786 %
iter.no.= 49, act.err.=   0.646 %, avg.err.=  -2.561 %, 20 it.err.=   0.143 %,
              hb. err.=  -0.384 %
iter.no.= 50, act.err.=  -0.520 %, avg.err.=  -2.520 %, 20 it.err.=   0.137 %,
              hb. err.=   0.066 %
iter.no.= 51, act.err.=  -0.252 %, avg.err.=  -2.476 %, 20 it.err.=   0.164 %,
              hb. err.=   0.281 %
iter.no.= 52, act.err.=  -0.336 %, avg.err.=  -2.435 %, 20 it.err.=   0.170 %,
              hb. err.=   0.106 %
iter.no.= 53, act.err.=   0.811 %, avg.err.=  -2.373 %, 20 it.err.=   0.153 %,
              hb. err.=  -0.264 %
iter.no.= 54, act.err.=  -0.428 %, avg.err.=  -2.337 %, 20 it.err.=   0.158 %,
              hb. err.=  -0.423 %
iter.no.= 55, act.err.=   0.583 %, avg.err.=  -2.284 %, 20 it.err.=   0.166 %,
              hb. err.=  -0.399 %
iter.no.= 56, act.err.=   0.176 %, avg.err.=  -2.240 %, 20 it.err.=   0.127 %,
              hb. err.=   0.328 %
iter.no.= 57, act.err.=  -0.279 %, avg.err.=  -2.206 %, 20 it.err.=   0.130 %,
              hb. err.=  -0.337 %
iter.no.= 58, act.err.=   0.149 %, avg.err.=  -2.165 %, 20 it.err.=   0.133 %,
              hb. err.=   0.113 %
iter.no.= 59, act.err.=   0.824 %, avg.err.=  -2.115 %, 20 it.err.=   0.198 %,
              hb. err.=  -0.207 %
iter.no.= 60, act.err.=   0.109 %, avg.err.=  -2.078 %, 20 it.err.=   0.225 %,
              hb. err.=   0.496 %
iter.no.= 61, act.err.=   0.745 %, avg.err.=  -2.031 %, 20 it.err.=   0.233 %,
              hb. err.=  -0.544 %
iter.no.= 62, act.err.=  -1.847 %, avg.err.=  -2.028 %, 20 it.err.=   0.109 %,
              hb. err.=   1.151 %
iter.no.= 63, act.err.=  -1.545 %, avg.err.=  -2.021 %, 20 it.err.=   0.066 %,
              hb. err.=   0.859 %
iter.no.= 64, act.err.=   1.324 %, avg.err.=  -1.968 %, 20 it.err.=   0.102 %,
              hb. err.=  -1.242 %
iter.no.= 65, act.err.=   1.247 %, avg.err.=  -1.919 %, 20 it.err.=   0.178 %,
              hb. err.=  -0.861 %
iter.no.= 66, act.err.=   0.562 %, avg.err.=  -1.881 %, 20 it.err.=   0.138 %,
              hb. err.=  -0.084 %
iter.no.= 67, act.err.=   0.251 %, avg.err.=  -1.849 %, 20 it.err.=   0.187 %,
              hb. err.=   0.258 %
iter.no.= 68, act.err.=  -0.227 %, avg.err.=  -1.826 %, 20 it.err.=   0.100 %,
              hb. err.=   0.090 %
iter.no.= 69, act.err.=   0.451 %, avg.err.=  -1.793 %, 20 it.err.=   0.090 %,
              hb. err.=   0.493 %
iter.no.= 70, act.err.=   0.264 %, avg.err.=  -1.763 %, 20 it.err.=   0.129 %,
              hb. err.=  -0.488 %
iter.no.= 71, act.err.=  -0.409 %, avg.err.=  -1.744 %, 20 it.err.=   0.121 %,
              hb. err.=  -0.139 %
```

```
iter.no.= 72, act.err.=   0.264 %, avg.err.=  -1.716 %, 20 it.err.=   0.151 %,
              hb. err.=  -0.219 %
iter.no.= 73, act.err.=   0.269 %, avg.err.=  -1.689 %, 20 it.err.=   0.124 %,
              hb. err.=   0.229 %
iter.no.= 74, act.err.=  -0.120 %, avg.err.=  -1.668 %, 20 it.err.=   0.140 %,
              hb. err.=  -0.066 %
iter.no.= 75, act.err.=   0.156 %, avg.err.=  -1.644 %, 20 it.err.=   0.118 %,
              hb. err.=  -0.061 %
iter.no.= 76, act.err.=   0.344 %, avg.err.=  -1.617 %, 20 it.err.=   0.127 %,
              hb. err.=   0.035 %
iter.no.= 77, act.err.=  -0.122 %, avg.err.=  -1.598 %, 20 it.err.=   0.135 %,
              hb. err.=   0.121 %
iter.no.= 78, act.err.=  -0.311 %, avg.err.=  -1.581 %, 20 it.err.=   0.112 %,
              hb. err.=  -0.036 %
iter.no.= 79, act.err.=  -0.306 %, avg.err.=  -1.565 %, 20 it.err.=   0.055 %,
              hb. err.=  -0.174 %
iter.no.= 80, act.err.=   0.182 %, avg.err.=  -1.543 %, 20 it.err.=   0.059 %,
              hb. err.=   0.066 %
iter.no.= 81, act.err.=  -0.106 %, avg.err.=  -1.526 %, 20 it.err.=   0.016 %,
              hb. err.=   0.037 %
iter.no.= 82, act.err.=  -0.182 %, avg.err.=  -1.509 %, 20 it.err.=   0.099 %,
              hb. err.=  -0.129 %
iter.no.= 83, act.err.=  -0.056 %, avg.err.=  -1.492 %, 20 it.err.=   0.174 %,
              hb. err.=  -0.144 %
iter.no.= 84, act.err.=   0.398 %, avg.err.=  -1.469 %, 20 it.err.=   0.128 %,
              hb. err.=   0.072 %
iter.no.= 85, act.err.=   0.326 %, avg.err.=  -1.448 %, 20 it.err.=   0.082 %,
              hb. err.=   0.123 %
iter.no.= 86, act.err.=  -0.039 %, avg.err.=  -1.432 %, 20 it.err.=   0.051 %,
              hb. err.=  -0.070 %
iter.no.= 87, act.err.=   0.080 %, avg.err.=  -1.414 %, 20 it.err.=   0.043 %,
              hb. err.=  -0.067 %
iter.no.= 88, act.err.=   0.284 %, avg.err.=  -1.395 %, 20 it.err.=   0.068 %,
              hb. err.=   0.117 %
iter.no.= 89, act.err.=   0.076 %, avg.err.=  -1.379 %, 20 it.err.=   0.050 %,
              hb. err.=   0.003 %
iter.no.= 90, act.err.=  -0.119 %, avg.err.=  -1.365 %, 20 it.err.=   0.031 %,
              hb. err.=  -0.115 %
iter.no.= 91, act.err.=   0.078 %, avg.err.=  -1.349 %, 20 it.err.=   0.055 %,
              hb. err.=  -0.035 %
iter.no.= 92, act.err.=   0.275 %, avg.err.=  -1.331 %, 20 it.err.=   0.055 %,
              hb. err.=   0.089 %
iter.no.= 93, act.err.=   0.145 %, avg.err.=  -1.315 %, 20 it.err.=   0.049 %,
              hb. err.=   0.008 %
iter.no.= 94, act.err.=  -0.048 %, avg.err.=  -1.302 %, 20 it.err.=   0.053 %,
              hb. err.=  -0.160 %
iter.no.= 95, act.err.=   0.109 %, avg.err.=  -1.287 %, 20 it.err.=   0.050 %,
              hb. err.=  -0.044 %
iter.no.= 96, act.err.=   0.357 %, avg.err.=  -1.270 %, 20 it.err.=   0.051 %,
              hb. err.=   0.114 %
iter.no.= 97, act.err.=   0.192 %, avg.err.=  -1.255 %, 20 it.err.=   0.067 %,
              hb. err.=  -0.021 %
iter.no.= 98, act.err.=   0.047 %, avg.err.=  -1.241 %, 20 it.err.=   0.085 %,
              hb. err.=  -0.135 %
iter.no.= 99, act.err.=   0.320 %, avg.err.=  -1.226 %, 20 it.err.=   0.116 %,
              hb. err.=  -0.009 %
iter.no.=100, act.err.=   0.326 %, avg.err.=  -1.210 %, 20 it.err.=   0.123 %,
              hb. err.=  -0.006 %
```

Listing 2.6. Contents of file 2DOT0101.100 (Case 1).

```
**********
*        *
* GENERAL INFORMATION *
*        *
**********

                        BOILER NAME:        BOILER 1
                        CASE NUMBER:        01
                        VERSION NUMBER:     01
                        THERMAL LOAD:       100.0    % OF FULL LOAD

**************
*            *
* INPUT/OUTPUT *
*            *
**************

                        NREAD:                0
                        NWRTE:                1

                        NAME OF INPUT DATA FILE:              2DIN0101.100 (copied to 2DINPT.DAT)
                        NAME OF INPUT ARRAY FILE:             IARR0101.100
                        NAME OF OUTPUT ARRAY FILE:            OARR0101.100
                        NAME OF GRAPHICS OUTPUT FILE:         GRAF
                        NAME OF OUTPUT DATA FILE:             2DOT0101.100
                        OUTPUT LEVEL:                         DEFAULT

******************
*              *
* USER'S COMMENTS *
*              *
******************

c FRONT WALL FIRED BURNERS. BOILER FIRING OIL AT 100% LOAD
c USE SOME DEFAULT PARAMETERS
c
c
c
c
c
c
c
c
```

```
*****************************
*                           *
* SUMMARY OF INPUT PARAMETERS *
*                           *
*****************************

              FUEL TYPE:                                  LIQUID
              TOTAL FUEL FLOW:                            4.6944    KG WET/S
              TOTAL AIR FLOW:                            68.2448    KG WET/S
              EXCESS AIR:                                 6.0000    %
              O2-CONTENT OF FLUE GAS:                     1.2597    VOL. % DRY
              SEC. AIR TEMPERATURE:                     491.0000    K
              PRIM. MIXTURE TEMPERATURE:                373.1500    K
              AMOUNT OF PRIM. AIR: IN % OF STOICH. AIR:   0.0000    %
              ATOMIZING STEAM FLOW:                       0.0000    KG STEAM/KG FUEL DRY

FUEL PROPERTY -
**************
              PROXIMATE: CFIX              0.0001     KG/KG WET
                         VOL               0.9798     KG/KG WET
                         MOI               0.0200     KG/KG WET
                         ASH               0.0001     KG/KG WET

              ULTIMATE:    C               0.8603     KG/KG DRY
                           H               0.1174     KG/KG DRY
                           N               0.0061     KG/KG DRY
                           O               0.0061     KG/KG DRY
                           S               0.0100     KG/KG DRY
                         ASH               0.0001     KG/KG DRY

              UPPER HEATING VALUE:      42262.8008     KJ/KG WET
              LOWER HEATING VALUE:      40563.5859     KJ/KG DRY

ASH RADIATION -
***************
              CLOUD SPECIFIC ABSORPTION COEFFICIENT:                13.6364    1/((KG/M**3)M)
              CLOUD SPECIFIC SURFACE AREA:                         545.4500    M**2/KG
              SCATTERING:                                            NO
              ABSORPTION EFFICIENCY:                                0.1000
              SCATTERING EFFICIENCY:                                0.0000

NUMERICAL PARAMETERS -
**********************
              NMAX:                        2
              NPHI:                        4
              EXACT:                       0.00010
              NO. OF ITERATIONS:             100
              NO. OF AVERAGED ITERATIONS:     30
              WEIGHTING FACTOR FOR HEAT FLUXES OF A PREVIOUS RUN:        0

STOICHIOMETRIC CALCULATIONS AT COMPLETE COMBUSTION

NAME OF VARIABLE    MEANING OF VARIABLE                                    VALUE          UNITS
----------------    -------------------                                    -----          -----
O2MINT              STOICHIOMETRIC O2                                       3.2275        KG O2/KG FUEL DRY
AIRMNT              STOICHIOMETRIC AIR                                     13.8570        KG AIR DRY/KG FUEL DRY
AIRNR               TOTAL AIR NUMBER                                        1.0600        -
H2OFUT              HUMIDITY OF FUEL                                        0.0204        KG H2O/KG FUEL DRY
H2OA2               HUMIDITY OF AIR                                         0.0099        KG H2O/KG  AIR DRY
FUTOT               FLOW RATE OF DRY FUEL                                   4.6005        KG FUEL DRY/S
DMA                 FLOW RATE OF DRY AIR                                   67.5742        KG  AIR DRY/S
DMH2O               FLOW RATE OF H2O                                        0.7644        KG  H2O    /S
DMTOT               TOTAL INPUT MASS FLOW RATE                             72.9392        KG         /S
HL                  TOT.NET CAL. VALUE OF DRY FUEL                      40563.5859        KJ/KG FUEL DRY

O2MINV              STOICHIOMETRIC O2 FOR VOLATILE FUELS                    3.2273        KG O2/KG FUEL DRY
AIRMINV             STOICHIOMETRIC AIR FOR VOLATILE FUELS                  13.8558        KG AIR DRY/KG FUEL DRY
FUS                 MASS FLOW RATE OF BURNER FUEL                           4.6005        KG FUEL DRY/S
FUSW                MASS FLOW RATE OF BURNER FUEL                           4.6944        KG FUEL WET/S
FUG                 MASS FLOW RATE OF REBURN FUEL                           0.0000        KG FUEL DRY/S
FUGW                MASS FLOW RATE OF REBURN FUEL                           0.0000        KG FUEL WET/S
FUGV                VOLUME FLOW RATE OF REBURN FUEL                         0.0000        M3N GAS DRY/S
FUGVW               VOLUME FLOW RATE OF REBURN FUEL                         0.0000        M3N GAS WET/S
DMA2                MASS FLOW RATE OF TOTAL OR SEC. AIR                    67.5742        KG AIR DRY/S
DMA2W               MASS FLOW RATE OF TOTAL OR SEC. AIR                    68.2448        KG AIR WET/S
DMA2V               VOLUME FLOW RATE OF TOTAL OR SEC. AIR                  56.5549        M3N AIR DRY/S
DMA2VW              VOLUME FLOW RATE OF TOTAL OR SEC. AIR                  57.4537        M3N AIR WET/S
DMCG                VOLUME FLOW RATE OF COMBUSTION GASES                   53.3658        M3N GAS DRY/S
DMCGW               VOLUME FLOW RATE OF COMBUSTION GASES                   60.8594        M3N GAS WET/S
HLS                 NET CAL. VALUE OF BURNER FUEL                       40563.5859        KJ/KG FUEL DRY
HUSW                GROSS CAL. VALUE OF BURNER FUEL                     42262.8008        KJ/KG FUEL WET
HLG                 NET CAL. VALUE OF REBURN FUEL                           0.0000        KJ/KG REBURN-FUEL DRY
HUGW                GROSS CAL. VALUE OF REBURN FUEL                         0.0000        KJ/KG REBURN-FUEL WET
HLGV                NET CAL. VALUE OF REBURN FUEL                           0.0000        KJ/M3N GAS DRY
HUGVW               GROSS CAL. VALUE OF REBURN FUEL                         0.0000        KJ/M3N GAS WET
SFLOWF              ATOMIZING STEAM IN BURNER FUEL                          0.0000        KG-STEAM/SEC


MASS CONCENTRATION OF GASEOUS SPECIES IN KG/KG WET
     CO2       H2O       N2        O2       VOL       SO2       ASH       CHAR      SOOT
   0.1988    0.0767    0.7110    0.0122    0.0000    0.0013    0.0000    0.0000    0.0000
CONCENTRATION OF GASEOUS SPECIES IN VOL.FRACTION WET
     CO2       H2O       N2        O2       VOL       SO2
   0.1307    0.1231    0.7345    0.0110    0.0000    0.0006
CONCENTRATION OF GASEOUS SPECIES IN VOL. FRACTION DRY
     CO2       H2O       N2        O2       VOL       SO2
   0.1491    0.0000    0.8377    0.0126    0.0000    0.0006
SO2 CONCENTRATION IN PPM MASS          1260.
SO2 CONCENTRATION IN PPM VOL WET        569.
SO2 CONCENTRATION IN PPM VOL DRY        649.


HEAT CAPACITY OF COMBUSTION SPECIES (KJ/KG-K)
                                CO2       H2O       N2        O2       VOL       SO2       ASH       CHAR      SOOT
```

AT	491.00K	0.9311159	1.9019108	1.0446855	0.9413832	2.5211427	0.6750727	0.8373600	1.0708083	0.9701869
AT	373.15K	0.8807241	1.8759655	1.0402993	0.9256364	2.3264122	0.6439830	0.8373600	0.9795517	0.8181642
AT	300.00K	0.8455777	1.8630723	1.0395783	0.9175348	2.2181914	0.6227968	0.8373600	0.9199310	0.7137299
AT	1800.00K	1.2005430	2.3140147	1.1634477	1.0747626	4.3484931	0.8270922	0.8373600	1.6863927	1.5045161
AT	900.00K	1.0583812	2.0220246	1.0806181	0.9992388	3.2324150	0.7527937	0.8373600	1.3415941	1.3412676

MEAN HEAT CAPACITIES OF SOME INPUT/OUTPUT STREAMS

INPUT STREAM	TEMPERATURE (K)	MEAN Cp (KJ/KG-K)
AIR	373.15	1.0220656
AIR	491.00	1.0292838
FLUE GAS	900.00	1.1469500
FLUE GAS	1800.00	1.2575084

MASS BALANCE FOR VOLUME ZONES

NR	I	J	MCONIN KG/S	MCONNT KG/S	MDIFIN KG/S	MDFNT KG/S	MTOTIN KG/S	MTOTEX KG/S	MTOTNT KG/S
1	1		29.176	0.000	25.377	0.000	54.553	54.553	0.000
1	2		29.176	0.000	28.934	0.000	58.110	58.110	0.000
2	1		29.176	0.000	27.156	0.000	56.331	56.331	0.000
2	2		43.764	0.000	55.209	0.000	98.972	98.972	0.000
2	3		21.882	0.000	35.127	0.000	57.009	57.009	0.000
3	1		7.294	0.000	17.017	0.000	24.311	24.311	0.000
3	2		18.986	0.007	49.315	0.000	68.301	68.308	0.007
3	3		34.391	0.000	80.437	0.000	114.828	114.828	0.000
3	4		24.311	0.000	40.590	0.000	64.901	64.901	0.000
4	1		2.888	0.000	20.329	0.000	23.217	23.217	0.000
4	2		7.899	0.000	57.107	0.000	65.006	65.006	0.000
4	3		38.001	-0.007	70.648	0.000	108.649	108.642	-0.007
4	4		36.112	0.000	41.418	0.000	77.530	77.530	0.000
5	1		5.011	0.000	29.086	0.000	34.097	34.097	0.000
5	2		10.328	0.000	87.328	0.000	97.657	97.657	0.000
5	3		51.364	0.007	93.708	0.000	145.072	145.079	0.007
5	4		41.626	0.000	51.121	0.000	92.747	92.748	0.000
6	1		5.011	0.000	31.090	0.000	36.101	36.101	0.000
6	2		10.941	0.000	85.680	0.000	96.621	96.621	0.000
6	3		56.090	-0.007	81.501	0.000	137.591	137.584	-0.007
6	4		30.686	0.000	45.455	0.000	76.141	76.141	0.000
7	1		4.559	0.000	24.428	0.000	28.986	28.986	0.000
7	2		14.136	0.000	68.436	0.000	82.571	82.571	0.000
7	3		50.904	0.007	71.888	0.000	122.792	122.799	0.007
7	4		25.966	0.000	38.677	0.000	64.643	64.643	0.000
8	1		5.930	0.000	15.763	0.000	21.693	21.693	0.000
8	2		20.518	0.000	48.924	0.000	69.442	69.442	0.000
8	3		43.647	-0.007	67.529	0.000	111.176	111.168	-0.007
8	4		20.204	0.000	35.219	0.000	55.423	55.423	0.000
9	1		7.666	0.000	13.045	0.000	20.710	20.710	0.000
9	2		24.734	-0.007	40.173	0.000	64.907	64.899	-0.007
9	3		49.227	0.007	74.017	0.000	123.244	123.251	0.007
9	4		16.528	0.000	29.956	0.000	46.484	46.484	0.000
10	1		7.666	0.000	19.833	0.000	27.498	27.498	0.000
10	2		27.855	0.000	54.617	0.000	82.472	82.472	0.000
10	3		56.871	0.000	61.530	0.000	118.400	118.400	0.000
11	1		7.666	0.000	14.481	0.000	22.147	22.147	0.000
11	2		27.855	0.000	37.104	0.000	64.960	64.960	0.000
11	3		56.871	0.000	49.369	0.000	106.240	106.240	0.000
12	1		7.666	0.000	8.156	0.000	15.822	15.822	0.000
12	2		22.990	0.000	24.465	0.000	47.455	47.455	0.000
12	3		42.283	0.000	44.993	0.000	87.276	87.276	0.000
13	1		7.666	0.000	12.351	0.000	20.017	20.017	0.000
13	2		22.990	0.000	28.659	0.000	51.650	51.650	0.000
13	3		42.283	0.000	44.993	0.000	87.276	87.276	0.000
14	1		18.235	0.000	18.692	0.000	36.927	36.927	0.000
14	2		65.273	0.000	41.344	0.000	106.617	106.617	0.000
14	3		42.283	0.000	22.496	0.000	64.779	64.779	0.000
15	1		32.823	0.000	18.874	0.000	51.697	51.697	0.000
15	2		54.704	0.000	62.457	0.000	117.162	117.162	0.000
16	1		32.823	0.000	18.874	0.000	51.697	51.697	0.000
16	2		54.704	0.000	62.457	0.000	117.162	117.162	0.000
17	1		18.235	0.000	14.498	0.000	32.733	32.733	0.000
17	2		54.704	0.000	43.493	0.000	98.198	98.198	0.000
18	1		18.235	0.000	14.498	0.000	32.733	32.733	0.000
18	2		54.704	0.000	43.493	0.000	98.198	98.198	0.000
19	1		18.235	0.000	7.249	0.000	25.484	25.484	0.000
19	2		54.704	0.000	21.747	0.000	76.451	76.451	0.000
TOTAL MASS BALANCE FOR THE FURNACE VOLUME INCLUDING SYMMETRICAL FLUXES IF EXISTING:			1668.45	0.00	2372.41	0.00	4040.87	4040.87	0.00

iter. no.=	1,	act.err.=	-64.7393 %,	avg.err.=	-64.7393 %,	20	it.err.=	-64.7393 %,	hb.err.=	8.7667 %
iter. no.=	2,	act.err.=	-26.9706 %,	avg.err.=	-45.8550 %,	20	it.err.=	-45.8550 %,	hb.err.=	7.5701 %
iter. no.=	3,	act.err.=	-19.4602 %,	avg.err.=	-37.0567 %,	20	it.err.=	-37.0567 %,	hb.err.=	5.3185 %
iter. no.=	4,	act.err.=	-14.0140 %,	avg.err.=	-31.2960 %,	20	it.err.=	-31.2960 %,	hb.err.=	2.7771 %
iter. no.=	5,	act.err.=	-9.8942 %,	avg.err.=	-27.0157 %,	20	it.err.=	-27.0157 %,	hb.err.=	1.1079 %
iter. no.=	6,	act.err.=	-6.0230 %,	avg.err.=	-23.5169 %,	20	it.err.=	-23.5169 %,	hb.err.=	0.0642 %
iter. no.=	7,	act.err.=	-4.0543 %,	avg.err.=	-20.7365 %,	20	it.err.=	-20.7365 %,	hb.err.=	-0.1946 %
iter. no.=	8,	act.err.=	-2.8514 %,	avg.err.=	-18.5009 %,	20	it.err.=	-18.5009 %,	hb.err.=	-0.8342 %
iter. no.=	9,	act.err.=	-0.8173 %,	avg.err.=	-16.5360 %,	20	it.err.=	-16.5360 %,	hb.err.=	-1.4289 %
iter. no.=	10,	act.err.=	0.2956 %,	avg.err.=	-14.8529 %,	20	it.err.=	-14.8529 %,	hb.err.=	-1.1621 %
iter. no.=	11,	act.err.=	-0.0720 %,	avg.err.=	-13.5092 %,	20	it.err.=	-13.5092 %,	hb.err.=	-0.1389 %
iter. no.=	12,	act.err.=	1.1576 %,	avg.err.=	-12.2869 %,	20	it.err.=	-12.2869 %,	hb.err.=	-1.7259 %
iter. no.=	13,	act.err.=	1.6458 %,	avg.err.=	-11.2152 %,	20	it.err.=	-11.2152 %,	hb.err.=	-1.8922 %
iter. no.=	14,	act.err.=	1.8169 %,	avg.err.=	-10.2843 %,	20	it.err.=	-10.2843 %,	hb.err.=	-0.9610 %
iter. no.=	15,	act.err.=	2.1990 %,	avg.err.=	-9.4521 %,	20	it.err.=	-9.4521 %,	hb.err.=	-1.6721 %
iter. no.=	16,	act.err.=	0.3198 %,	avg.err.=	-8.8413 %,	20	it.err.=	-8.8413 %,	hb.err.=	-0.3785 %
iter. no.=	17,	act.err.=	0.7340 %,	avg.err.=	-8.2781 %,	20	it.err.=	-8.2781 %,	hb.err.=	-0.7184 %
iter. no.=	18,	act.err.=	2.9004 %,	avg.err.=	-7.6571 %,	20	it.err.=	-7.6571 %,	hb.err.=	-1.4803 %
iter. no.=	19,	act.err.=	0.9046 %,	avg.err.=	-7.2065 %,	20	it.err.=	-7.2065 %,	hb.err.=	-0.8203 %
iter. no.=	20,	act.err.=	2.2091 %,	avg.err.=	-6.7357 %,	20	it.err.=	-6.7357 %,	hb.err.=	-0.9937 %
iter. no.=	21,	act.err.=	-0.0110 %,	avg.err.=	-6.4155 %,	20	it.err.=	-3.4993 %,	hb.err.=	0.2956 %
iter. no.=	22,	act.err.=	0.6018 %,	avg.err.=	-6.0965 %,	20	it.err.=	-2.1206 %,	hb.err.=	-0.0024 %
iter. no.=	23,	act.err.=	1.9698 %,	avg.err.=	-5.7458 %,	20	it.err.=	-1.0491 %,	hb.err.=	-1.1555 %
iter. no.=	24,	act.err.=	0.5679 %,	avg.err.=	-5.4827 %,	20	it.err.=	-0.3200 %,	hb.err.=	-0.2308 %
iter. no.=	25,	act.err.=	-0.0401 %,	avg.err.=	-5.2650 %,	20	it.err.=	0.1727 %,	hb.err.=	-0.1842 %
iter. no.=	26,	act.err.=	2.0929 %,	avg.err.=	-4.9820 %,	20	it.err.=	0.5785 %,	hb.err.=	-1.0084 %
iter. no.=	27,	act.err.=	-0.1909 %,	avg.err.=	-4.8046 %,	20	it.err.=	0.7716 %,	hb.err.=	1.0353 %

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iter. no.= 28,  act.err.=   0.5723 %,  avg.err.=  -4.6125 %,  20 it.err.=   0.9428 %,  hb.err.=  -0.3942 %
iter. no.= 29,  act.err.=   0.7992 %,  avg.err.=  -4.4259 %,  20 it.err.=   1.0236 %,  hb.err.=  -0.4686 %
iter. no.= 30,  act.err.=  -0.3954 %,  avg.err.=  -4.2916 %,  20 it.err.=   0.9891 %,  hb.err.=   0.1931 %
iter. no.= 31,  act.err.=  -0.7899 %,  avg.err.=  -4.1786 %,  20 it.err.=   0.9532 %,  hb.err.=  -0.6218 %
iter. no.= 32,  act.err.=  -0.4658 %,  avg.err.=  -4.0626 %,  20 it.err.=   0.8720 %,  hb.err.=   0.4079 %
iter. no.= 33,  act.err.=   1.1554 %,  avg.err.=  -3.9045 %,  20 it.err.=   0.8475 %,  hb.err.=  -0.6365 %
iter. no.= 34,  act.err.=  -0.5306 %,  avg.err.=  -3.8052 %,  20 it.err.=   0.7301 %,  hb.err.=   0.4433 %
iter. no.= 35,  act.err.=   0.4316 %,  avg.err.=  -3.6842 %,  20 it.err.=   0.6418 %,  hb.err.=  -0.1360 %
iter. no.= 36,  act.err.=   0.9564 %,  avg.err.=  -3.5553 %,  20 it.err.=   0.6736 %,  hb.err.=  -1.0379 %
iter. no.= 37,  act.err.=  -0.3552 %,  avg.err.=  -3.4688 %,  20 it.err.=   0.6191 %,  hb.err.=   0.8108 %
iter. no.= 38,  act.err.=   0.1015 %,  avg.err.=  -3.3748 %,  20 it.err.=   0.4792 %,  hb.err.=  -0.3626 %
iter. no.= 39,  act.err.=  -0.4729 %,  avg.err.=  -3.3004 %,  20 it.err.=   0.4103 %,  hb.err.=   0.3309 %
iter. no.= 40,  act.err.=  -0.4400 %,  avg.err.=  -3.2289 %,  20 it.err.=   0.2779 %,  hb.err.=   0.2849 %
iter. no.= 41,  act.err.=   0.5902 %,  avg.err.=  -3.1358 %,  20 it.err.=   0.3079 %,  hb.err.=  -0.1186 %
iter. no.= 42,  act.err.=   0.6368 %,  avg.err.=  -3.0459 %,  20 it.err.=   0.3097 %,  hb.err.=  -0.9146 %
iter. no.= 43,  act.err.=  -0.6939 %,  avg.err.=  -2.9912 %,  20 it.err.=   0.1765 %,  hb.err.=   0.7315 %
iter. no.= 44,  act.err.=   0.6010 %,  avg.err.=  -2.9096 %,  20 it.err.=   0.1781 %,  hb.err.=  -0.8312 %
iter. no.= 45,  act.err.=  -0.2616 %,  avg.err.=  -2.8508 %,  20 it.err.=   0.1671 %,  hb.err.=   0.2647 %
iter. no.= 46,  act.err.=   1.3512 %,  avg.err.=  -2.7594 %,  20 it.err.=   0.1300 %,  hb.err.=  -0.7954 %
iter. no.= 47,  act.err.=  -0.7176 %,  avg.err.=  -2.7160 %,  20 it.err.=   0.1036 %,  hb.err.=   0.5959 %
iter. no.= 48,  act.err.=   1.5127 %,  avg.err.=  -2.6279 %,  20 it.err.=   0.1507 %,  hb.err.=  -0.7864 %
iter. no.= 49,  act.err.=   0.6463 %,  avg.err.=  -2.5610 %,  20 it.err.=   0.1430 %,  hb.err.=  -0.3841 %
iter. no.= 50,  act.err.=  -0.5204 %,  avg.err.=  -2.5202 %,  20 it.err.=   0.1368 %,  hb.err.=   0.0661 %
iter. no.= 51,  act.err.=  -0.2519 %,  avg.err.=  -2.4758 %,  20 it.err.=   0.1637 %,  hb.err.=   0.2814 %
iter. no.= 52,  act.err.=  -0.3359 %,  avg.err.=  -2.4346 %,  20 it.err.=   0.1701 %,  hb.err.=   0.1059 %
iter. no.= 53,  act.err.=   0.8109 %,  avg.err.=  -2.3734 %,  20 it.err.=   0.1529 %,  hb.err.=  -0.2644 %
iter. no.= 54,  act.err.=  -0.4281 %,  avg.err.=  -2.3373 %,  20 it.err.=   0.1580 %,  hb.err.=  -0.4233 %
iter. no.= 55,  act.err.=   0.5829 %,  avg.err.=  -2.2843 %,  20 it.err.=   0.1656 %,  hb.err.=  -0.3991 %
iter. no.= 56,  act.err.=   0.1759 %,  avg.err.=  -2.2403 %,  20 it.err.=   0.1266 %,  hb.err.=   0.3285 %
iter. no.= 57,  act.err.=  -0.2787 %,  avg.err.=  -2.2059 %,  20 it.err.=   0.1304 %,  hb.err.=  -0.3373 %
iter. no.= 58,  act.err.=   0.1493 %,  avg.err.=  -2.1653 %,  20 it.err.=   0.1328 %,  hb.err.=   0.1131 %
iter. no.= 59,  act.err.=   0.8242 %,  avg.err.=  -2.1146 %,  20 it.err.=   0.1977 %,  hb.err.=  -0.2072 %
iter. no.= 60,  act.err.=   0.1094 %,  avg.err.=  -2.0776 %,  20 it.err.=   0.2251 %,  hb.err.=   0.4964 %
iter. no.= 61,  act.err.=   0.7446 %,  avg.err.=  -2.0313 %,  20 it.err.=   0.2328 %,  hb.err.=  -0.5444 %
iter. no.= 62,  act.err.=  -1.8466 %,  avg.err.=  -2.0283 %,  20 it.err.=   0.1087 %,  hb.err.=   1.1506 %
iter. no.= 63,  act.err.=  -1.5445 %,  avg.err.=  -2.0206 %,  20 it.err.=   0.0661 %,  hb.err.=   0.8590 %
iter. no.= 64,  act.err.=   1.3237 %,  avg.err.=  -1.9684 %,  20 it.err.=   0.1023 %,  hb.err.=  -1.2422 %
iter. no.= 65,  act.err.=   1.2474 %,  avg.err.=  -1.9189 %,  20 it.err.=   0.1777 %,  hb.err.=  -0.8614 %
iter. no.= 66,  act.err.=   0.5625 %,  avg.err.=  -1.8813 %,  20 it.err.=   0.1383 %,  hb.err.=  -0.0839 %
iter. no.= 67,  act.err.=   0.2509 %,  avg.err.=  -1.8495 %,  20 it.err.=   0.1867 %,  hb.err.=   0.2583 %
iter. no.= 68,  act.err.=  -0.2268 %,  avg.err.=  -1.8256 %,  20 it.err.=   0.0998 %,  hb.err.=   0.0900 %
iter. no.= 69,  act.err.=   0.4506 %,  avg.err.=  -1.7926 %,  20 it.err.=   0.0900 %,  hb.err.=   0.4931 %
iter. no.= 70,  act.err.=   0.2643 %,  avg.err.=  -1.7633 %,  20 it.err.=   0.1292 %,  hb.err.=  -0.4880 %
iter. no.= 71,  act.err.=  -0.4087 %,  avg.err.=  -1.7442 %,  20 it.err.=   0.1214 %,  hb.err.=  -0.1391 %
iter. no.= 72,  act.err.=   0.2644 %,  avg.err.=  -1.7163 %,  20 it.err.=   0.1514 %,  hb.err.=  -0.2190 %
iter. no.= 73,  act.err.=   0.2694 %,  avg.err.=  -1.6891 %,  20 it.err.=   0.1243 %,  hb.err.=   0.2293 %
iter. no.= 74,  act.err.=  -0.1205 %,  avg.err.=  -1.6679 %,  20 it.err.=   0.1397 %,  hb.err.=  -0.0657 %
iter. no.= 75,  act.err.=   0.1564 %,  avg.err.=  -1.6436 %,  20 it.err.=   0.1184 %,  hb.err.=  -0.0612 %
iter. no.= 76,  act.err.=   0.3440 %,  avg.err.=  -1.6174 %,  20 it.err.=   0.1268 %,  hb.err.=   0.0355 %
iter. no.= 77,  act.err.=  -0.1220 %,  avg.err.=  -1.5980 %,  20 it.err.=   0.1346 %,  hb.err.=   0.1210 %
iter. no.= 78,  act.err.=  -0.3105 %,  avg.err.=  -1.5815 %,  20 it.err.=   0.1116 %,  hb.err.=  -0.0364 %
iter. no.= 79,  act.err.=  -0.3061 %,  avg.err.=  -1.5653 %,  20 it.err.=   0.0551 %,  hb.err.=  -0.1736 %
iter. no.= 80,  act.err.=   0.1819 %,  avg.err.=  -1.5435 %,  20 it.err.=   0.0587 %,  hb.err.=   0.0662 %
iter. no.= 81,  act.err.=  -0.1056 %,  avg.err.=  -1.5257 %,  20 it.err.=   0.0162 %,  hb.err.=   0.0365 %
iter. no.= 82,  act.err.=  -0.1816 %,  avg.err.=  -1.5093 %,  20 it.err.=   0.0995 %,  hb.err.=  -0.1291 %
iter. no.= 83,  act.err.=  -0.0559 %,  avg.err.=  -1.4918 %,  20 it.err.=   0.1739 %,  hb.err.=  -0.1438 %
iter. no.= 84,  act.err.=   0.3982 %,  avg.err.=  -1.4693 %,  20 it.err.=   0.1276 %,  hb.err.=   0.0724 %
iter. no.= 85,  act.err.=   0.3264 %,  avg.err.=  -1.4482 %,  20 it.err.=   0.0816 %,  hb.err.=   0.1231 %
iter. no.= 86,  act.err.=  -0.0391 %,  avg.err.=  -1.4318 %,  20 it.err.=   0.0515 %,  hb.err.=  -0.0700 %
iter. no.= 87,  act.err.=   0.0799 %,  avg.err.=  -1.4144 %,  20 it.err.=   0.0429 %,  hb.err.=  -0.0665 %
iter. no.= 88,  act.err.=   0.2838 %,  avg.err.=  -1.3952 %,  20 it.err.=   0.0685 %,  hb.err.=   0.1166 %
iter. no.= 89,  act.err.=   0.0764 %,  avg.err.=  -1.3786 %,  20 it.err.=   0.0497 %,  hb.err.=   0.0026 %
iter. no.= 90,  act.err.=  -0.1194 %,  avg.err.=  -1.3646 %,  20 it.err.=   0.0306 %,  hb.err.=  -0.1154 %
iter. no.= 91,  act.err.=   0.0778 %,  avg.err.=  -1.3488 %,  20 it.err.=   0.0549 %,  hb.err.=  -0.0352 %
iter. no.= 92,  act.err.=   0.2748 %,  avg.err.=  -1.3311 %,  20 it.err.=   0.0554 %,  hb.err.=   0.0892 %
iter. no.= 93,  act.err.=   0.1449 %,  avg.err.=  -1.3153 %,  20 it.err.=   0.0492 %,  hb.err.=   0.0076 %
iter. no.= 94,  act.err.=  -0.0478 %,  avg.err.=  -1.3018 %,  20 it.err.=   0.0528 %,  hb.err.=  -0.1601 %
iter. no.= 95,  act.err.=   0.1086 %,  avg.err.=  -1.2869 %,  20 it.err.=   0.0504 %,  hb.err.=  -0.0444 %
iter. no.= 96,  act.err.=   0.3570 %,  avg.err.=  -1.2698 %,  20 it.err.=   0.0511 %,  hb.err.=   0.1144 %
iter. no.= 97,  act.err.=   0.1917 %,  avg.err.=  -1.2547 %,  20 it.err.=   0.0668 %,  hb.err.=  -0.0208 %
iter. no.= 98,  act.err.=   0.0469 %,  avg.err.=  -1.2415 %,  20 it.err.=   0.0846 %,  hb.err.=  -0.1347 %
iter. no.= 99,  act.err.=   0.3200 %,  avg.err.=  -1.2257 %,  20 it.err.=   0.1159 %,  hb.err.=  -0.0095 %
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THE DISTRIBUTION OF SPSU in m**2/kg AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.472E+02	2.451E+02	2.442E+02	2.559E+02	2.634E+02	2.695E+02	2.739E+02	0.000E-01
J= 3	0.000E-01	2.766E+02	2.644E+02	2.613E+02	2.621E+02	2.666E+02	2.703E+02	2.738E+02	2.765E+02	2.789E+02
J= 2	2.806E+02	2.784E+02	2.723E+02	2.723E+02	2.728E+02	2.745E+02	2.761E+02	2.778E+02	2.797E+02	2.809E+02
J= 1	2.800E+02	2.791E+02	2.778E+02	2.785E+02	2.788E+02	2.796E+02	2.801E+02	2.812E+02	2.823E+02	2.826E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	2.796E+02	2.802E+02	2.805E+02	2.806E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	2.812E+02	2.819E+02	2.821E+02	2.815E+02	2.816E+02	2.817E+02	2.817E+02	2.817E+02	2.817E+02
J= 1	2.827E+02	2.831E+02	2.829E+02	2.821E+02	2.819E+02	2.820E+02	2.820E+02	2.820E+02	2.820E+02
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF UBRT in Fraction of Input fixed-C AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	6.443E-01	6.627E-01	6.753E-01	5.608E-01	4.976E-01	4.514E-01	4.200E-01	0.000E-01
J= 3	0.000E-01	4.059E-01	4.933E-01	5.150E-01	5.098E-01	4.730E-01	4.448E-01	4.201E-01	4.021E-01	3.866E-01
J= 2	3.787E-01	3.930E-01	4.339E-01	4.322E-01	4.291E-01	4.163E-01	4.050E-01	3.936E-01	3.813E-01	3.735E-01
J= 1	3.826E-01	3.881E-01	3.963E-01	3.900E-01	3.879E-01	3.824E-01	3.787E-01	3.718E-01	3.650E-01	3.630E-01
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	3.817E-01	3.782E-01	3.762E-01	3.752E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	3.713E-01	3.674E-01	3.658E-01	3.699E-01	3.693E-01	3.687E-01	3.686E-01	3.686E-01	3.686E-01
J= 1	3.620E-01	3.596E-01	3.608E-01	3.660E-01	3.670E-01	3.668E-01	3.667E-01	3.667E-01	3.667E-01
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF PO2 in Vol. Fraction. Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.687E-02	3.123E-02	5.052E-02	1.478E-02	1.105E-02	1.112E-02	1.117E-02	0.000E-01
J= 3	0.000E-01	1.118E-02	1.156E-02	1.135E-02	1.405E-02	1.127E-02	1.125E-02	1.126E-02	1.125E-02	1.123E-02
J= 2	1.121E-02	1.119E-02	1.121E-02	1.116E-02	1.137E-02	1.120E-02	1.121E-02	1.121E-02	1.121E-02	1.120E-02
J= 1	1.122E-02	1.119E-02	1.115E-02	1.121E-02	1.116E-02	1.116E-02	1.117E-02	1.117E-02	1.117E-02	1.118E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	1.122E-02	1.122E-02	1.121E-02	1.121E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	
J= 1	1.118E-02	1.119E-02	1.119E-02	1.119E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF FUL0 in kg/(kg,mixture) AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	0.000E-01
J= 3	0.000E-01	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02
J= 2	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02
J= 1	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	6.307E-02	6.307E-02	6.307E-02	6.307E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	
J= 1	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	6.307E-02	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOL0 in Number of Vol. Lumps Released AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	3.304E+03	3.309E+03	3.277E+03	3.400E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	2.300E+01	2.300E+01	2.900E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF SO2 in Vol. Fraction. Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	5.261E-04	5.121E-04	4.500E-04	5.648E-04	5.768E-04	5.765E-04	5.763E-04	0.000E-01
J= 3	0.000E-01	5.759E-04	5.750E-04	5.758E-04	5.671E-04	5.761E-04	5.761E-04	5.760E-04	5.760E-04	5.760E-04
J= 2	5.755E-04	5.757E-04	5.760E-04	5.762E-04	5.755E-04	5.761E-04	5.761E-04	5.761E-04	5.760E-04	5.760E-04
J= 1	5.755E-04	5.756E-04	5.760E-04	5.759E-04	5.761E-04	5.761E-04	5.761E-04	5.761E-04	5.761E-04	5.760E-04

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	5.760E-04	5.760E-04	5.760E-04	5.760E-04	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	5.760E-04	5.760E-04	5.759E-04	5.759E-04	5.759E-04	5.758E-04	5.758E-04	5.758E-04	5.758E-04	
J= 1	5.760E-04	5.759E-04	5.759E-04	5.758E-04	5.758E-04	5.758E-04	5.758E-04	5.757E-04	5.757E-04	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

UNBURN FIXED CARBON AT FURNACE EXIT = 36.82% AFTER 100 ITERATIONS

ATOM OUTFLUX IN KG/S :

C=	3.957821	H=	0.625642	N=	51.863163	O=	16.446154
S=	0.045924	A=	0.000460				
SUM=	72.939163						

ATOM INFLUX IN KG/S :

C=	3.957820	H=	0.625642	N=	51.863060	O=	16.446178
S=	0.046005	A=	0.000460				
SUM=	72.939163						

ATOM BALANCE -> (OUT-IN)/IN IN % :

C=	0.000012	H=	0.000000	N=	0.000199	O=	-0.000151
S=	-0.176575	A=	0.000006				
SUM=	0.000000						

ENERGY BALANCE FOR VOLUME ZONES AND TOTAL FURNACE EFFICIENCY AFTER 100 ITERATIONS

I	J	TPSAD K	TEX K	RHOG OLD KG/M3	CP EX KJ/KGK	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QCHEIN KW	QCHENT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTNT KW	TNEW K
1	1	1594.5	1587.0	0.22222	1.23601	87465.	-562.	0.	0.	0.	0.	15751.	563.	103216.	103216.	0.	1587.
2	1	1611.4	1611.1	0.21889	1.23858	91626.	-18.	0.	0.	0.	0.	16667.	19.	108293.	108293.	0.	1611.
3	1	1685.6	1685.8	0.20919	1.24631	42037.	7.	0.	0.	0.	0.	17268.	-7.	59304.	59305.	0.	1686.
4	1	1715.9	1705.7	0.20676	1.24830	41121.	-329.	0.	0.	0.	0.	16096.	329.	57218.	57218.	0.	1706.
5	1	1716.4	1715.2	0.20560	1.24926	60397.	-35.	0.	0.	0.	-19.	10513.	54.	70911.	70930.	0.	1715.
6	1	1713.7	1711.3	0.20608	1.24887	63834.	-122.	0.	0.	0.	0.	16371.	122.	80205.	80205.	0.	1711.
7	1	1702.1	1700.1	0.20743	1.24775	50784.	-77.	0.	0.	0.	0.	12510.	78.	63295.	63295.	0.	1700.
8	1	1681.4	1673.8	0.21070	1.24508	37382.	-228.	0.	0.	0.	0.	12107.	229.	49489.	49490.	0.	1674.
9	1	1631.9	1625.3	0.21699	1.24007	34272.	-188.	0.	0.	0.	0.	13367.	188.	47640.	47640.	0.	1625.
10	1	1563.5	1535.0	0.22975	1.23036	42921.	-1075.	0.	158.	0.	0.	8967.	917.	51888.	51888.	0.	1535.
11	1	1514.3	1490.5	0.23661	1.22540	33078.	-720.	0.	286.	0.	0.	9700.	434.	42778.	42778.	0.	1490.
12	1	1474.6	1446.8	0.24375	1.22041	22777.	-596.	0.	268.	0.	0.	9279.	328.	32056.	32056.	0.	1447.
13	1	1427.6	1428.9	0.24681	1.21832	27540.	34.	0.	0.	0.	0.	9420.	-34.	36960.	36960.	0.	1429.
14	1	1374.3	1370.6	0.25731	1.21139	48155.	-183.	0.	0.	0.	0.	8470.	183.	56625.	56625.	0.	1371.
15	1	1330.7	1311.7	0.26886	1.20417	64404.	-1309.	0.	585.	0.	0.	8815.	724.	73218.	73218.	0.	1312.
16	1	1295.2	1275.6	0.27646	1.19964	61962.	-1341.	0.	553.	0.	0.	8187.	788.	70149.	70149.	0.	1276.

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17  1 1244.3 1193.3 0.29554 1.18894  37028.  -2192.      0.   1581.      0.      0.   7519.    611.  44547.  44547.      0. 1193.
18  1 1174.8 1132.9 0.31128 1.18079  34047.  -1783.      0.   1364.      0.      0.   6739.    419.  40786.  40786.      0. 1133.
19  1 1132.9 1109.5 0.31786 1.17756  25119.   -772.      0.    427.      0.      0.   8680.    345.  33800.  33800.      0. 1110.
 1  2 1588.8 1549.8 0.22756 1.23198  92713.  -3111.      0.    563.      0.      0.  44608.   2548. 137321. 137322.      0. 1550.
 2  2 1598.8 1594.4 0.22118 1.23681 159277.   -599.      0.      0.      0.      0.  48687.    600. 207965. 207965.      0. 1594.
 3  2 1701.8 1695.9 0.20796 1.24732 119615.   -540.      0.      2.      0.    -19.  51621.    559. 171236. 171255.      0. 1696.
 4  2 1742.6 1738.0 0.20291 1.25152 117471.   -331.      0.      0.      0.    -75.  50012.    407. 167483. 167559.      1. 1738.
 5  2 1743.4 1737.4 0.20298 1.25150 176098.   -200.      0.      0.      0.   -616.  31472.    817. 207571. 208187.      1. 1737.
 6  2 1735.5 1729.0 0.20397 1.25062 173702.   -803.      0.      0.      0.    -75.  49229.    879. 222930. 223006.      1. 1729.
 7  2 1715.8 1711.2 0.20609 1.24886 146239.   -524.      0.      0.      0.      0.  37548.    525. 183786. 183787.      0. 1711.
 8  2 1687.8 1682.0 0.20966 1.24592 120289.   -555.      0.      0.      0.      0.  36693.    555. 156982. 156982.      0. 1682.
 9  2 1638.7 1631.2 0.21620 1.24068 108023.   -676.      0.      0.      0.      0.  40202.    677. 148224. 148224.      0. 1631.
10  2 1575.4 1569.1 0.22475 1.23409 130061.   -703.      0.      0.      0.      0.  30015.    704. 160076. 160076.      0. 1569.
11  2 1536.2 1514.6 0.23284 1.22810  98964.  -1917.      0.    591.      0.      0.  29928.   1325. 128892. 128892.      0. 1515.
12  2 1492.6 1465.9 0.24058 1.22260  69473.  -1724.      0.    561.      0.      0.  28354.   1163.  97827.  97827.      0. 1466.
13  2 1438.7 1428.9 0.24681 1.21832  71840.   -687.      0.      0.      0.      0.  27472.    687.  99311.  99311.      0. 1429.
14  2 1366.3 1363.6 0.25864 1.21054 137897.   -391.      0.      0.      0.      0.  25298.    391. 163195. 163195.      0. 1364.
15  2 1327.1 1304.5 0.27034 1.20328 145402.  -3524.      0.   1273.      0.      0.  26031.   2250. 171433. 171433.      0. 1305.
16  2 1279.8 1258.2 0.28028 1.19741 138034.  -3342.      0.   1185.      0.      0.  23954.   2156. 161987. 161987.      0. 1258.
17  2 1231.4 1189.9 0.29637 1.18849 109419.  -5343.      0.   3361.      0.      0.  22243.   1982. 131662. 131662.      0. 1190.
18  2 1173.3 1136.3 0.31037 1.18125 101939.  -4721.      0.   2949.      0.      0.  19861.   1772. 121800. 121800.      0. 1136.
19  2 1136.3 1114.3 0.31650 1.17822  75688.  -2177.      0.   1146.      0.      0.  26341.   1031. 102029. 102029.      0. 1114.
 2  3 1629.5 1577.2 0.22360 1.23496  94133.  -4081.      0.    919.      0.    -19.  85968.   3182. 180100. 180119.      0. 1577.
 3  3 1711.1 1715.1 0.20563 1.24924 197470.   5787.      0.      0.      0.  -9349.  93872.   3562. 291342. 300691.      0. 1715.
 4  3 1810.7 1790.2 0.19699 1.25663 194741.   8973.      0.      0.      0. -11943.  93203.   2971. 287944. 299888.      0. 1790.
 5  3 1789.9 1768.1 0.19930 1.25553 257214.  10518.      0.      0.      0. -15171.  59201.   4653. 316415. 331587.      0. 1768.
 6  3 1777.5 1765.5 0.19975 1.25422 252115.   1102.      0.      0.      0.  -4031.  91600.   2930. 343715. 347747.      1. 1765.
 7  3 1741.6 1732.1 0.20360 1.25093 221853.  -1586.      0.      0.      0.    -38.  69438.   1625. 291292. 291330.      1. 1732.
 8  3 1697.4 1685.6 0.20922 1.24628 194061.  -1820.      0.      0.      0.      0.  66869.   1820. 260929. 260930.      0. 1686.
 9  3 1636.0 1622.0 0.21743 1.23972 204641.  -2372.      0.      0.      0.      0.  72200.   2372. 276842. 276842.      0. 1622.
10  3 1584.5 1570.9 0.22450 1.23427 188206.  -2212.      0.    399.      0.      0.  54777.   1813. 242983. 242983.      0. 1571.
11  3 1543.9 1508.8 0.23373 1.22746 162967.  -5088.      0.   1273.      0.      0.  53288.   3815. 216254. 216255.      0. 1509.
12  3 1478.3 1442.8 0.24443 1.21994 126074.  -4199.      0.   1198.      0.      0.  49732.   3001. 175805. 175805.      0. 1443.
13  3 1417.7 1389.8 0.25374 1.21370 118910.  -3270.      0.   1125.      0.      0.  46941.   2145. 165850. 165850.      0. 1390
14  3 1389.8 1344.8 0.26224 1.20826  85832.  -3910.      0.   1294.      0.      0.  43302.   2616. 129134. 129134.      0. 1345.
 3  4 1696.9 1714.8 0.20481 1.25437  76724.  38604.      0.    874.    -76. -50567.  51111.  11089. 127759. 178403.      0. 1715.
 4  4 1820.0 1718.0 0.20417 1.25631  99469.  38832.      0.    639.    -76. -50679.  50965.  11209. 150357. 201113.      0. 1718.
 5  4 1597.7 1559.1 0.22378 1.24589 129477.  16235.      0.    347.    -76. -20935.  35112.   4353. 164512. 185523.      0. 1559.
 6  4 1840.0 1774.0 0.19859 1.25635 127549.  13633.      0.    723.      0. -20732.  45002.   6376. 172551. 193283.      0. 1774.
 7  4 1769.7 1737.4 0.20297 1.25149 117344.   -908.      0.    560.      0.  -2071.  33661.   2419. 151005. 153076.      0. 1737.
 8  4 1700.9 1669.9 0.21118 1.24469  96997.  -2365.      0.    534.      0.    -19.  32447.   1851. 129444. 129463.      0. 1670.
 9  4 1649.3 1606.2 0.21957 1.23805  78042.  -2765.      0.    729.      0.      0.  35124.   2037. 113166. 113166.      0. 1606.
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HEAT BALANCE FOR VOLUME ZONES: 6.22E+06 5.57E+04 0. 2.7E-04-2.3E-02-1.9E-05 2.0E-06 1.0E-05 8.3E-06 8.4E-06 1.0E-01

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	DTMAX	I	J	RDTMAX	I	J	DQMAX	I	J	RDQMAX	DQTOTAL	RDQTOTAL
		K			%			KW			%	KW	%
5	1	0.00	5	1	0.000	6	2	0.7	4	1	0.000	10.0	0.000

HEAT FLUX TO ADDITIONAL HEAT SINKS IN KW

CONVECTIVE FLUX	RADIATIVE FLUX	TOTAL FLUX
18254.7871	24913.5508	43168.3359

SURFACE TEMPERATURES OF ADDITIONAL HEAT SINKS IN K --- represented by TWSINK(i,j)

TWSINK(10, j) =	927.63	0.00	0.00
TWSINK(11, j) =	844.65	845.73	841.45
TWSINK(12, j) =	841.17	831.20	816.05
TWSINK(13, j) =	0.00	0.00	808.04
TWSINK(14, j) =	0.00	0.00	802.33
TWSINK(15, j) =	849.10	860.10	
TWSINK(16, j) =	838.36	846.64	
TWSINK(17, j) =	813.02	814.79	
TWSINK(18, j) =	804.84	808.12	
TWSINK(19, j) =	805.07	801.39	

MEAN FURNACE EXIT TEMPERATURE = 1113.07K AFTER 100 ITERATIONS
TOTAL FURNACE EFFICIENCY = 65.1028 % WITH 186359. KW HEAT RELEASE AND 14277. KW SENSIBLE INPUT

CHEM. HEAT OUTFLUX IN KW :
FUEL= 5.9 SULF.= 0.0 SUM = 5.9
SENS. HEAT OUTFLUX IN KW :
EXT.= 70022.5 REC. = 0.0 SUM = 70022.5
OUTFLUX TO HEAT SINKS IN KW :
RAD.= 103154.5 CONV.= 27465.3 SUM = 130619.8
TOTAL HEAT OUTFLUX : 200648.2 KW
CHEM. HEAT INFLUX IN KW :
FUEL= 186613.3 EVAP.= -229.3 CALC.= 0.0
SULF= 0.0 SUM = 186384.0
SENS. HEAT AIR INFLUX IN KW :
SEC.= 13546.4 PRIM.= 0.0 TRANS.= 0.0
REC.= 0.0 SUM = 13546.4
SENS. HEAT FUEL INFLUX IN KW :
DRY = 717.0 H2OG = 13.2 SUM = 730.2
SENS. HEAT SORBENT INFLUX IN KW :
CAO = 0.0 H2OG = 0.0 CO2G = 0.0 SUM = 0.0
SENS. HEAT BURNER-STEAM INFLUX IN KW: 0.0
TOTAL HEAT INFLUX : 200660.7 KW
GAS ZONE HEAT BALANCE :
HEAT BALANCE -> OUT - IN : -12.4 KW
HEAT BALANCE -> (OUT-IN)/IN : -0.006190 %

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW	QCONIN	QCONNT	QDIFIN	QDIFNT	QRADIN	QRADNT	QTOTIN	QTOTEX	QTOTN	TNEWW
			K	KW	KW	KW	KW	KW	KW	KW	KW	KW	K
1	2	1	780.0	0.	1695.	168.	-168.	1711.	-1527.	1879.	1879.	0.	780.0
2	3	1	807.9	0.	3630.	309.	-309.	3712.	-3322.	4020.	4020.	0.	807.9
3	4	1	866.0	0.	2377.	172.	-172.	2465.	-2204.	2637.	2637.	0.	866.0

SURFACE ZONE HEAT BALANCE : 0.0E-01 7.7E+03 6.5E-02-6.5E-02 7.9E+03-7.1E+03 8.5E+03 8.5E-03 1.4E-04

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX	I	J	M	RDTMAX	I	J	M	DQMAX	I	J	M	RDQMAX	DQTOTAL	RDQTOTAL
			K				%				KW				%	KW	%
3	4	1	0.00	3	4	1	0.000	2	3	1	0.0	2	3	1	0.000	0.0	0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

J= 2 1.949E+02

I	J	M	TOLDW K	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTN KW	TNEWW K
14	3	3	753.1	0.	1309.	237.	-237.	1366.	-1072.	1604.	1604.	0.	753.1
9	4	3	877.2	0.	1241.	148.	-148.	1367.	-1093.	1515.	1515.	0.	877.2

SURFACE ZONE HEAT BALANCE : 0.0E-01 2.6E+03 3.9E-02-3.9E-02 2.7E-03-2.2E+03 3.1E+03 3.1E+03 2.1E-04

J= 3 -1.574E+02
J= 2 -1.352E+02
J= 1 -1.989E+02

M1= 1

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

J= 4 8.772E+02
J= 3 7.531E+02
J= 2 8.000E+02
J= 1 8.000E+02

M3= 1

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

J= 4 1.675E+02
J= 3 8.466E+01
J= 2 3.687E+01
J= 1 5.204E+01

M3= 1

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

J= 4 -1.064E+02
J= 3 -5.679E+01
J= 2 -1.365E+01
J= 1 -2.882E+01

M3= 1

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

M4= 1	7.555E+02	7.835E+02	8.880E+02	9.165E+02	8.773E+02	8.651E+02	8.234E+02	7.995E+02	7.760E+02	7.582E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	7.765E+02	7.492E+02	7.213E+02	7.073E+02	6.729E+02	6.605E+02	6.359E+02	6.313E+02	6.543E+02	
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

M4= 1	1.638E+02	1.987E+02	3.311E+02	3.691E+02	3.209E+02	2.994E+02	2.460E+02	2.169E+02	1.884E+02	1.666E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	9.689E+01	7.956E+01	6.169E+01	5.330E+01	3.124E+01	2.414E+01	1.678E+01	1.378E+01	3.601E+01	
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

M4= 1	-1.156E+02	-1.379E+02	-2.215E+02	-2.443E+02	-2.130E+02	-2.032E+02	-1.699E+02	-1.507E+02	-1.319E+02	-1.177E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	-6.614E+01	-5.525E+01	-4.408E+01	-3.847E+01	-2.472E+01	-1.975E+01	-1.489E+01	-1.213E+01	-2.593E+01	
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	

iter. no.=100, act.err.= 0.3264 %. avg.err.= -1.2102 %. 20 it.err.= 0.1232 %. hb.err.= -0.0062 %

BALANCE OF TOTAL RADIATIVE EXCHANGE

NUMBER OF BEAMS = 354960

SUM OF EMITTED RADIATION (KW) :

VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
2.132E+06	2.753E+04	8.613E+02	7.956E+03	9.616E+02	1.775E+04	2.160E+06

SUM OF ABSORBED RADIATION (KW) :

VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
2.071E+06	8.938E+04	8.722E+03	0.000E-01	3.413E+03	7.724E+04	2.160E+06

SUM OF NET EMITTED RADIATION (KW) :

VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
6.184E+04	-6.185E+04	-7.861E+03	7.956E+03	-2.451E+03	-5.950E+04	-9.830E+00

ERROR OF RADIATIVE ENERGY BALANCE =-4.551E-04 %

TOTAL HEAT BALANCE :
HEAT TO FURNACE WALLS IN KW :
RAD.= 76690.8 CONV.= 9211.5 SUM = 85902.3

13	1563.8	771.7	2335.6
14	1464.6	719.5	2184.1
15	3345.9	1597.0	4942.9
16	2568.1	1490.2	4058.3
17	2578.8	4699.0	7277.8
18	2113.7	4091.4	6205.1
19	566.9	1305.8	1872.7

CLOSURE OF TOTAL HEAT BALANCE :

HEAT FLUX FROM FLUE GAS	:	130619.8 KW
HEAT FLUX TO HEAT SINKS	:	130193.4 KW
DIFFERENCE	:	-426.4 KW
ACT. PERCENTAGE ERROR	:	0.326448 %
AVG. PERCENTAGE ERRRR	:	-1.210160 %
AVG. ERROR OF LAST 20 IT.	:	0.123163 %

I INDEX	X-CO-ORDINATE	NET NORM. MASS FLUX	MEAN TEMP.	MEAN RES. TIME	SUM OF RES. TIME
-	M	-	K	Sec	Sec
1	0.988	0.4000	1549.75	0.2561	0.4703
2	2.964	0.7000	1596.62	0.3422	0.1711
3	4.912	0.7250	1705.70	0.3853	0.1927
4	6.772	0.7707	1758.17	0.3309	0.5508
5	8.247	1.1375	1690.58	0.1471	0.7898
6	9.722	1.1436	1761.72	0.2231	0.9749
7	11.314	1.0188	1728.92	0.1959	1.1844
8	12.700	1.0000	1680.23	0.2050	1.3849
9	14.185	1.0000	1625.24	0.2432	1.6090
10	15.608	1.0000	1569.18	0.1549	1.8081
11	16.919	1.0000	1508.73	0.1734	1.9722
12	18.279	1.0000	1450.52	0.1803	2.1491
13	19.640	1.0000	1406.29	0.1860	2.3323
14	21.000	1.0000	1365.31	0.1933	2.5219
15	22.501	1.0000	1307.75	0.1017	2.6694
16	24.144	1.0000	1262.59	0.1052	2.7728
17	25.834	1.0000	1190.77	0.1178	2.8843
18	27.570	1.0000	1135.43	0.1236	3.0051
19	29.592	1.0000	1113.07	0.1676	3.1507

MEAN GAS SPECIES CONCENTRATION ALONG FURNACE :

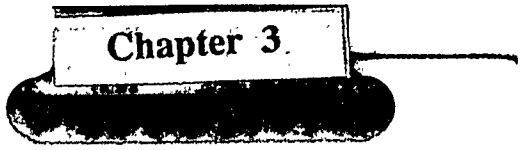
I	X-CO-ORD.	CO2	H2O	N2	O2	VOL	SO2
-	M	VOL% WET	VOL% WET	VOL% WET	VOL% WET	VOL% WET	VOL% WET
1	0.988	13.0727	12.3129	73.4513	1.1063	0.0000	0.0568
2	2.964	13.0726	12.3129	73.4537	1.1040	0.0000	0.0568
3	4.912	12.8164	12.1035	73.3904	1.4637	0.1703	0.0557
4	6.772	12.6136	11.9377	73.3632	1.7235	0.3070	0.0549
5	8.247	11.8699	11.3294	73.2135	2.7209	0.8146	0.0517
6	9.722	12.9877	12.2435	73.4349	1.2188	0.0586	0.0565
7	11.314	13.0717	12.3122	73.4546	1.1040	0.0006	0.0569
8	12.700	13.0726	12.3129	73.4516	1.1060	0.0000	0.0569
9	14.185	13.0727	12.3130	73.4492	1.1083	0.0000	0.0568
10	15.608	13.0727	12.3130	73.4500	1.1075	0.0000	0.0568
11	16.919	13.0727	12.3129	73.4510	1.1065	0.0000	0.0568
12	18.279	13.0727	12.3129	73.4514	1.1062	0.0000	0.0568
13	19.640	13.0727	12.3129	73.4516	1.1059	0.0000	0.0568
14	21.000	13.0727	12.3129	73.4525	1.1051	0.0000	0.0568
15	22.501	13.0727	12.3129	73.4525	1.1051	0.0000	0.0568
16	24.144	13.0727	12.3129	73.4524	1.1052	0.0000	0.0568
17	25.834	13.0727	12.3129	73.4524	1.1052	0.0000	0.0568
18	27.570	13.0727	12.3129	73.4523	1.1052	0.0000	0.0568
19	29.592	13.0727	12.3129	73.4523	1.1052	0.0000	0.0568

OTHER MEAN QUANTITIES ALONG FURNACE :

I	X-CO-ORD.	CARBON IN ASH	TOT. FUEL HEAT REL.	VOLATILE HEAT REL.	SO2 REDUCTION	CAO UTIL.
	M	%	%	%	%	%
1	0.988	27.8757	0.0001	0.0000	0.0000	0.0000
2	2.964	28.7658	0.0103	0.0100	0.0000	0.0000
3	4.912	33.6631	32.1685	32.1700	0.0000	0.0000
4	6.772	35.7547	65.8068	65.8100	0.0000	0.0000
5	8.247	36.7637	85.5358	85.5400	0.0000	0.0000
6	9.722	33.3348	98.8456	98.8500	0.0000	0.0000
7	11.314	31.4707	99.9760	99.9800	0.0000	0.0000
8	12.700	29.8425	99.9864	99.9900	0.0000	0.0000
9	14.185	28.5565	99.9866	99.9900	0.0000	0.0000
10	15.608	28.1180	99.9867	99.9900	0.0000	0.0000
11	16.919	27.7491	99.9868	99.9900	0.0000	0.0000
12	18.279	27.5616	99.9868	99.9900	0.0000	0.0000
13	19.640	27.4807	99.9869	99.9900	0.0000	0.0000
14	21.000	27.3521	99.9869	99.9900	0.0000	0.0000
15	22.501	27.3148	99.9869	99.9900	0.0000	0.0000
16	24.144	27.3159	99.9869	99.9900	0.0000	0.0000
17	25.834	27.3117	99.9869	99.9900	0.0000	0.0000
18	27.570	27.3100	99.9869	99.9900	0.0000	0.0000
19	29.592	27.3081	99.9869	99.9900	0.0000	0.0000

Listing 2.7. Contents of file BOILER.DAT (Case 1).

```
0101100.0    100
                85902.33        0.00        0.00        0.00        0.00
                    0.00        0.00        0.00        0.00     2450.97
                 6546.97     5585.60     2335.56     2184.13     4942.85
                 4058.26     7277.76     6205.13     1872.67        0.00
                    0.00        0.00        0.00        0.00        0.00
                    0.00        0.00        0.00        0.00        0.00
               1549.75 1596.62 1705.70 1758.17 1690.58
               1761.72 1728.92 1680.23 1625.24 1569.18
               1508.73 1450.52 1406.29 1365.31 1307.75
               1262.59 1190.77 1135.43 1113.07    0.00
                  0.00    0.00    0.00    0.00    0.00
                  0.00    0.00    0.00    0.00    0.00
                0.1307  0.1307  0.1282  0.1261  0.1187
                0.1299  0.1307  0.1307  0.1307  0.1307
                0.1307  0.1307  0.1307  0.1307  0.1307
                0.1307  0.1307  0.1307  0.1307  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.1231  0.1231  0.1210  0.1194  0.1133
                0.1224  0.1231  0.1231  0.1231  0.1231
                0.1231  0.1231  0.1231  0.1231  0.1231
                0.1231  0.1231  0.1231  0.1231  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.7351  0.7351  0.7362  0.7373  0.7408
                0.7355  0.7351  0.7351  0.7351  0.7351
                0.7351  0.7351  0.7351  0.7351  0.7351
                0.7351  0.7351  0.7351  0.7351  1.0000
                1.0000  1.0000  1.0000  1.0000  1.0000
                1.0000  1.0000  1.0000  1.0000  1.0000
                0.0111  0.0110  0.0146  0.0172  0.0272
                0.0122  0.0110  0.0111  0.0111  0.0111
                0.0111  0.0111  0.0111  0.0111  0.0111
                0.0111  0.0111  0.0111  0.0111  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0156  0.7776  0.2067
                 72.9392
                 68.2448
                  4.6944
                0.0001  0.9798  0.0200  0.0001
                42262.80
                40563.59
               200865.39
```


Chapter 3

3.0 CASE 2 FILES

This chapter documents all the input and output files associated with the execution of the Case 2 example as defined in Chapter 1. Case 2 example includes the application of gas reburning for the wall-fired boiler (Boiler 1) which uses *oil* as fuel. Basicly, this case demonstrates model set-up using the three input codes 2DINPT, RBINPT, and BPINPT. The results obtained from the three main codes, 2DHT, RBNOX, and BPM, are also documented. The user may refer to Figure 1.1 for the 2D boiler zone-arrangement. Files included in this chapter are as follows:

- The record of the 2DINPT interactive session (Listing 3.1). --- This record shows the procedures of preparing an input data file step-by-step. The input file prepared for the 2DHT code has a file name as 2DIN0201.075. Note that the 2DINPT code was operated under the "updating" mode, which means that file 2DIN0201.075 was established from the modification of an existing data file (in this case, file 2DIN0101.100). The boiler flow field was prescribed using the "computer aided option".

- The contents of file FORWA.DAT (Listing 3.2). --- This file was created upon completion of the 2DINPT code execution. The user is suggested to save this file under a different name (e.g., FORW0201.075) if he wishes to reproduce the Case 2 results, as this file will be over-written every time the 2DINPT code is executed. This file contains the user-specified information for the creation of the boiler forward mass fluxes.

- The contents of file RECIR.DAT (Listing 3.3). --- This file was created upon completion of the 2DINPT code execution. The user is suggested to save this file under a different name (e.g., RECI0201.075) if he wishes to reproduce the results of this case, as this file will be over-written every time the 2DINPT code is executed. This file contains the user-specified information for the creation of the boiler recirculating flow field.

- The contents of the file 2DIN0201.075 (Listing 3.4).

- The contents of the computer-terminal output (Listing 3.5). --- This was the outputs directed to the computer terminal screen, showing the progress of the 2DHT code execution.

- The contents of file 2DOT0201.075 (Listing 3.6). --- File 2DOT0201.075 was created upon completion of the 2DHT furnace-code execution. This file contains the predicted furnace thermal-performance information.

- The contents of file BOILER.DAT (Listing 3.7). --- Again, this file was created upon completion of the 2DHT code execution. The user is suggested to save this file under a different name (e.g., BOIL0201.075) if he wishes to reproduce the Case 2 results, as this file will be over-written every time the 2DHT code is executed. This file was later used in the preparation of an input file (BPIN0201.075) for the BPM code.

- The contents of file REBURN.DAT (Listing 3.8). --- This file was also created upon completion of the 2DHT code execution. The user is suggested to save this file under a different name (e.g., REBU0201.075) if he wishes to reproduce the results of this case, as this file will be over-written every time the 2DHT code is executed. This file was later used in the preparation of an input file (RBIN0201.075) for the RBNOX code.

- The record of the RBINPT interactive session (Listing 3.9). --- This record shows the procedures of preparing an input data file step-by-step. The input file prepared for the RBNOX code has a file name as RBIN0201.075. Note that the RBINPT code can *only* operates under the "updating" mode, which means that file RBIN0201.075 was established from the modification of an "existing" data file (in this case, the "existing" data file was created by the author with the help of an IBM editor).

- The contents of the file RBIN0201.075 (Listing 3.10).

- The contents of file THERMO.DAT (Listing 3.11). --- This file must be present together with the input file RBINPT.DAT, in order to execute the RBNOX code for NO_X emissions predictions.

- The contents of the computer-terminal output (Listing 3.12). --- This was the outputs directed to the computer terminal screen, showing the progress of the RBNOX code execution.

- The contents of file RBOT0201.075 (Listing 3.13). --- File RBOT0201.075 was created upon completion of the RBNOX code execution. This file contains the predicted NO_X information.

- The record of the BPINPT interactive session (Listing 3.14). --- This record shows the procedures of creating an input data file step-by-step. The input file created for the BPM code has a file name as BPIN0201.075. Note that the BPINPT code was operated under the "creation" mode, which means that file BPIN0201.075 had not existed and was established from scratch.

- The contents of the file BPIN0201.075 (Listing 3.15).

- The contents of file BPOT0201.075 (Listing 3.16). --- File BPOT0201.075 was created upon completion of the BPM code execution. This file contains the predicted boiler steam-side and efficiency information. An exact copy of this file was also directed to the computer terminal screen, but was not captured.

Listing 3.1. Record of 2DINPT interactive session (Case 2).

```
2DINPT


-- This is an interactive program (2DINPT) to create
   or update a data file which is required to run the
   EER two-dimensional heat transfer code (2DHT).
-- Version 1.70, May, 1992


************************ Attention *********************
 This interactive program accepts inputs from keyboard
 in UPPER case only.
 -- Please set your keyboard to the UPPER case symbols
    (i.e., Caps Lock !).
 -- To continue, type C and press Return (or Enter).
*******************************************************

C

STATUS OF INPUT FILE:
---------------------
To Create an input file, Press: C
To Update an input file,        Return

You chose to update an existing input file.

NOTE:
-- To update an existing file, you have to copy the
   existing file to file "INPUT.DAT" under DOS before you
   execute this input code.

To continue, press Return


 Chapter 1 :
-------------
INPUT/OUTPUT SPECIFICATIONS AND PARAMETERS WHICH
CONTROL THE EXTENT OF NUMERICAL CALCULATIONS

         Press: P to by-pass this chapter
                Return to proceed through

Specify the name (BOLNAM) of the boiler:  BOILER 1
-- Maximum characters allowed: 24
-- Characters can be alphabetic or numeric

         Press: C to change
                Return to continue

Specify a two-digit case number (NRCS) for
current run (e.g., 01, 02, or 03):   01
-- Case number can be used to distinguish the boiler operating
   conditions, or parametric parameters being studied

         Press: C to change
                Return to continue  C
02

Specify a two-digit version number (NRVS) for
current run (e.g., 01, 02, or 03):   01
-- Version number can be used to further document cases run
   under the same case number as specified above
```

```
         Press: C to change
                Return to continue

Specify boiler load (CLOAD) for current run:   100.0
-- Boiler load may be described as 60.5, 90.0, or 100.0,
   to show the % of current load relative to the boiler MCR

         Press: C to change
                Return to continue  C
75.0

Name of output file (FINPT) from this program:   2DIN0101.100
-- Default file name is 2DINcsvs.LLL
-- csvs represents the case number and the version numbers
-- LLL shows the boiler load percentage

         Press: D for default values
                C to change
                Return to continue  D

Name of input array file (FINPTAR):   IARR0101.100
-- The default name has format as IARRcsvs.LLL
-- IARR denotes "input array" for the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output array file (FINPTAR):   OARR0101.100
-- The default name has format as OARRcsvs.LLL
-- OARR denotes "output array" from the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output file (FHDOPT) from the 2DHT code:   2DOT0101.100
-- The default name has format as 2DOTcsvs.LLL
-- 2DOT denotes "output file" from the 2DHT code

         Press: D for the default file name
                C to change the file name
                B to direct the file to your monitor
                Return to continue  D

Specification of output level (LOUTPUT) :
Current output level is DEFAULT.
-- DEFAULT setting is most useful and recommended.
-- In addition to the default setting, you can choose from
   four other output levels : 1, 2, 3, and 4.
-- Higher output levels give more comprehehsive information.

         Press: D for default values
                C to change
                Return to continue

You can include your comments on the front page
of the printout :
-- Comment block may consist of 10 lines
-- Each line may have a max. of 78 characters
To continue, press Return

Current comments are:
FRONT WALL FIRED BURNERS, BOILER FIRING OIL AT 100% LOAD
```

```
USE SOME DEFAULT PARAMETERS
* Line  3 is blank *
* Line  4 is blank *
* Line  5 is blank *
* Line  6 is blank *
* Line  7 is blank *
* Line  8 is blank *
* Line  9 is blank *
* Line 10 is blank *

          Press: C to change
                 Return to continue  C

FRONT WALL FIRED BURNERS, BOILER FIRING OIL AT 100% LOAD

          Press: C to change
                 Return to continue  C
UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH

USE SOME DEFAULT PARAMETERS

          Press: C to change
                 Return to continue  C
GAS REBURNING

* Line  3 is blank *

          Press: C to change
                 Return to continue

* Line  4 is blank *

          Press: C to change
                 Return to continue

* Line  5 is blank *

          Press: C to change
                 Return to continue

* Line  6 is blank *

          Press: C to change
                 Return to continue

* Line  7 is blank *

          Press: C to change
                 Return to continue

* Line  8 is blank *

          Press: C to change
                 Return to continue

* Line  9 is blank *

          Press: C to change
                 Return to continue

* Line 10 is blank *

          Press: C to change
                 Return to continue
```

```
Maximum number of iterations for this run
NIMAX=100
-- During the test phase, set NIMAX =1
-- For production runs, use NIMAX values between 30 and 100

         Press: C to change
                Return to continue

Number of iterations at which the averaging procedure
is initialized to smooth-out the Monte Carlo effects :
NITACC= 71
-- For runs without averaging, set NITACC = NIMAX.
-- For complete averaging, set NITACC =1.
-- For typical runs, set NITACC = NIMAX - 30.

         Press: C to change
                Return to continue

Number of sub-iterations for fixed carbon mass
balances per iteration of total heat balance :
NIMX=  1
-- During test phase, set NIMX=1
-- For coal combustion, set NIMX between 5 and 10
-- For gaseous and oil fuels, set NIMX=1

         Press: C to change
                Return to continue

(a) Number of divisions on the largest linear dimension
    of volume zones: NMAX= 2
(b) Divisions of polar angle: NPHI= 4
(c) Cut-off value for beam tracking: EXACT=0.000100
Default values are: NMAX  = 2
                    NPHI  = 4
                    EXACT = 0.0001
NMAX and NPHI must be even numbers

         Press: D for default values
                C to change
                Return to continue

Number of iterations after which field variables
of total heat balances are printed :
NPRIN= 100
-- Default value is NPRIN=NIMAX (recommended)

         Press: D for default values
                C to change
                Return to continue

Switches to print detailed outputs of:
-- total energy balance for volume and surface zones
-- mass balance for volume zones
Currently, switches are set to print the above information.

         Enter: C to change
                Return to continue

Switches to write or read files to/from hard disk :
NWRTE: Switch to save data file at the end of the 2DHT run
       Currently, NWRTE= 1
NREAD: Switch to read variable values from a restarting
       file at the beginning of the 2DHT run
       Currently, NREAD= 0
```

```
-- For trial runs     , set NWRTE=1 and NREAD=0.
-- For continued runs, set NWRTE=1 and NREAD=1.

         Press: C to change
                Return to continue

NWRTE= 1, NREAD= 0, Are these values O.K. ?

         Press: C to change
                Return to continue

 Chapter 2 :
-------------
BOILER FURNACE OPERATING DATA

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

FUEL TYPE:
For gaseous fuels, set NGAS= 1, NLIQ= 0, NSLL= 0.
For liquid  fuels, set NGAS= 0, NLIQ= 1, NSLL= 0.
For solid   fuels, set NGAS= 0, NLIQ= 0, NSLL= 1.
Currently, NGAS= 0 NLIQ= 1 NSLL= 0

         Press: C to change
                Return to continue

You chose oil as fuel
Press Return to continue

Do you want to change fuel oil composition ?

         Press: C to change
                Return to continue

The following is only information

Equivalent proximate analysis of fuel in kg/kg wet
PCFX=0.0001  PVOL=0.9798  PMOI=0.0200  PASH=0.0001

Press Return to continue

Temperature of atomizing steam, in K :    525.00
Default is 525 K

         Press: D for default values
                C to change
                Return to continue

Equivalent heat capacity of atomizing steam, in kj/kg-K :      0.0000
Default is 1.6026

         Press: D for default values
                C to change
                Return to continue

Ratio of atomizing steam/fuel oil flow rates :      0.0000
Default is 0.02 kg-steam/kg-dry fuel

         Press: D for default values
                C to change
                Return to continue
```

```
Inherent sulfur capture by ash:   0.0000 % of total sulfur
Default value is 0.0 % (i.e., all sulfur is converted to SO2)

         Press: D for default values
                C to change
                Return to continue

Gross (higher) heating value of fuel in kj/kg wet :
HUSW= 42262.8

         Press: C to change
                Return to continue  C
42133.2

Fuel flow rate in kg wet / sec :
FUSW=  4.6944

         Press: C to change
                Return to continue  C
2.9393

Gross fuel heat input is   123842.1 kw

         Press: C to change
                Return to continue

Temperature of fuel oil in K :
TFS=  373.15

         Press: C to change
                Return to continue  C
376.15

Specific heat of fuel oil in kj/kg dry K :
CPFS=  2.0781
Default value is 1.8334 for oil

         Press: D for default values
                C to change
                Return to continue

Air Flow Rates and Properties
Current settings:
  Total air (wet, kg/sec) flow rate =   0.0000
  Total stochiometric air ratio =   1.0600
  O2 % (dry) in flue gas =   0.0000

You have three options to choose:
  Option A -- Specify total air flow rate (wet) in kg/sec
  Option B -- Specify total stochiometric air ratio
  Option C -- Specify O2 % (dry) in the flue gas

         Press: A, B, or C for your option
                Return to continue  A

TOTAL AIR FLOW IN KG WET/S DMA2W=    0.0000

         Press: C to change
                Return to continue  C
52.5703

 DMA2W =  52.5703
 AIRNR =   0.0000
 FLUO2D=   0.0000
```

```
Are these final settings O.K. ?

         Press: C to change
                Return to continue

Water vapor content in air
(a) Relative humidity in % : RELHA2= 50.0000
(b) Saturation pressure in bar : PSH2A2=  0.0317
Default values are 50 % and 0.0317 bar at 298.15 K

         Press: D for default values
                C to change
                Return to continue

Temperature of secondary air in K :
TA2=  491.00

         Press: C to change
                Return to continue  C
493.15

Amount of primary air in % of stoichiometric air :
PASTCH= 0.0
Default value is 20%

         Press: D for default values
                C to change
                Return to continue

Convective heat transfer coefficient at furnace walls
in kw/m**2 K : ALPHA=  0.0174
Default value is 0.0116 kw/m**2 K

         Press: D for default values
                C to change
                Return to continue  C
0.0147

Cool side temperature of furnace walls in K :
TOUT=611.10
Default value is 750.0 K

         Press: D for default values
                C to change
                Return to continue

 Chapter 3 :
-------------
INITIAL PARTICLE SIZE DISTRIBUTION

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 4 :
-------------
PARAMETERS FOR CHAR AND VOLATILE BURN-OUT

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Parameters for Fixed Carbon Burn-Out Model
Current settings are :
```

```
(a) Activation energy in kj/kmole : ACENER=179000.00
(b) Frequency factor in kg/m**2 s bar O2 : FREQFC =  61000.00

Default values (for carbon in oil) are:
ACENER=179000.0, FREQFC=61000.0

         Press: D for default values
                C to change
                Return to continue

The following is only for information:
-- absorption efficiency of ash cloud is assumed to be 0.1
-- mass mean diameter of fixed carbon is  43.5 microns.
-- radiation mean diameter of ash is  5.0 microns.
Press Return to continue

Specific absorption coefficient of oil ash : SKASH= 13.6364  1/((kg/m**3)m)
-- Default value is  13.6364  1/((kg/m**3)m)

         Press: D for default values
                C to change
                Return to continue

Fuel "Volatile" Burnout Characteristics
"Volatile" burnout time in sec : TLFMAX=  0.15
-- Default values are 0.7 sec
-- For highly swirling flow, set TLFMAX=0.4
-- For delayed mixing flame such for T-fired
   boiler, set TLFMAX=1.4

         Press: D for default values
                C to change
                Return to continue  C
0.2218

Number of lumps used to represent fuel "volatile"
combustion : NVLTOT=  10000.
-- Default value is 10000.

         Press: D for default values
                C to change
                Return to continue  C
8420

Fractional conversion of "volatile" carbon to soot :
CMCVLS=  0.20
-- Default value is 0.1 (for high volatile bituminous flames)
-- For lignite flames, set to 0.05
-- For heavy oil flames, set to 0.2
-- For non-luminous gaseous flames, set to 0.0

         Press: D for default values
                C to change
                Return to continue

 Chapter 5 :
-------------
PARAMETERS FOR ASH REACTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 7 :
```

```
-------------
SPECIFICATION OF FURNACE MODEL GEOMETRY

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 8 :
-------------
PARAMETERS FOR REBURNING OR CO-FIRING

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Switch for reburning or co-firing
0: to turn-off, 1: to turn-on this option
Currently, NREB=    0

         Press: C to change
                Return to continue  C
1

Reburn fuel type (ILIQ)
0: gas,  1: fuel oil
Currently, ILIQ= 0

         Press: C to change
                Return to continue

(a) Flue gas recirculation flow rates, in kg/sec :    0.0000
(b) Flue gas temperature, in K :    300.00

         Press: C to change
                Return to continue  C
1.7882
573.15

Reburn fuel flow rates, in kg(dry)/sec :    0.0000

         Press: C to change
                Return to continue  C
0.5510

Reburn fuel temperature, in K :    300.00

         Press: C to change
                Return to continue  C
298.15

Reburn fuel heat capacity, in kj/kg(dry)-K :    0.0000
-- Default is 2.2490 for CH4; 1.8334 for No. 6 oil

         Press: D for default values
                C to change
                Return to continue  C
2.158

Reburn fuel lower heating value, in kj/kg(dry) fuel :       0.0
-- Default is 50164.0 for CH4; 41210.0 for No. 6 oil

         Press: C to change
                Return to continue  C
44302.7
```

```
Reburn fuel water content, in kg-water/kg(dry) fuel :      0.0

         Press: C to change
                Return to continue

Reburn fuel (gaseous) composition, in dry volume fraction :
   CH4        C2H6       C3H8       CXHY       CO         CO2
 0.000000   0.000000   0.000000   0.000000   0.000000   0.000000
    H2         N2         SO2        SO3         S
 0.000000   0.000000   0.000000   0.000000   0.000000


         Press: C to change
                Return to continue  C

Type in volume fractions of the following species :
   CH4        C2H6       C3H8       CxHy       CO         CO2
0.93 0.02 0.02 0.0 0.0 0.005

Type in volume fractions of the following species :
    H2         N2         SO2        SO3         S
0.0 0.025 0.0 0.0 0.0

Check the reburn fuel compositions one more time ?

         Press: C to check
                Return to continue  C

Reburn fuel (gaseous) composition, in dry volume fraction :
   CH4        C2H6       C3H8       CXHY       CO         CO2
 0.930000   0.020000   0.020000   0.000000   0.000000   0.005000
    H2         N2         SO2        SO3         S
 0.000000   0.025000   0.000000   0.000000   0.000000


         Press: C to change
                Return to continue

(a) Reburn fuel characteristic burn-out time, in sec :  0.0000
(b) Number of lumps to represent the reburn fuel combustion :      0.
-- Default values are 0.24 sec and 8000. lumps

         Press: D for default values
                C to change
                Return to continue  C
0.4378
1580

Reburn fuel injection-profiles in J-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Reburn fuel injection-profiles in I-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000

         Press: C to change
                Return to continue  C

Reburn fuel mass injection at I=  1 is :   0.0000
```

```
          Press: C to change
                 Return to continue

Reburn fuel mass injection at I=  2 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I=  3 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I=  4 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I=  5 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I=  6 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I=  7 is :    0.0000

          Press: C to change
                 Return to continue  C
1.0

Reburn fuel mass injection at I=  8 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I=  9 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I= 10 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I= 11 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I= 12 is :    0.0000

          Press: C to change
                 Return to continue

Reburn fuel mass injection at I= 13 is :    0.0000

          Press: C to change
                 Return to continue
```

```
Reburn fuel mass injection at I= 14 is :    0.0000

         Press: C to change
                Return to continue

Reburn fuel mass injection at I= 15 is :    0.0000

         Press: C to change
                Return to continue

Reburn fuel mass injection at I= 16 is :    0.0000

         Press: C to change
                Return to continue

Reburn fuel mass injection at I= 17 is :    0.0000

         Press: C to change
                Return to continue

Reburn fuel mass injection at I= 18 is :    0.0000

         Press: C to change
                Return to continue

Reburn fuel mass injection at I= 19 is :    0.0000

         Press: C to change
                Return to continue

Check the I injection profiles one more time ?

         Press: C to check
                Return to continue  C

Reburn fuel injection-profiles in I-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  1.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

 Chapter 9 :
-------------
SPECIFICATION OF HEAT EXTRACTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 11 :
--------------
RELATIVE MASS FLOW RATE DISTRIBUTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

--- Prescription of Relative Inlet Mass Flows ---
Relative inlet mass flow rates in positive X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
```

```
                Return to continue

Relative inlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.3333  0.3333  0.3334  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

          Press: C to change
                 Return to continue  C

DM4( 1, 3) =   0.0000

          Press: C to change
                 Return to continue

DM4( 2, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4( 3, 5) =   0.3333

          Press: C to change
                 Return to continue  C
0.0

DM4( 4, 5) =   0.3333

          Press: C to change
                 Return to continue  C
0.2044

DM4( 5, 5) =   0.3334

          Press: C to change
                 Return to continue  C
0.3065

DM4( 6, 5) =   0.0000

          Press: C to change
                 Return to continue  C
0.3065

DM4( 7, 5) =   0.0000

          Press: C to change
                 Return to continue  C
0.0404

DM4( 8, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4( 9, 5) =   0.0000

          Press: C to change
                 Return to continue  C
0.1422

DM4(10, 4) =   0.0000

          Press: C to change
                 Return to continue
```

```
DM4(11, 4) =   0.0000

         Press: C to change
                Return to continue

DM4(12, 4) =   0.0000

         Press: C to change
                Return to continue

DM4(13, 4) =   0.0000

         Press: C to change
                Return to continue

DM4(14, 4) =   0.0000

         Press: C to change
                Return to continue

DM4(15, 3) =   0.0000

         Press: C to change
                Return to continue

DM4(16, 3) =   0.0000

         Press: C to change
                Return to continue

DM4(17, 3) =   0.0000

         Press: C to change
                Return to continue

DM4(18, 3) =   0.0000

         Press: C to change
                Return to continue

DM4(19, 3) =   0.0000

         Press: C to change
                Return to continue


Note:
-- You changed the inlet mass fluxes.
-- Existing mass fluxes will be set to 0.0,
   except at the inlets and the outlets.
Press Return to continue.

--- Prescription of Relative Outlet Mass Flows ---
Relative outlet mass flow rates in negative X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative outlet mass flow rates in positive X-direction :
 0.2500  0.7500

You have two options to modify outlet flow in the
positive X-direction:
```

```
   Option A -- Zonewise prescription
   Option B -- Use profile factors
-- Default is plug flow

         Press: A for option A
                B for option B
                D for the default
                Return to continue

Relative outlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative outlet mass flow rates in positive Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

--- Prescription of Relative Zonal Mass Flow Rates ---

You have two options.
-- Option A: Direct (i.e., zone by zone) prescription
-- Option B: Computer aided prescription (recommended)

         Press: A for option A
                B for option B
                Return to continue  B

You chose option B.
To continue, press Return

Normalized velocities in X-direction :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000
J= 3     0.0000  0.0000
J= 2     0.0000  3.0765
J= 1     0.0000  3.0765
         I=19    I=20
You chose option B.
To continue, press Return


--- Computer aided zonal mass prescription ---
Default distribution is plug flow in positive X-direction,
and superimpose recirculation flows latter.

         Press: D for default distribution
                Return to continue

--- Computer aided zonal mass prescription ---
```

```
You have two options to specify the mass flows
in X-direction.
 Option A: Prescribe forward velocity profiles using
           profile factors, then superimpose recirculation
           flows later (recommended).
 Option B: Prescribe complete velocity profiles (i.e., zonal
           velocity normalized with mean velocity over the
           largest furnace cross-section in the X-direction).

          Press: A for option A
                 B for option B
                 Return to continue  A

Note:
-- Data file FORWA.DAT exists
-- FORWA.DAT contains profile factors of forward velocities
Press Return to continue

Profile factors in X-direction at cross-section I=  2

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  3

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  4

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  5

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  6

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  7

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  8

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  9

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I= 10

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I= 11
```

```
         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 12

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 13

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 14

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 15

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 16

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 17

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 18

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 19

         Press: C to change
                Return to continue

To continue, press Return

Normalized velocities in Y-direction
J= 5     0.0000  0.0000  0.0000 -0.2297 -0.5392 -0.3445 -0.0590  0.0000 -0.1815
J= 4     0.0000  0.0000  0.0000 -0.2020 -0.4742 -0.3029 -0.0519  0.0000 -0.4885
J= 3     0.0000  0.0000  0.0000 -0.1310 -0.3074 -0.1964 -0.0336  0.0000 -0.3167
J= 2     0.0000  0.0000  0.0000 -0.0655 -0.1537 -0.0982 -0.0168  0.0000 -0.1584
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000 -1.5124  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000 -0.7562  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19    I=
```

```
To continue, press Return

Residual of total mass balance for volume zones
as fraction of total input mass flow :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19
To continue, press Return

 Chapter 12 :
--------------
PRESCRIPTION OF RECIRCULATING FLOW FIELD

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Note:
-- Recirculation data file (RECIR.DAT) exists
Press Return to continue

Recirculating flow over cross-section I= 2
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
24.66

Existing profile factors in pos. and neg. X-directions
over cross-section I= 2 and J= 1 :  0.000 10.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 2 and J= 2 : 10.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 3
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
```

```
over this cross-section in % of inlet mass flow :
32.88

Existing profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 1 :  0.000  6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 2 :  0.000  4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 3 : 10.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 4
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
24.66

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 1 :  0.000  6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 2 :  0.000  4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 3 :  4.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 4 :  6.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 5
is    0.00 % of total inlet mass flow.
```

```
         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
16.43

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 1 :  0.000  6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 2 :  0.000  4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 3 :  4.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 4 :  6.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 6
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
16.43

Existing profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 1 :  0.000  6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 2 :  0.000  4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 3 :  4.000  0.000
Change existing profile factors ?

         Press: C to change
```

```
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 4 :  6.000  0.000
Change existing profile factors ?

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I= 7
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
36.98

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 1 :  0.000  6.000
Change existing profile factors ?

          Press: C to change
                 Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 2 :  0.000  4.000
Change existing profile factors ?

          Press: C to change
                 Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 3 :  4.000  0.000
Change existing profile factors ?

          Press: C to change
                 Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 4 :  6.000  0.000
Change existing profile factors ?

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I= 8
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
25.87

Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 1 :  0.000  5.000
Change existing profile factors ?

          Press: C to change
                 Return to continue
```

```
Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 2 :  0.000  5.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 3 :  5.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 4 :  5.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 9
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
12.93

Type profile factors in pos. and neg. X-directions
over cross-section I= 9 and J= 1 :  0 5

Type profile factors in pos. and neg. X-directions
over cross-section I= 9 and J= 2 :  0 5

Type profile factors in pos. and neg. X-directions
over cross-section I= 9 and J= 3 :  5 0

Type profile factors in pos. and neg. X-directions
over cross-section I= 9 and J= 4 :  5 0

Recirculating flow over cross-section I=10
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=11
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=12
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=13
is    0.00 % of total inlet mass flow.
```

```
         Press: C to change
                Return to continue

Recirculating flow over cross-section I=14
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=15
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=16
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
20

Existing profile factors in pos. and neg. X-directions
over cross-section I=16 and J= 1 : 10.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I=16 and J= 2 :  0.000 10.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=17
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=18
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=19
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

File RECIR.DAT has been updated to reflect your modification.
To continue, press Return


Normalized velocities in Y-direction
J= 5     0.0000  0.0000  0.0000 -0.2297 -0.5392 -0.3445 -0.0590  0.0000 -0.1815
J= 4     0.0000  0.0000  0.1274 -0.2474 -0.4742 -0.1897 -0.1725 -0.0722 -0.5515
```

```
J= 3     0.0000  0.5905 -0.1519 -0.2932 -0.3074  0.2087 -0.3183 -0.3315 -0.6062
J= 2     0.8857 -0.4921 -0.1013 -0.1736 -0.1537  0.1719 -0.3170 -0.1658 -0.3031
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000 -1.5124  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000 -0.7562 -0.8639  0.8639  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19    I=
To continue, press Return

 Chapter 13 :
--------------
PRESCRIPTION OF TURBULENT MASS FLUX VECTORS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

This is the current relative turbulent mass flux
field with respect to the X-direction :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0498  0.1095  0.1993  0.1940  0.0970
J= 1     0.0000  0.0000  0.0000  0.0000  0.0166  0.0415  0.0664  0.0647  0.0323
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.2000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000
J= 3     0.0000  0.0000
J= 2     0.0000  0.0000
J= 1     0.0000  0.0000
         I=19    I=20    I=
To continue, press Return

This is the current turbulent mass flux field
with respect to the Y-direction :
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0886  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0996  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0249  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
```

```
         I=19     I=
To continue, press Return

You have three options to modify the turbulent field.
Option A : Default distribution calculated by the
           2DHT program (recommended).
Option B : No turbulence at all.
Option C : Column- and row-wise prescriptions.

         Press: a corresponding key for your option
                Return to continue

Residual of total mass balance for volume zones
as fraction of total input mass flow :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19
To continue, press Return

 Chapter 14 :
--------------
FUEL INLET FLOWS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Relative Fuel Inlet Flow Rates :
Default distribution assumes fuel inlet flows are
proportional to total mass flow rates, i.e., burners
are fired at same stoichiometry.

         Press: D for default distribution
                Return to continue

Prescription of Relative Fuel Inlet Flow Rates

Relative fuel inlet flow rates in pos. X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative fuel inlet flow rates in neg. Y-direction :
 0.0000  0.0000  0.3333  0.3333  0.3334  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue  C

In neg. Y-direction, I =  1 FU2 =  0.0000
```

```
         Press: C to change
                Return to continue

In neg. Y-direction, I =  2 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  3 FU2 =   0.3333

         Press: C to change
                Return to continue  C
0.0

In neg. Y-direction, I =  4 FU2 =   0.3333

         Press: C to change
                Return to continue  C
0.25

In neg. Y-direction, I =  5 FU2 =   0.3334

         Press: C to change
                Return to continue  C
0.375

In neg. Y-direction, I =  6 FU2 =   0.0000

         Press: C to change
                Return to continue  C
0.375

In neg. Y-direction, I =  7 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  8 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  9 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 10 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 11 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 12 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 13 FU2 =   0.0000
```

```
          Press: C to change
                 Return to continue

In neg. Y-direction, I = 14 FU2 =    0.0000

          Press: C to change
                 Return to continue

In neg. Y-direction, I = 15 FU2 =    0.0000

          Press: C to change
                 Return to continue

In neg. Y-direction, I = 16 FU2 =    0.0000

          Press: C to change
                 Return to continue

In neg. Y-direction, I = 17 FU2 =    0.0000

          Press: C to change
                 Return to continue

In neg. Y-direction, I = 18 FU2 =    0.0000

          Press: C to change
                 Return to continue

In neg. Y-direction, I = 19 FU2 =    0.0000

          Press: C to change
                 Return to continue

 Chapter 15 :
--------------
DATA FOR INITIAL VOLUME AND SURFACE ZONE TEMPERATURES

          Press: P to by-pass this chapter
                 R to save file and exit 2DINPT
                 Return to proceed through  P

 Chapter 16 :
--------------
DATA FOR EMISSIVITIES AND DEPOSIT CONDUCTIVITIES

          Press: P to by-pass this chapter
                 R to save file and exit 2DINPT
                 Return to proceed through  P

NOTE:
-- Output file was saved as file 2DIN0201.075
-- To update 2DIN0201.075 further, you have to copy file 2DIN0201.075
   to file INPUT.DAT under DOS, then rerun 2DINPT.EXE
-- If you want to save the original contents of file
   INPUT.DAT, make sure you save it with a different name
```

Listing 3.2. Contents of file FORWA.DAT (Case 2).

```
    1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
    1   1   1
c --
    2   1   2
  1.000  1.000
c --
    3   1   3
  1.000  1.000  1.000
c --
    4   1   4
  1.000  1.000  1.000  1.000
c --
    5   1   4
  1.000  1.000  1.000  1.000
c --
    6   1   4
  1.000  1.000  1.000  1.000
c --
    7   1   4
  1.000  1.000  1.000  1.000
c --
    8   1   4
  1.000  1.000  1.000  1.000
c --
    9   1   4
  1.000  1.000  1.000  1.000
c --
   10   1   3
  1.000  1.000  1.000
c --
   11   1   3
  1.000  1.000  1.000
c --
   12   1   3
  1.000  1.000  1.000
c --
   13   1   3
  1.000  1.000  1.000
c --
   14   1   3
  1.000  1.000  1.000
c --
   15   1   2
  1.000  1.000
c --
   16   1   2
  1.000  1.000
c --
   17   1   2
  1.000  1.000
c --
   18   1   2
  1.000  1.000
c --
   19   1   2
  1.000  1.000
```

Listing 3.3. Contents of file RECIR.DAT (Case 2).

```
    1    1    1    1    1    1    1    1    0    1    0    0    0    0    1
    0    0    0
c --
    2    1    2
  0.000 10.000
 10.000  0.000
c --
    3    1    3
  0.000  0.000 10.000
  6.000  4.000  0.000
c --
    4    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    5    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    6    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    7    1    4
  0.000  0.000  4.000  6.000
  6.000  4.000  0.000  0.000
c --
    8    1    4
  0.000  0.000  5.000  5.000
  5.000  5.000  0.000  0.000
c --
    9    1    4
  0.000  0.000  5.000  5.000
  5.000  5.000  0.000  0.000
c --
   11    1    3
  0.000  0.000 10.000
  6.000  4.000  0.000
c --
   16    1    2
 10.000  0.000
  0.000 10.000
```

Listing 3.4. Contents of file 2DIN0201.075 (Case 2).

```
BOILER 1
02
01
75.0    075
2DIN0201.075
IARR0201.075
OARR0201.075
GRAF
2DOT0201.075
   4   1
c UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
c GAS REBURNING
c
c
c
c
c
c
c
c
 100
    09999.000009999.00000
  71
   1
   2   40.000100
 100
   0
   1   1
   1   0
   0
   0   1   0
  0.0001  0.9798  0.0200  0.0001
  0.8603  0.1174  0.0061  0.0061  0.0100  0.0001
525.000000  0.000000  0.000000
  0.0000
 42133.2
  2.9393
  376.15
  2.0781
   52.5703
  0.0000
  0.0000
 50.0000  0.0317
  493.15
  0.0000     0.0
  0.0147
  611.10
 0.0000167 0.0000233 0.0000300 0.0000367 0.0000433 0.0000500 0.0000567 0.0000633
 0.0000700 0.0000767
  0.0130  0.0567  0.1542  0.2110  0.1981  0.1510  0.0974  0.0617  0.0471  0.0098
   1050.52    690.00
 179000.00  61000.00      1.00
 13.6364  545.45
  0.2218   8420.
  0.2000
  0.300000  0.300000  0.002917  0.002917
   0
   0   1   0   0
    0.0000
   0    0.000000    0.000000   74.094742    0.000000    0.000000
    0.000000    0.000000    0.000000    0.000000
   5
0.00000000000.00000000000.00000000000.00000000000.0000000000
  0.000000  0.000000  0.000000  0.000000  0.000000
    0.00    0.00    0.00    0.00    0.00
    0.00    0.00    0.00
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
  0
0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
0.0000000 0.0000000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.0000
  0
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000000
0.1000000
 19   4
  1  10  19
   0.0000  0.0000
 0.0000
   0.00
  0
 1.9760  1.9759  1.9200  1.8000  1.1500  1.8000  1.3851  1.3851  1.5851  1.2621
 1.3601  1.3601  1.3601  1.3601  1.6430  1.6430  1.7361  1.7361  2.3079
 1.1534  1.1534  1.2514  0.4879
  1   1   2   3
 19  19  14   9
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  2   3   4   4   4   4   4   4   4   3   3   3   3   3   2   2   2   2   2
  1   0   1
 1.7882  573.15
 0.5510
 298.15
 2.1580
44302.7
 0.0000
 0.930000  0.020000  0.020000  0.000000  0.005000  0.000000  0.025000  0.000000
 0.000000  0.000000  0.000000
0.0000000 0.0000000
 0.4378   1580.
 0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  1.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0   0
300.00000   0.00000   0.00000
  0.00000   0.00000   0.00000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  2.4646
 3.8887  3.8887  0.0000  0.0000  9.2101  9.2101 11.4566 11.4566  2.9108
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.5925  2.5925  0.0000  0.0000  5.5261  5.5261  7.6377  7.6377  1.9405
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.1146  2.1146  2.1148  2.1148  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  800.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00  800.00  800.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.7000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.7000  0.7000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.8000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.4000  0.4000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
 0    0    0    0    0    0    0    0    0    1    3    3    1    1    7    7    9    9    2
 0    0    0    0    0    0    0    0    0   24   21   21   21   21   22   22   24   24   30
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0508
0.0508   0.0508   0.0508   0.0508   0.0508   0.0508   0.0508   0.0508   0.0508
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.5402
1.0497   1.0497   3.1495   3.1495   0.2867   0.2867   0.2303   0.2303   0.9333
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.9660
0.7844   0.7844   0.7844   0.7844   0.6802   0.6802   0.7022   0.7022   0.6603
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0200
0.0200   0.0200   0.0200   0.0200   0.0200   0.0200   0.0500   0.0500   0.0500
  0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00   720.00
720.00   720.00   720.00   720.00   786.39   786.39   765.56   765.56   765.56
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   1.0000
1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000   1.0000
 0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
    0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0      0.0
0.0000   0.0000   0.0000   0.0000
0.0000   0.2466   0.0000   0.0000
0.0000   0.0000   0.3288   0.0000
0.0000   0.0000   0.1403   0.1063
0.0166   0.0498   0.1851   0.1172
0.0415   0.1246   0.3225   0.1866
0.0664   0.1993   0.5768   0.3447
0.0697   0.2091   0.5564   0.2813
0.0697   0.2091   0.4705   0.2378
0.1051   0.3152   0.5797   0.0000
0.1051   0.3152   0.5797   0.0000
0.1051   0.3152   0.5797   0.0000
0.1051   0:3152   0.5797   0.0000
0.1051   0.3152   0.5797   0.0000
0.2500   0.7500   0.0000   0.0000
0.4500   0.7500   0.0000   0.0000
0.2500   0.7500   0.0000   0.0000
0.2500   0.7500   0.0000   0.0000
0.2500   0.7500   0.0000   0.0000
0.2500   0.7500   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.2466   0.0000   0.0000   0.0000
0.1096   0.2192   0.0000   0.0000
0.0822   0.1644   0.0000   0.0000
0.0548   0.1095   0.0000   0.0000
0.0548   0.1095   0.0000   0.0000
0.1233   0.2465   0.0000   0.0000
0.0647   0.1940   0.0000   0.0000
0.0323   0.0970   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.2000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
0.2466   0.0000   0.0000   0.0000   0.0000   0.0685   0.0000   0.0000   0.0000   0.0000
0.0000   0.0000   0.0000   0.0000   0.0000   0.2000   0.0000   0.0000   0.0000
0.0000   0.3288   0.0000   0.0000   0.0000   0.2055   0.0000   0.0000   0.0000   0.0000
```

```
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.1063  0.0000  0.0000  0.0886  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.1370  0.0274  0.0440  0.0249  0.0249  0.0619  0.0324  0.1677  0.0000
0.0000  0.0000  0.0000  0.1449  0.2000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0822  0.1487  0.0996  0.0996  0.1242  0.1294  0.2708  0.0000
0.0000  0.0000  0.0000  0.5797  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.1936  0.2370  0.2370  0.1039  0.0434  0.3800  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.2044  0.3065  0.3065  0.0404  0.0000  0.1422  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000 -0.2500 -0.3750 -0.3750  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
   1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00    1.00    1.00    1.00    1.00    1.00
   1.00    1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00    1.00
   1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00    1.00
 350.00 1200.00 1200.00 1200.00
 800.00  800.00 1200.00 1200.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00
 1.0000  0.7000  0.7000  0.7000
 1.0000  1.0000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.8000  0.8000  0.8000
 0.0000  0.0000  0.4000  0.4000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000
 0.4000  0.4000  0.4000  0.4000  0.4000  0.4000  0.6000  0.6000  0.6000
 100.00  100.00
```

Listing 3.5. Screen output from the 2DHT code (Case 2).

2DHT

```
iter.no.=  1, act.err.= 705.714 %, avg.err.= 705.714 %, 20 it.err.= 705.714 %,
              hb. err.= -75.407 %
iter.no.=  2, act.err.= -70.021 %, avg.err.= 317.846 %, 20 it.err.= 317.846 %,
              hb. err.=  15.728 %
iter.no.=  3, act.err.= -39.497 %, avg.err.= 198.732 %, 20 it.err.= 198.732 %,
              hb. err.=  11.689 %
iter.no.=  4, act.err.= -29.335 %, avg.err.= 141.715 %, 20 it.err.= 141.715 %,
              hb. err.=   8.639 %
iter.no.=  5, act.err.= -23.125 %, avg.err.= 108.747 %, 20 it.err.= 108.747 %,
              hb. err.=   5.873 %
iter.no.=  6, act.err.= -18.636 %, avg.err.=  87.517 %, 20 it.err.=  87.517 %,
              hb. err.=   4.223 %
iter.no.=  7, act.err.= -13.860 %, avg.err.=  73.034 %, 20 it.err.=  73.034 %,
              hb. err.=   2.831 %
iter.no.=  8, act.err.= -13.066 %, avg.err.=  62.272 %, 20 it.err.=  62.272 %,
              hb. err.=   3.278 %
iter.no.=  9, act.err.=  -9.393 %, avg.err.=  54.309 %, 20 it.err.=  54.309 %,
              hb. err.=   1.817 %
iter.no.= 10, act.err.=  -6.755 %, avg.err.=  48.203 %, 20 it.err.=  48.203 %,
              hb. err.=   1.100 %
iter.no.= 11, act.err.=  -5.498 %, avg.err.=  43.321 %, 20 it.err.=  43.321 %,
              hb. err.=   1.205 %
iter.no.= 12, act.err.=  -3.460 %, avg.err.=  39.422 %, 20 it.err.=  39.422 %,
              hb. err.=   0.790 %
iter.no.= 13, act.err.=  -3.876 %, avg.err.=  36.092 %, 20 it.err.=  36.092 %,
              hb. err.=   1.496 %
iter.no.= 14, act.err.=  -3.870 %, avg.err.=  33.237 %, 20 it.err.=  33.237 %,
              hb. err.=   0.833 %
iter.no.= 15, act.err.=  -2.169 %, avg.err.=  30.877 %, 20 it.err.=  30.877 %,
              hb. err.=   0.677 %
iter.no.= 16, act.err.=  -1.833 %, avg.err.=  28.832 %, 20 it.err.=  28.832 %,
              hb. err.=   0.398 %
iter.no.= 17, act.err.=  -0.914 %, avg.err.=  27.083 %, 20 it.err.=  27.083 %,
              hb. err.=  -0.132 %
iter.no.= 18, act.err.=  -0.688 %, avg.err.=  25.540 %, 20 it.err.=  25.540 %,
              hb. err.=   0.459 %
iter.no.= 19, act.err.=  -0.954 %, avg.err.=  24.145 %, 20 it.err.=  24.145 %,
              hb. err.=   0.987 %
iter.no.= 20, act.err.=  -1.371 %, avg.err.=  22.870 %, 20 it.err.=  22.870 %,
              hb. err.=   0.821 %
iter.no.= 21, act.err.=  -0.144 %, avg.err.=  21.774 %, 20 it.err.= -12.423 %,
              hb. err.=   0.031 %
iter.no.= 22, act.err.=  -0.217 %, avg.err.=  20.774 %, 20 it.err.=  -8.933 %,
              hb. err.=   0.832 %
iter.no.= 23, act.err.=  -0.826 %, avg.err.=  19.835 %, 20 it.err.=  -6.999 %,
              hb. err.=   0.117 %
iter.no.= 24, act.err.=  -1.557 %, avg.err.=  18.944 %, 20 it.err.=  -5.611 %,
              hb. err.=   0.471 %
iter.no.= 25, act.err.=  -1.483 %, avg.err.=  18.127 %, 20 it.err.=  -4.528 %,
              hb. err.=   0.827 %
iter.no.= 26, act.err.=  -2.607 %, avg.err.=  17.329 %, 20 it.err.=  -3.727 %,
              hb. err.=   0.685 %
iter.no.= 27, act.err.=  -0.691 %, avg.err.=  16.662 %, 20 it.err.=  -3.069 %,
              hb. err.=   0.382 %
iter.no.= 28, act.err.=  -2.059 %, avg.err.=  15.993 %, 20 it.err.=  -2.518 %,
              hb. err.=   0.945 %
iter.no.= 29, act.err.=  -0.602 %, avg.err.=  15.421 %, 20 it.err.=  -2.079 %,
              hb. err.=   0.536 %
iter.no.= 30, act.err.=   0.343 %, avg.err.=  14.918 %, 20 it.err.=  -1.724 %,
              hb. err.=  -0.247 %
iter.no.= 31, act.err.=  -0.374 %, avg.err.=  14.425 %, 20 it.err.=  -1.468 %,
              hb. err.=   0.740 %
iter.no.= 32, act.err.=  -1.326 %, avg.err.=  13.933 %, 20 it.err.=  -1.361 %,
              hb. err.=   0.546 %
iter.no.= 33, act.err.=  -0.367 %, avg.err.=  13.500 %, 20 it.err.=  -1.185 %,
              hb. err.=  -0.150 %
iter.no.= 34, act.err.=  -0.964 %, avg.err.=  13.074 %, 20 it.err.=  -1.040 %,
              hb. err.=   0.376 %
iter.no.= 35, act.err.=  -0.601 %, avg.err.=  12.683 %, 20 it.err.=  -0.962 %,
              hb. err.=   0.545 %
```

```
iter.no.= 36, act.err.=  -1.260 %, avg.err.=  12.196 %, 20 it.err.=  -0.933 %,
              hb. err.=   0.361 %
iter.no.= 37, act.err.=  -0.213 %, avg.err.=  11.958 %, 20 it.err.=  -0.898 %,
              hb. err.=   0.820 %
iter.no.= 38, act.err.=  -1.123 %, avg.err.=  11.614 %, 20 it.err.=  -0.920 %,
              hb. err.=   0.130 %
iter.no.= 39, act.err.=   0.432 %, avg.err.=  11.327 %, 20 it.err.=  -0.850 %,
              hb. err.=   0.155 %
iter.no.= 40, act.err.=   0.741 %, avg.err.=  11.062 %, 20 it.err.=  -0.745 %,
              hb. err.=  -0.248 %
iter.no.= 41, act.err.=  -1.578 %, avg.err.=  10.754 %, 20 it.err.=  -0.816 %,
              hb. err.=   1.058 %
iter.no.= 42, act.err.=  -0.470 %, avg.err.=  10.487 %, 20 it.err.=  -0.829 %,
              hb. err.=   0.019 %
iter.no.= 43, act.err.=  -2.187 %, avg.err.=  10.192 %, 20 it.err.=  -0.897 %,
              hb. err.=   0.651 %
iter.no.= 44, act.err.=  -0.596 %, avg.err.=   9.947 %, 20 it.err.=  -0.849 %,
              hb. err.=   0.258 %
iter.no.= 45, act.err.=   0.740 %, avg.err.=   9.742 %, 20 it.err.=  -0.738 %,
              hb. err.=  -0.061 %
iter.no.= 46, act.err.=  -1.719 %, avg.err.=   9.493 %, 20 it.err.=  -0.694 %,
              hb. err.=   0.781 %
iter.no.= 47, act.err.=  -1.349 %, avg.err.=   9.263 %, 20 it.err.=  -0.726 %,
              hb. err.=   0.144 %
iter.no.= 48, act.err.=  -1.684 %, avg.err.=   9.034 %, 20 it.err.=  -0.708 %,
              hb. err.=   0.983 %
iter.no.= 49, act.err.=   0.296 %, avg.err.=   8.856 %, 20 it.err.=  -0.663 %,
              hb. err.=  -0.529 %
iter.no.= 50, act.err.=   1.710 %, avg.err.=   8.713 %, 20 it.err.=  -0.595 %,
              hb. err.=  -0.485 %
iter.no.= 51, act.err.=  -1.457 %, avg.err.=   8.514 %, 20 it.err.=  -0.649 %,
              hb. err.=   0.158 %
iter.no.= 52, act.err.=   1.811 %, avg.err.=   8.385 %, 20 it.err.=  -0.492 %,
              hb. err.=  -0.477 %
iter.no.= 53, act.err.=   2.949 %, avg.err.=   8.282 %, 20 it.err.=  -0.326 %,
              hb. err.=  -0.218 %
iter.no.= 54, act.err.=  -2.647 %, avg.err.=   8.080 %, 20 it.err.=  -0.410 %,
              hb. err.=   1.102 %
iter.no.= 55, act.err.=  -1.953 %, avg.err.=   7.898 %, 20 it.err.=  -0.478 %,
              hb. err.=   0.729 %
iter.no.= 56, act.err.=  -0.858 %, avg.err.=   7.741 %, 20 it.err.=  -0.458 %,
              hb. err.=  -0.213 %
iter.no.= 57, act.err.=   0.528 %, avg.err.=   7.615 %, 20 it.err.=  -0.421 %,
              hb. err.=   0.027 %
iter.no.= 58, act.err.=   0.450 %, avg.err.=   7.491 %, 20 it.err.=  -0.342 %,
              hb. err.=  -0.025 %
iter.no.= 59, act.err.=  -0.953 %, avg.err.=   7.348 %, 20 it.err.=  -0.411 %,
              hb. err.=   0.543 %
iter.no.= 60, act.err.=  -1.256 %, avg.err.=   7.205 %, 20 it.err.=  -0.511 %,
              hb. err.=   0.258 %
iter.no.= 61, act.err.=   2.397 %, avg.err.=   7.126 %, 20 it.err.=  -0.312 %,
              hb. err.=  -0.837 %
iter.no.= 62, act.err.=  -1.426 %, avg.err.=   6.988 %, 20 it.err.=  -0.360 %,
              hb. err.=   0.900 %
iter.no.= 63, act.err.=  -1.925 %, avg.err.=   6.846 %, 20 it.err.=  -0.347 %,
              hb. err.=   0.079 %
iter.no.= 64, act.err.=  -0.447 %, avg.err.=   6.732 %, 20 it.err.=  -0.340 %,
              hb. err.=   0.257 %
iter.no.= 65, act.err.=   1.306 %, avg.err.=   6.649 %, 20 it.err.=  -0.311 %,
              hb. err.=  -0.633 %
iter.no.= 66, act.err.=   0.645 %, avg.err.=   6.558 %, 20 it.err.=  -0.193 %,
              hb. err.=  -0.023 %
iter.no.= 67, act.err.=   0.091 %, avg.err.=   6.461 %, 20 it.err.=  -0.121 %,
              hb. err.=   0.257 %
iter.no.= 68, act.err.=  -0.165 %, avg.err.=   6.364 %, 20 it.err.=  -0.045 %,
              hb. err.=   0.090 %
iter.no.= 69, act.err.=  -0.621 %, avg.err.=   6.263 %, 20 it.err.=  -0.091 %,
              hb. err.=  -0.309 %
iter.no.= 70, act.err.=   0.267 %, avg.err.=   6.177 %, 20 it.err.=  -0.163 %,
              hb. err.=  -0.270 %
iter.no.= 71, act.err.=   1.428 %, avg.err.=   6.110 %, 20 it.err.=  -0.019 %,
              hb. err.=  -0.939 %
```

```
iter.no.= 72, act.err.=   1.409 %, avg.err.=   5.045 %, 20 it.err.=  -0.039 %,
              hb. err.=   0.843 %
iter.no.= 73, act.err.=  -0.860 %, avg.err.=   5.950 %, 20 it.err.=  -0.230 %,
              hb. err.=  -0.169 %
iter.no.= 74, act.err.=  -0.447 %, avg.err.=   5.864 %, 20 it.err.=  -0.120 %,
              hb. err.=   0.086 %
iter.no.= 75, act.err.=  -0.091 %, avg.err.=   5.784 %, 20 it.err.=  -0.026 %,
              hb. err.=  -0.088 %
iter.no.= 76, act.err.=   0.178 %, avg.err.=   5.711 %, 20 it.err.=   0.025 %,
              hb. err.=   0.445 %
iter.no.= 77, act.err.=  -0.974 %, avg.err.=   5.624 %, 20 it.err.=  -0.050 %,
              hb. err.=  -0.238 %
iter.no.= 78, act.err.=  -0.390 %, avg.err.=   5.547 %, 20 it.err.=  -0.092 %,
              hb. err.=   0.205 %
iter.no.= 79, act.err.=  -0.875 %, avg.err.=   5.465 %, 20 it.err.=  -0.088 %,
              hb. err.=  -0.236 %
iter.no.= 80, act.err.=   0.042 %, avg.err.=   5.398 %, 20 it.err.=  -0.023 %,
              hb. err.=   0.390 %
iter.no.= 81, act.err.=  -0.976 %, avg.err.=   5.319 %, 20 it.err.=  -0.192 %,
              hb. err.=  -0.072 %
iter.no.= 82, act.err.=  -0.348 %, avg.err.=   5.250 %, 20 it.err.=  -0.138 %,
              hb. err.=   0.236 %
iter.no.= 83, act.err.=  -1.174 %, avg.err.=   5.173 %, 20 it.err.=  -0.100 %,
              hb. err.=  -0.226 %
iter.no.= 84, act.err.=  -0.574 %, avg.err.=   5.104 %, 20 it.err.=  -0.107 %,
              hb. err.=  -0.040 %
iter.no.= 85, act.err.=  -0.119 %, avg.err.=   5.043 %, 20 it.err.=  -0.178 %,
              hb. err.=   0.163 %
iter.no.= 86, act.err.=  -0.553 %, avg.err.=   4.978 %, 20 it.err.=  -0.238 %,
              hb. err.=  -0.116 %
iter.no.= 87, act.err.=  -0.755 %, avg.err.=   4.912 %, 20 it.err.=  -0.280 %,
              hb. err.=  -0.319 %
iter.no.= 88, act.err.=   0.045 %, avg.err.=   4.856 %, 20 it.err.=  -0.269 %,
              hb. err.=   0.076 %
iter.no.= 89, act.err.=   0.537 %, avg.err.=   4.808 %, 20 it.err.=  -0.212 %,
              hb. err.=   0.353 %
iter.no.= 90, act.err.=  -0.992 %, avg.err.=   4.743 %, 20 it.err.=  -0.275 %,
              hb. err.=  -0.700 %
iter.no.= 91, act.err.=   1.185 %, avg.err.=   4.704 %, 20 it.err.=  -0.287 %,
              hb. err.=   0.761 %
iter.no.= 92, act.err.=  -0.926 %, avg.err.=   4.643 %, 20 it.err.=  -0.403 %,
              hb. err.=  -0.697 %
iter.no.= 93, act.err.=   1.829 %, avg.err.=   4.613 %, 20 it.err.=  -0.269 %,
              hb. err.=   1.209 %
iter.no.= 94, act.err.=  -2.407 %, avg.err.=   4.538 %, 20 it.err.=  -0.367 %,
              hb. err.=  -1.556 %
iter.no.= 95, act.err.=   1.793 %, avg.err.=   4.509 %, 20 it.err.=  -0.273 %,
              hb. err.=   1.200 %
iter.no.= 96, act.err.=  -1.000 %, avg.err.=   4.452 %, 20 it.err.=  -0.332 %,
              hb. err.=  -0.720 %
iter.no.= 97, act.err.=   0.550 %, avg.err.=   4.412 %, 20 it.err.=  -0.255 %,
              hb. err.=   0.349 %
iter.no.= 98, act.err.=   0.023 %, avg.err.=   4.367 %, 20 it.err.=  -0.235 %,
              hb. err.=  -0.059 %
iter.no.= 99, act.err.=   0.046 %, avg.err.=   4.323 %, 20 it.err.=  -0.189 %,
              hb. err.=  -0.051 %
iter.no.=100, act.err.=   0.067 %, avg.err.=   4.281 %, 20 it.err.=  -0.187 %,
              hb. err.=  -0.013 %
```

Listing 3.6. Contents of file 2DOT0201.075 (Case 2).

```
**********
*        *
* GENERAL INFORMATION *
*        *
**********

                        BOILER NAME:        BOILER 1
                        CASE NUMBER:        02
                        VERSION NUMBER:     01
                        THERMAL LOAD:        75.0    % OF FULL LOAD
**************
*            *
* INPUT/OUTPUT *
*            *
**************

                        NREAD:                0
                        NWRTE:                1

                        NAME OF INPUT DATA FILE:              2DIN0201.075 (copied to 2DINPT.DAT)
                        NAME OF INPUT ARRAY FILE:             IARR0201.075
                        NAME OF OUTPUT ARRAY FILE:            OARR0201.075
                        NAME OF GRAPHICS OUTPUT FILE:         GRAF
                        NAME OF OUTPUT DATA FILE:             2DOT0201.075
                        OUTPUT LEVEL:                         DEFAULT
******************
*                *
* USER'S COMMENTS *
*                *
******************

C UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
C GAS. REBURNING
C
C
C
C
C
C
C
C
```

```
*****************************
*                           *
* SUMMARY OF INPUT PARAMETERS *
*                           *
*****************************

              FUEL TYPE:                                    [illegible]
              TOTAL FUEL FLOW:                              3.4933    KG WET/S
              TOTAL AIR FLOW:                              52.5703    KG WET/S
              EXCESS AIR:                                   6.6991    %
              O2-CONTENT OF FLUE GAS:                       1.4070    VOL  % DRY
              SEC. AIR TEMPERATURE:                       493.1500    K
              PRIM. MIXTURE TEMPERATURE:                  376.1500    K
              AMOUNT OF PRIM. AIR: IN % OF STOICH. AIR:     0.0000    %
              ATOMIZING STEAM FLOW:                         0.0000    KG STEAM/KG FUEL DRY

FUEL PROPERTY -
**************
              -------------- BASED ON FUEL MIXTURE ---------------
              PROXIMATE: CFIX                0.0001     KG/KG WET
                         VOL                 0.9830     KG/KG WET
                         MOI                 0.0168     KG/KG WET
                         ASH                 0.0001     KG/KG WET

              ULTIMATE:    C                 0.8374     KG/KG DRY
                           H                 0.1359     KG/KG DRY
                           N                 0.0116     KG/KG DRY
                           O                 0.0066     KG/KG DRY
                           S                 0.0084     KG/KG DRY
                         ASH                 0.0001     KG/KG DRY


              -------------- BASED ON FUEL MIXTURE ---------------
              LOWER HEATING VALUE:        41052.9609     KJ/KG DRY


              -------------- BASED ON BURNER FUEL ----------------
              UPPER HEATING VALUE:        42133.1992     KJ/KG WET
              LOWER HEATING VALUE:        40431.3359     KJ/KG DRY

REBURNING -
***********
              REBURN OR COFIRING:                           YES
              FUEL TYPE:                                    GAS
              FUEL FLOW:                                  0.5510    KG DRY/S
              FGR  FLOW:                                  1.7882    KG/S
              FUEL TEMPERATURE:                         298.1500    K
              FGR  TEMPERATURE:                         573.1500    K

ASH RADIATION -
***************
              CLOUD SPECIFIC ABSORPTION COEFFICIENT:                13.6364    1/((KG/M**3)M)
              CLOUD SPECIFIC SURFACE AREA:                         545.4500    M**2/KG
              SCATTERING:                                                NO
              ABSORPTION EFFICIENCY:                                 0.1000
              SCATTERING EFFICIENCY:                                 0.0000

NUMERICAL PARAMETERS -
**********************
              NMAX:                        2
              NPHI:                        4
              EXACT:                       0.00010
              NO. OF ITERATIONS:             100
              NO. OF AVERAGED ITERATIONS:     30
              WEIGHTING FACTOR FOR HEAT FLUXES OF A PREVIOUS RUN:          0

STOICHIOMETRIC CALCULATIONS AT COMPLETE COMBUSTION

NAME OF VARIABLE    MEANING OF VARIABLE                                    VALUE          UNITS
----------------    -------------------                                    -----          -----
O2MINT              STOICHIOMETRIC O2                                      3.3114         KG O2/KG FUEL DRY
AIRMNT              STOICHIOMETRIC AIR                                    14.2169         KG AIR DRY/KG FUEL DRY
AIRNR               TOTAL AIR NUMBER                                       1.0670         -
H2OFUT              HUMIDITY OF FUEL                                       0.0171         KG H2O/KG FUEL DRY
H2OA2               HUMIDITY OF AIR                                        0.0099         KG H2O/KG  AIR DRY
FUTOT               FLOW RATE OF DRY FUEL                                  3.4315         KG FUEL DRY/S
DMA                 FLOW RATE OF DRY AIR                                  52.0538         KG  AIR DRY/S
DMH2O               FLOW RATE OF H2O                                       0.5753         KG  H2O    /S
DMTOT               TOTAL INPUT MASS FLOW RATE                            57.8488         KG         /S
HL                  TOT.NET CAL. VALUE OF DRY FUEL                     41052.9609         KJ/KG FUEL DRY

O2MINV              STOICHIOMETRIC O2 FOR VOLATILE FUELS                   3.3111         KG O2/KG FUEL DRY
AIRMINV             STOICHIOMETRIC AIR FOR VOLATILE FUELS                 14.2159         KG AIR DRY/KG FUEL DRY
FUS                 MASS FLOW RATE OF BURNER FUEL                          2.8805         KG FUEL DRY/S
FUSW                MASS FLOW RATE OF BURNER FUEL                          2.9393         KG FUEL WET/S
FUG                 MASS FLOW RATE OF REBURN FUEL                          0.5510         KG FUEL DRY/S
FUGW                MASS FLOW RATE OF REBURN FUEL                          0.5510         KG FUEL WET/S
FUGV                VOLUME FLOW RATE OF REBURN FUEL                        0.3953         M3N GAS DRY/S
FUGVW               VOLUME FLOW RATE OF REBURN FUEL                        0.3953         M3N GAS WET/S
DMA2                MASS FLOW RATE OF TOTAL OR SEC. AIR                   52.0538         KG AIR DRY/S
DMA2W               MASS FLOW RATE OF TOTAL OR SEC. AIR                   52.5703         KG AIR WET/S
DMA2V               VOLUME FLOW RATE OF TOTAL OR SEC. AIR                 43.5654         M3N AIR DRY/S
DMA2VW              VOLUME FLOW RATE OF TOTAL OR SEC. AIR                 44.2577         M3N AIR WET/S
DMCG                VOLUME FLOW RATE OF COMBUSTION GASES                  42.1258         M3N GAS DRY/S
DMCGW               VOLUME FLOW RATE OF COMBUSTION GASES                  48.6861         M3N GAS WET/S
HLS                 NET CAL. VALUE OF BURNER FUEL                      40431.3359         KJ/KG FUEL DRY
HUSW                GROSS CAL. VALUE OF BURNER FUEL                    42133.1992         KJ/KG FUEL WET
HLG                 NET CAL. VALUE OF REBURN FUEL                      44302.6992         KJ/KG REBURN-FUEL DRY
HUGW                GROSS CAL. VALUE OF REBURN FUEL                    49381.1367         KJ/KG REBURN-FUEL WET
HLGV                NET CAL. VALUE OF REBURN FUEL                      31785.6992         KJ/M3N GAS DRY
HUGVW               GROSS CAL. VALUE OF REBURN FUEL                    39382.1992         KJ/M3N GAS WET
SFLOWF              ATOMIZING STEAM IN BURNER FUEL                         0.0000         KG-STEAM/SEC

MASS CONCENTRATION OF GASEOUS SPECIES IN KG/KG WET
```

CO2	H2O	N2	O2	VOL	SO2	ASH	CHAR	SOOT
0.1878	0.0846	0.7130	0.0136	0.0000	0.0010	0.0000	0.0000	0.0000

CONCENTRATION OF GASEOUS SPECIES IN VOL.FRACTION WET

CO2	H2O	N2	O2	VOL	SO2
0.1224	0.1347	0.7302	0.0122	0.0000	0.0005

CONCENTRATION OF GASEOUS SPECIES IN VOL. FRACTION DRY

CO2	H2O	N2	O2	VOL	SO2
0.1415	0.0000	0.8439	0.0141	0.0000	0.0005

SO2 CONCENTRATION IN PPM MASS 1027.
SO2 CONCENTRATION IN PPM VOL WET 460.
SO2 CONCENTRATION IN PPM VOL DRY 531.

HEAT CAPACITY OF COMBUSTION SPECIES (KJ/KG-K)

	CO2	H2O	N2	O2	VOL	SO2	ASH	CHAR	SOOT
AT 493.15K	0.9319689	1.9024371	1.0447987	0.9416904	2.5248535	0.6756042	0.8373599	1.0724180	0.9727679
AT 376.15K	0.8821020	1.8765520	1.0403634	0.9260021	2.3311000	0.6448221	0.8373600	0.9819483	0.8222868
AT 298.25K	0.8434441	1.8582036	1.0395815	0.9173627	2.2140925	0.6205368	0.8373599	0.9184768	0.7111416
AT 1800.00K	1.2005430	2.3140147	1.1634477	1.0747626	4.3484931	0.8270922	0.8373600	1.6863927	1.5045161
AT 900.00K	1.0583812	2.0220246	1.0806181	0.9992388	3.2324150	0.7527937	0.8373600	1.3415941	1.3412676
AT 573.15K	0.9621025	1.9230694	1.0497636	0.9533783	2.6651895	0.6944230	0.8373600	1.1309191	1.0638425

MEAN HEAT CAPACITIES OF SOME INPUT/OUTPUT STREAMS

INPUT STREAM	TEMPERATURE (K)	MEAN Cp (KJ/KG-K)
AIR	376.15	1.0222045
AIR	493.15	1.0294459
FLUE GAS	573.15	1.1055170
FLUE GAS	900.00	1.1546530
FLUE GAS	1800.00	1.2662147

MASS BALANCE FOR VOLUME ZONES

NR	I	J	MCONIN KG/S	MCONNT KG/S	MDIFIN KG/S	MDFNT KG/S	MTOTIN KG/S	MTOTEX KG/S	MTOTNT KG/S
1	1		14.266	0.000	14.803	0.000	29.068	29.068	0.000
1	2		14.266	0.000	17.624	0.000	31.889	31.889	0.000
2	1		14.266	0.000	16.213	0.000	30.478	30.478	0.000
2	2		26.946	0.000	39.128	0.000	66.074	66.074	0.000
2	3		19.021	0.000	28.859	0.000	47.880	47.880	0.000
3	1		6.340	0.000	11.321	0.000	17.661	17.661	0.000
3	2		14.266	0.000	31.110	0.000	45.376	45.376	0.000
3	3		19.021	0.000	50.854	0.000	69.875	69.875	0.000
3	4		6.149	0.000	22.110	0.000	28.259	28.259	0.000
4	1		4.755	0.000	11.613	0.000	16.368	16.368	0.000
4	2		12.056	0.000	33.513	0.000	45.569	45.569	0.000
4	3		19.316	-0.006	49.537	0.000	68.853	68.847	-0.006
4	4		17.974	0.006	28.687	0.000	46.661	46.667	0.006
5	1		2.210	0.000	12.337	0.000	14.547	14.547	0.000
5	2		5.762	0.006	35.104	0.000	40.866	40.872	0.006
5	3		24.418	0.000	44.517	0.000	68.935	68.935	0.000
5	4		24.511	-0.006	25.930	0.000	50.440	50.435	-0.006
6	1		3.292	0.000	21.490	0.000	24.782	24.782	0.000
6	2		6.126	0.000	65.451	0.000	71.578	71.578	0.000
6	3		33.367	0.000	75.389	0.000	108.757	108.757	0.000
6	4		28.525	0.000	41.445	0.000	69.971	69.971	0.000
7	1		3.581	0.000	20.492	0.000	24.072	24.072	0.000
7	2		7.185	0.000	59.340	0.000	66.525	66.525	0.000
7	3		39.378	-0.006	56.414	0.000	95.792	95.786	-0.006
7	4		22.278	0.006	30.985	0.000	53.263	53.269	0.006
8	1		2.164	0.000	16.485	0.000	18.648	18.648	0.000
8	2		8.359	0.000	50.576	0.000	58.935	58.935	0.000
8	3		34.698	0.006	53.610	0.000	88.308	88.313	0.006
8	4		16.273	-0.006	28.080	0.000	44.353	44.347	-0.006
9	1		6.080	0.000	13.335	0.000	19.415	19.415	0.000
9	2		22.150	0.000	42.362	0.000	64.512	64.512	0.000
9	3		49.200	0.000	64.797	0.000	113.998	113.998	0.000
9	4		21.983	0.000	26.615	0.000	48.598	48.598	0.000
10	1		6.080	0.000	9.556	0.000	15.636	15.636	0.000
10	2		18.234	0.000	28.664	0.000	46.898	46.898	0.000
10	3		33.535	0.000	41.858	0.000	75.393	75.393	0.000
11	1		6.080	0.000	6.469	0.000	12.549	12.549	0.000
11	2		18.234	0.000	19.403	0.000	37.637	37.637	0.000
11	3		33.535	0.000	35.684	0.000	69.219	69.219	0.000
12	1		6.080	0.000	6.469	0.000	12.549	12.549	0.000
12	2		18.234	0.000	19.403	0.000	37.637	37.637	0.000
12	3		33.535	0.000	35.684	0.000	69.219	69.219	0.000
13	1		6.080	0.000	9.795	0.000	15.875	15.875	0.000
13	2		18.234	0.000	22.730	0.000	40.964	40.964	0.000
13	3		33.535	0.000	35.684	0.000	69.219	69.219	0.000
14	1		14.462	0.000	14.825	0.000	29.287	29.287	0.000
14	2		51.769	0.000	32.790	0.000	84.559	84.559	0.000
14	3		33.535	0.000	17.842	0.000	51.377	51.377	0.000
15	1		26.032	0.000	14.969	0.000	41.001	41.001	0.000
15	2		43.387	0.000	49.536	0.000	92.922	92.922	0.000
16	1		26.032	0.000	14.969	0.000	41.001	41.001	0.000
16	2		43.387	0.000	49.536	0.000	92.922	92.922	0.000
17	1		14.462	0.000	11.498	0.000	25.961	25.961	0.000
17	2		43.387	0.000	34.495	0.000	77.882	77.882	0.000
18	1		14.462	0.000	11.498	0.000	25.961	25.961	0.000
18	2		43.387	0.000	34.495	0.000	77.882	77.882	0.000
19	1		14.462	0.000	5.749	0.000	20.211	20.211	0.000
19	2		43.387	0.000	17.247	0.000	60.634	60.634	0.000
TOTAL MASS BALANCE FOR THE FURNACE VOLUME									
INCLUDING SYMMETRICAL FLUXES IF EXISTING:			1193.72	0.00	1720.98	0.00	2914.70	2914.70	0.00

iter. no.= 1, act.err.= 705.7140 %, avg.err.= 705.7140 %, 20 it.err.= 705.7140 %, hb.err.= -75.4073 %
iter. no.= 2, act.err.= -70.0213 %, avg.err.= 317.8463 %, 20 it.err.= 317.8463 %, hb.err.= 15.7280 %
iter. no.= 3, act.err.= -39.4965 %, avg.err.= 198.7321 %, 20 it.err.= 198.7321 %, hb.err.= 11.6893 %
iter. no.= 4, act.err.= -29.3348 %, avg.err.= 141.7153 %, 20 it.err.= 141.7153 %, hb.err.= 8.6393 %
iter. no.= 5, act.err.= -23.1255 %, avg.err.= 108.7472 %, 20 it.err.= 108.7472 %, hb.err.= 5.8732 %
iter. no.= 6, act.err.= -18.6358 %, avg.err.= 87.5167 %, 20 it.err.= 87.5167 %, hb.err.= 4.2228 %
iter. no.= 7, act.err.= -13.8597 %, avg.err.= 73.0343 %, 20 it.err.= 73.0343 %, hb.err.= 2.8306 %
iter. no.= 8, act.err.= -13.0660 %, avg.err.= 62.2718 %, 20 it.err.= 62.2718 %, hb.err.= 3.2780 %
iter. no.= 9, act.err.= -9.3933 %, avg.err.= 54.3090 %, 20 it.err.= 54.3090 %, hb.err.= 1.8173 %
iter. no.= 10, act.err.= -6.7552 %, avg.err.= 48.2026 %, 20 it.err.= 48.2026 %, hb.err.= 1.0997 %

iter. no.= 11,	act.err.=	-5.4984 %,	avg.err.=	43.3207 %,	20 it.err.=	43.3207 %,	hb.err.=	1.2046 %
iter. no.= 12,	act.err.=	-3.4600 %,	avg.err.=	39.4223 %,	20 it.err.=	39.4223 %,	hb.err.=	0.7902 %
iter. no.= 13,	act.err.=	-3.8765 %,	avg.err.=	36.0916 %,	20 it.err.=	36.0916 %,	hb.err.=	1.4963 %
iter. no.= 14,	act.err.=	-3.8696 %,	avg.err.=	33.2373 %,	20 it.err.=	33.2373 %,	hb.err.=	0.8328 %
iter. no.= 15,	act.err.=	-2.1690 %,	avg.err.=	30.8768 %,	20 it.err.=	30.8768 %,	hb.err.=	0.6775 %
iter. no.= 16,	act.err.=	-1.8329 %,	avg.err.=	28.8325 %,	20 it.err.=	28.8325 %,	hb.err.=	0.3978 %
iter. no.= 17,	act.err.=	-0.9136 %,	avg.err.=	27.0827 %,	20 it.err.=	27.0827 %,	hb.err.=	-0.1321 %
iter. no.= 18,	act.err.=	-0.6881 %,	avg.err.=	25.5399 %,	20 it.err.=	25.5399 %,	hb.err.=	0.4587 %
iter. no.= 19,	act.err.=	-0.9538 %,	avg.err.=	24.1455 %,	20 it.err.=	24.1455 %,	hb.err.=	0.3868 %
iter. no.= 20,	act.err.=	-1.3709 %,	avg.err.=	22.8697 %,	20 it.err.=	22.8697 %,	hb.err.=	0.8215 %
iter. no.= 21,	act.err.=	-0.1442 %,	avg.err.=	21.7738 %,	20 it.err.=	12.4233 %,	hb.err.=	0.0308 %
iter. no.= 22,	act.err.=	-0.2166 %,	avg.err.=	20.7742 %,	20 it.err.=	-8.9330 %,	hb.err.=	0.8322 %
iter. no.= 23,	act.err.=	-0.8257 %,	avg.err.=	19.8351 %,	20 it.err.=	-6.9995 %,	hb.err.=	0.1173 %
iter. no.= 24,	act.err.=	-1.5573 %,	avg.err.=	18.9437 %,	20 it.err.=	-5.6106 %,	hb.err.=	0.4712 %
iter. no.= 25,	act.err.=	-1.4825 %,	avg.err.=	18.1267 %,	20 it.err.=	-4.5285 %,	hb.err.=	0.8269 %
iter. no.= 26,	act.err.=	-2.6069 %,	avg.err.=	17.3292 %,	20 it.err.=	-3.7270 %,	hb.err.=	0.6853 %
iter. no.= 27,	act.err.=	-0.6906 %,	avg.err.=	16.6618 %,	20 it.err.=	-3.0686 %,	hb.err.=	0.3819 %
iter. no.= 28,	act.err.=	-2.0593 %,	avg.err.=	15.9932 %,	20 it.err.=	-2.5182 %,	hb.err.=	0.9449 %
iter. no.= 29,	act.err.=	-0.6019 %,	avg.err.=	15.4210 %,	20 it.err.=	-2.0787 %,	hb.err.=	0.5361 %
iter. no.= 30,	act.err.=	0.3434 %,	avg.err.=	14.9184 %,	20 it.err.=	-1.7237 %,	hb.err.=	-0.2475 %
iter. no.= 31,	act.err.=	-0.3739 %,	avg.err.=	14.4251 %,	20 it.err.=	-1.4675 %,	hb.err.=	0.7398 %
iter. no.= 32,	act.err.=	-1.3256 %,	avg.err.=	13.9329 %,	20 it.err.=	-1.3608 %,	hb.err.=	0.5460 %
iter. no.= 33,	act.err.=	-0.3667 %,	avg.err.=	13.4995 %,	20 it.err.=	-1.1853 %,	hb.err.=	-0.1499 %
iter. no.= 34,	act.err.=	-0.9636 %,	avg.err.=	13.0742 %,	20 it.err.=	-1.0400 %,	hb.err.=	0.3763 %
iter. no.= 35,	act.err.=	-0.6010 %,	avg.err.=	12.6834 %,	20 it.err.=	-0.9616 %,	hb.err.=	0.5455 %
iter. no.= 36,	act.err.=	-1.2601 %,	avg.err.=	12.2961 %,	20 it.err.=	-0.9330 %,	hb.err.=	0.3606 %
iter. no.= 37,	act.err.=	-0.2126 %,	avg.err.=	11.9581 %,	20 it.err.=	-0.8979 %,	hb.err.=	0.8199 %
iter. no.= 38,	act.err.=	-1.1227 %,	avg.err.=	11.6138 %,	20 it.err.=	-0.9196 %,	hb.err.=	0.1300 %
iter. no.= 39,	act.err.=	0.4322 %,	avg.err.=	11.3271 %,	20 it.err.=	-0.8503 %,	hb.err.=	0.1555 %
iter. no.= 40,	act.err.=	0.7414 %,	avg.err.=	11.0625 %,	20 it.err.=	-0.7447 %,	hb.err.=	-0.2481 %
iter. no.= 41,	act.err.=	-1.5781 %,	avg.err.=	10.7542 %,	20 it.err.=	-0.8164 %,	hb.err.=	1.0582 %
iter. no.= 42,	act.err.=	-0.4698 %,	avg.err.=	10.4869 %,	20 it.err.=	-0.8291 %,	hb.err.=	0.0187 %
iter. no.= 43,	act.err.=	-2.1871 %,	avg.err.=	10.1922 %,	20 it.err.=	-0.8971 %,	hb.err.=	0.6512 %
iter. no.= 44,	act.err.=	-0.5961 %,	avg.err.=	9.9470 %,	20 it.err.=	-0.8491 %,	hb.err.=	0.2580 %
iter. no.= 45,	act.err.=	0.7398 %,	avg.err.=	9.7424 %,	20 it.err.=	-0.7380 %,	hb.err.=	-0.0610 %
iter. no.= 46,	act.err.=	-1.7188 %,	avg.err.=	9.4932 %,	20 it.err.=	-0.6936 %,	hb.err.=	0.7809 %
iter. no.= 47,	act.err.=	-1.3488 %,	avg.err.=	9.2626 %,	20 it.err.=	-0.7265 %,	hb.err.=	0.1436 %
iter. no.= 48,	act.err.=	-1.6842 %,	avg.err.=	9.0345 %,	20 it.err.=	-0.7077 %,	hb.err.=	0.9826 %
iter. no.= 49,	act.err.=	0.2956 %,	avg.err.=	8.8561 %,	20 it.err.=	-0.6628 %,	hb.err.=	-0.5288 %
iter. no.= 50,	act.err.=	1.7096 %,	avg.err.=	8.7132 %,	20 it.err.=	-0.5945 %,	hb.err.=	-0.4847 %
iter. no.= 51,	act.err.=	-1.4575 %,	avg.err.=	8.5138 %,	20 it.err.=	-0.6487 %,	hb.err.=	0.1577 %
iter. no.= 52,	act.err.=	1.8115 %,	avg.err.=	8.3849 %,	20 it.err.=	-0.4918 %,	hb.err.=	-0.4767 %
iter. no.= 53,	act.err.=	2.9490 %,	avg.err.=	8.2823 %,	20 it.err.=	-0.3261 %,	hb.err.=	-0.2175 %
iter. no.= 54,	act.err.=	-2.6470 %,	avg.err.=	8.0799 %,	20 it.err.=	-0.4102 %,	hb.err.=	1.1017 %
iter. no.= 55,	act.err.=	-1.9531 %,	avg.err.=	7.8975 %,	20 it.err.=	-0.4778 %,	hb.err.=	0.7294 %
iter. no.= 56,	act.err.=	-0.8579 %,	avg.err.=	7.7412 %,	20 it.err.=	-0.4577 %,	hb.err.=	-0.2129 %
iter. no.= 57,	act.err.=	0.5276 %,	avg.err.=	7.6146 %,	20 it.err.=	-0.4207 %,	hb.err.=	0.0268 %
iter. no.= 58,	act.err.=	0.4505 %,	avg.err.=	7.4911 %,	20 it.err.=	-0.3421 %,	hb.err.=	-0.0250 %
iter. no.= 59,	act.err.=	-0.9526 %,	avg.err.=	7.3480 %,	20 it.err.=	-0.4113 %,	hb.err.=	0.5432 %
iter. no.= 60,	act.err.=	-1.2558 %,	avg.err.=	7.2046 %,	20 it.err.=	-0.5112 %,	hb.err.=	0.2582 %
iter. no.= 61,	act.err.=	2.3973 %,	avg.err.=	7.1258 %,	20 it.err.=	-0.3124 %,	hb.err.=	-0.8371 %
iter. no.= 62,	act.err.=	-1.4258 %,	avg.err.=	6.9879 %,	20 it.err.=	-0.3602 %,	hb.err.=	0.8995 %
iter. no.= 63,	act.err.=	-1.9249 %,	avg.err.=	6.8464 %,	20 it.err.=	-0.3471 %,	hb.err.=	0.0788 %
iter. no.= 64,	act.err.=	-0.4467 %,	avg.err.=	6.7324 %,	20 it.err.=	-0.3396 %,	hb.err.=	0.2565 %
iter. no.= 65,	act.err.=	1.3057 %,	avg.err.=	6.6489 %,	20 it.err.=	-0.3113 %,	hb.err.=	-0.6331 %
iter. no.= 66,	act.err.=	0.6445 %,	avg.err.=	6.5580 %,	20 it.err.=	-0.1932 %,	hb.err.=	-0.0227 %
iter. no.= 67,	act.err.=	0.0906 %,	avg.err.=	6.4614 %,	20 it.err.=	-0.1212 %,	hb.err.=	0.2569 %
iter. no.= 68,	act.err.=	-0.1653 %,	avg.err.=	6.3640 %,	20 it.err.=	-0.0452 %,	hb.err.=	0.0896 %
iter. no.= 69,	act.err.=	-0.6212 %,	avg.err.=	6.2627 %,	20 it.err.=	-0.0911 %,	hb.err.=	-0.3088 %
iter. no.= 70,	act.err.=	0.2669 %,	avg.err.=	6.1771 %,	20 it.err.=	-0.1632 %,	hb.err.=	-0.2699 %
iter. no.= 71,	act.err.=	1.4276 %,	avg.err.=	6.1102 %,	20 it.err.=	-0.0190 %,	hb.err.=	-0.9385 %
iter. no.= 72,	act.err.=	1.4092 %,	avg.err.=	6.0449 %,	20 it.err.=	-0.0391 %,	hb.err.=	0.8430 %
iter. no.= 73,	act.err.=	-0.8604 %,	avg.err.=	5.9503 %,	20 it.err.=	-0.2295 %,	hb.err.=	-0.1694 %
iter. no.= 74,	act.err.=	-0.4473 %,	avg.err.=	5.8639 %,	20 it.err.=	-0.1196 %,	hb.err.=	0.0858 %
iter. no.= 75,	act.err.=	-0.0909 %,	avg.err.=	5.7845 %,	20 it.err.=	-0.0265 %,	hb.err.=	-0.0885 %
iter. no.= 76,	act.err.=	0.1777 %,	avg.err.=	5.7107 %,	20 it.err.=	0.0253 %,	hb.err.=	0.4451 %
iter. no.= 77,	act.err.=	-0.9739 %,	avg.err.=	5.6239 %,	20 it.err.=	-0.0497 %,	hb.err.=	-0.2381 %
iter. no.= 78,	act.err.=	-0.3900 %,	avg.err.=	5.5468 %,	20 it.err.=	-0.0918 %,	hb.err.=	0.2054 %
iter. no.= 79,	act.err.=	-0.8747 %,	avg.err.=	5.4655 %,	20 it.err.=	-0.0879 %,	hb.err.=	-0.2362 %
iter. no.= 80,	act.err.=	0.0416 %,	avg.err.=	5.3977 %,	20 it.err.=	-0.0230 %,	hb.err.=	0.3899 %
iter. no.= 81,	act.err.=	-0.9760 %,	avg.err.=	5.3190 %,	20 it.err.=	-0.1917 %,	hb.err.=	-0.0722 %
iter. no.= 82,	act.err.=	-0.3480 %,	avg.err.=	5.2499 %,	20 it.err.=	-0.1378 %,	hb.err.=	0.2355 %
iter. no.= 83,	act.err.=	-1.1740 %,	avg.err.=	5.1725 %,	20 it.err.=	-0.1002 %,	hb.err.=	-0.2261 %
iter. no.= 84,	act.err.=	-0.5736 %,	avg.err.=	5.1041 %,	20 it.err.=	-0.1066 %,	hb.err.=	-0.0400 %
iter. no.= 85,	act.err.=	-0.1191 %,	avg.err.=	5.0426 %,	20 it.err.=	-0.1778 %,	hb.err.=	0.1628 %
iter. no.= 86,	act.err.=	-0.5528 %,	avg.err.=	4.9776 %,	20 it.err.=	-0.2377 %,	hb.err.=	-0.1162 %
iter. no.= 87,	act.err.=	-0.7549 %,	avg.err.=	4.9117 %,	20 it.err.=	-0.2800 %,	hb.err.=	-0.3187 %
iter. no.= 88,	act.err.=	0.0448 %,	avg.err.=	4.8564 %,	20 it.err.=	-0.2695 %,	hb.err.=	0.0756 %
iter. no.= 89,	act.err.=	0.5367 %,	avg.err.=	4.8078 %,	20 it.err.=	-0.2116 %,	hb.err.=	0.3532 %
iter. no.= 90,	act.err.=	-0.9923 %,	avg.err.=	4.7434 %,	20 it.err.=	-0.2745 %,	hb.err.=	-0.6999 %
iter. no.= 91,	act.err.=	1.1851 %,	avg.err.=	4.7043 %,	20 it.err.=	-0.2866 %,	hb.err.=	0.7609 %
iter. no.= 92,	act.err.=	-0.9255 %,	avg.err.=	4.6431 %,	20 it.err.=	-0.4034 %,	hb.err.=	-0.6967 %
iter. no.= 93,	act.err.=	1.8286 %,	avg.err.=	4.6128 %,	20 it.err.=	-0.2689 %,	hb.err.=	1.2086 %
iter. no.= 94,	act.err.=	-2.4073 %,	avg.err.=	4.5382 %,	20 it.err.=	-0.3669 %,	hb.err.=	-1.5557 %
iter. no.= 95,	act.err.=	1.7928 %,	avg.err.=	4.5093 %,	20 it.err.=	-0.2727 %,	hb.err.=	1.1996 %
iter. no.= 96,	act.err.=	-0.9999 %,	avg.err.=	4.4519 %,	20 it.err.=	-0.3316 %,	hb.err.=	-0.7204 %
iter. no.= 97,	act.err.=	0.5497 %,	avg.err.=	4.4116 %,	20 it.err.=	-0.2554 %,	hb.err.=	0.3490 %
iter. no.= 98,	act.err.=	0.0232 %,	avg.err.=	4.3669 %,	20 it.err.=	-0.2348 %,	hb.err.=	-0.0593 %
iter. no.= 99,	act.err.=	0.0462 %,	avg.err.=	4.3232 %,	20 it.err.=	-0.1887 %,	hb.err.=	-0.0512 %

THE DISTRIBUTION OF SPSU in m**2/kg AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.284E+02	2.205E+02	2.165E+02	2.199E+02	2.289E+02	2.355E+02	2.571E+02	0.000E-01
J= 3	0.000E-01	2.314E+02	2.301E+02	2.263E+02	2.246E+02	2.271E+02	2.299E+02	2.347E+02	2.461E+02	2.475E+02
J= 2	2.322E+02	2.316E+02	2.307E+02	2.294E+02	2.297E+02	2.315E+02	2.335E+02	2.369E+02	2.432E+02	2.449E+02
J= 1	2.321E+02	2.319E+02	2.318E+02	2.316E+02	2.326E+02	2.340E+02	2.353E+02	2.380E+02	2.418E+02	2.431E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	2.484E+02	2.488E+02	2.490E+02	2.491E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	2.457E+02	2.462E+02	2.468E+02	2.480E+02	2.480E+02	2.480E+02	2.480E+02	2.480E+02	2.480E+02
J= 1	2.437E+02	2.443E+02	2.455E+02	2.472E+02	2.475E+02	2.476E+02	2.476E+02	2.476E+02	2.476E+02
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF UBRT in Fraction of Input fixed-C AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	8.167E-01	9.340E-01	1.001E+00	9.460E-01	8.275E-01	7.499E-01	5.675E-01	0.000E-01
J= 3	0.000E-01	7.749E-01	7.927E-01	8.461E-01	8.698E-01	8.366E-01	8.035E-01	7.513E-01	6.428E-01	6.271E-01
J= 2	7.654E-01	7.722E-01	7.847E-01	8.025E-01	7.997E-01	7.791E-01	7.587E-01	7.235E-01	6.632E-01	6.458E-01
J= 1	7.661E-01	7.698E-01	7.708E-01	7.732E-01	7.634E-01	7.495E-01	7.363E-01	7.095E-01	6.727E-01	6.595E-01
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	6.179E-01	6.135E-01	6.112E-01	6.101E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	6.370E-01	6.315E-01	6.269E-01	6.176E-01	6.174E-01	6.177E-01	6.176E-01	6.175E-01	6.175E-01
J= 1	6.536E-01	6.475E-01	6.370E-01	6.239E-01	6.211E-01	6.210E-01	6.208E-01	6.208E-01	6.207E-01
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF PO2 in Vol. Fraction, Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.094E-02	3.188E-02	5.381E-02	3.751E-02	1.106E-02	6.993E-03	3.959E-02	0.000E-01
J= 3	0.000E-01	9.517E-03	1.012E-02	1.091E-02	1.350E-02	8.541E-03	3.928E-03	3.450E-03	1.653E-02	1.423E-02
J= 2	9.227E-03	9.349E-03	9.429E-03	9.416E-03	7.599E-03	4.729E-03	2.845E-03	3.490E-03	9.572E-03	1.003E-02
J= 1	9.172E-03	9.166E-03	8.755E-03	7.988E-03	6.011E-03	4.073E-03	3.469E-03	3.924E-03	6.894E-03	7.535E-03
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	1.388E-02	1.382E-02	1.381E-02	1.381E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	9.965E-03	1.011E-02	1.055E-02	1.222E-02	1.219E-02	1.210E-02	1.211E-02	1.212E-02	1.212E-02
J= 1	7.721E-03	8.145E-03	9.272E-03	1.118E-02	1.157E-02	1.158E-02	1.158E-02	1.159E-02	1.159E-02
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF FUL0 in kg/(kg,mixture) AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	5.899E-02	5.965E-02	5.982E-02	5.873E-02	5.453E-02	5.214E-02	4.197E-02	0.000E-01
J= 3	0.000E-01	5.868E-02	5.882E-02	5.917E-02	5.908E-02	5.803E-02	5.643E-02	5.410E-02	4.863E-02	4.885E-02
J= 2	5.856E-02	5.862E-02	5.868E-02	5.866E-02	5.807E-02	5.694E-02	5.570E-02	5.394E-02	5.101E-02	5.072E-02
J= 1	5.854E-02	5.854E-02	5.842E-02	5.814E-02	5.733E-02	5.630E-02	5.542E-02	5.412E-02	5.231E-02	5.190E-02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	4.885E-02	4.885E-02	4.885E-02	4.885E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	5.070E-02	5.063E-02	5.042E-02	4.962E-02	4.965E-02	4.970E-02	4.969E-02	4.969E-02	4.969E-02
J= 1	5.183E-02	5.164E-02	5.108E-02	5.015E-02	4.997E-02	4.997E-02	4.997E-02	4.997E-02	4.997E-02
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOL0 in Number of Vol. Lumps Released AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.000E+00	2.095E+03	3.129E+03	3.137E+03	1.400E+01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	8.000E+00	1.900E+01	1.600E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF SO2 in Vol. Fraction, Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	5.343E-04	4.822E-04	4.156E-04	4.461E-04	4.798E-04	4.703E-04	3.792E-04	0.000E-01
J= 3	0.000E-01	5.317E-04	5.331E-04	5.382E-04	5.289E-04	5.246E-04	5.094E-04	4.887E-04	4.396E-04	4.416E-04
J= 2	5.301E-04	5.310E-04	5.324E-04	5.324E-04	5.264E-04	5.154E-04	5.039E-04	4.878E-04	4.611E-04	4.583E-04
J= 1	5.299E-04	5.300E-04	5.296E-04	5.277E-04	5.195E-04	5.097E-04	5.014E-04	4.893E-04	4.727E-04	4.689E-04
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	4.415E-04	4.414E-04	4.413E-04	4.413E-04	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	4.581E-04	4.574E-04	4.555E-04	4.481E-04	4.483E-04	4.487E-04	4.486E-04	4.486E-04	4.486E-04
J= 1	4.683E-04	4.665E-04	4.614E-04	4.528E-04	4.511E-04	4.511E-04	4.510E-04	4.510E-04	4.510E-04
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

UNBURN FIXED CARBON AT FURNACE EXIT = 61.81% AFTER 100 ITERATIONS

ATOM OUTFLUX IN KG/S :

C=	2.964584	H=	0.547796	N=	41.244461	O=	13.062082
S=	0.029583	A=	0.000297				

SUM= 57.848804

ATOM INFLUX IN KG/S :

C=	2.965163	H=	0.547721	N=	41.244305	O=	13.061593
S=	0.029724	A=	0.000297				

SUM= 57.848804

ATOM BALANCE -> (OUT-IN)/IN IN % :

C=	-0.019515	H=	0.013625	N=	0.000379	O=	0.003746
S=	-0.475400	A=	-0.055321				

SUM= 0.000000

ENERGY BALANCE FOR VOLUME ZONES AND TOTAL FURNACE EFFICIENCY AFTER 100 ITERATIONS

I J TPSAD TEX RHOG OLD CP EX QCONIN QCONNT QDIFIN QDIFNT QCHEIN QCHENT QRADIN QRADNT QTOTIN QTOTEX QTOTNT TNEW

		K	K	KG/M3	KJ/KGK	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	K
1	1	1391.6	1380.1	0.25469	1.21673	38719.	-454.	0.	0.	0.	0.	12484.	454.	51203.	51203.	0.	1380.
2	1	1416.6	1413.7	0.24863	1.22078	41626.	-119.	0.	0.	0.	0.	13445.	119.	55071.	55071.	0.	1414.
3	1	1496.8	1492.5	0.23547	1.23027	26056.	-105.	0.	0.	0.	0.	14482.	105.	40538.	40538.	0.	1493.
4	1	1569.9	1566.8	0.22423	1.23930	25917.	-183.	0.	0.	0.	0.	14703.	183.	40621.	40621.	0.	1567
5	1	1631.2	1625.8	0.21591	1.24773	24180.	-82.	0.	0.	0.	-29.	10055.	111.	34236.	34265.	0.	1626.
6	1	1661.0	1654.7	0.21192	1.25306	42114.	12.	0.	0.	0.	-93.	16414.	80.	58528.	58620.	0.	1655
7	1	1665.4	1653.8	0.21188	1.25425	41049.	-119.	0.	0.	0.	-93.	12521.	211.	53570.	53662.	0.	1654.
8	1	1645.1	1636.9	0.21391	1.25269	31368.	-93.	0.	0.	0	-124.	12318.	217.	43685.	43809.	0.	1637.
9	1	1605.2	1594.7	0.21942	1.24717	31611.	-215.	0	0.	0.	-62.	13364.	277.	44974.	45036.	0.	1595.
10	1	1557.2	1513.8	0.23111	1.23793	24434.	-904.	0.	157.	0.	-31.	9190.	778.	33624.	33655.	0.	1514.
11	1	1483.1	1444.1	0.24228	1.22981	18355.	-671.	0.	266.	0.	0.	9469.	405.	27824.	27824.	0.	1444.
12	1	1425.5	1394.1	0.25094	1.22372	17367.	-537.	0.	247.	0.	0.	8928.	290.	26295.	26295.	0.	1394
13	1	1374.1	1372.3	0.25489	1.22068	20854.	-39.	0.	0	0.	0.	8850.	39.	29704.	29704.	0.	1372.
14	1	1315.1	1310.2	0.26689	1.21232	36132.	-198	0.	0	0.	0.	7806.	198.	43938	43938.	0	1310.
15	1	1269.1	1250.1	0.27969	1.20450	48053.	-1038.	0.	520.	0.	0.	8182.	518.	56235.	56235.	0	1250
16	1	1233.3	1214.5	0.28789	1.19983	46100.	-1020.	0.	482	0.	0.	7601.	538.	53701.	53701.	0.	1215
17	1	1181.8	1129.3	0.30961	1.18828	27424.	-1783.	0.	1350.	0.	0.	6770.	433.	34194.	34194	0.	1129.
18	1	1110.2	1065.3	0.32822	1.17928	24995.	-1509.	0.	1118.	0.	0.	5806.	391.	30801.	30801.	0.	1065.
19	1	1065.3	1042.6	0.33538	1.17601	18285.	-591.	0.	343.	0.	0.	7531.	248.	25815.	25815.	0.	1043.
1	2	1380.5	1343.1	0.26171	1.21216	41995.	-1602.	0.	391.	0.	0.	35501.	1211.	77495.	77495.	0.	1343.
2	2	1387.7	1381.6	0.25443	1.21672	87648.	-546.	0.	0.	0.	0.	38305.	546.	125952.	125952.	0.	1382.
3	2	1469.8	1458.3	0.24106	1.22569	65237.	-713.	0.	0.	0.	0.	41112.	713.	106350.	106350.	0.	1458.
4	2	1570.0	1566.5	0.22441	1.23798	71929.	-380.	0.	0.	0.	-71.	43868.	451.	115797.	115868.	0.	1566.
5	2	1651.6	1644.9	0.21354	1.24834	68494.	212.	0.	0.	0.	-593.	30422.	380.	98916.	99509.	0.	1645.
6	2	1681.9	1676.2	0.20930	1.25499	123676.	108.	0.	0.	0.	-892.	49457.	783.	173133.	174025.	-1.	1676.
7	2	1683.2	1679.0	0.20868	1.25809	115139.	428.	0.	0.	0.	-987.	38554.	559.	153692.	154679.	-1.	1679.
8	2	1667.8	1662.2	0.21059	1.25658	100563.	452.	0.	0.	0.	-958.	38009.	506.	138572.	139530.	-1.	1662.
9	2	1614.3	1607.0	0.21764	1.24780	105431.	-69.	0.	0.	0.	-618.	40274.	687.	145705.	146322.	-1.	1607.
10	2	1567.5	1554.1	0.22503	1.24172	73994.	-853.	0.	0.	0.	-31.	30029.	884.	104024.	104054.	0.	1554.
11	2	1520.6	1485.0	0.23551	1.23388	56926.	-1809.	0.	574.	0.	-31.	29611.	1266.	86537.	86568.	0.	1485.
12	2	1457.9	1420.9	0.24612	1.22633	53722.	-1900.	0.	530.	0.	0.	27090.	1370.	80812.	80812.	0.	1420
13	2	1389.4	1379.6	0.25348	1.22118	54644.	-545.	0.	0.	0.	0.	26266.	545.	80910.	80910.	0.	1380
14	2	1307.2	1303.9	0.26812	1.21116	103387.	-379.	0.	0.	0.	0.	23273.	378.	126660.	126660.	0.	1304.
15	2	1265.1	1240.6	0.28182	1.20304	108384.	-3030.	0.	1100.	0.	0.	23643.	1930.	132027.	132027.	0.	1241.
16	2	1215.6	1191.6	0.29340	1.19659	102289.	-2942.	0.	998.	0.	0.	21335.	1944.	123624.	123624.	0.	1192.
17	2	1164.9	1122.8	0.31137	1.18721	80529.	-4276.	0.	2820.	0.	0.	19789.	1457.	100318.	100318.	0.	1123.
18	2	1106.1	1069.9	0.32679	1.17976	74558.	-3651.	0.	2409.	0.	0.	17513.	1242.	92071.	92071.	0.	1070.
19	2	1069.9	1046.8	0.33398	1.17646	55204.	-1796.	0.	911.	0.	0.	22651.	885.	77854.	77854.	0.	1047.
2	3	1387.8	1345.7	0.26123	1.21220	63515.	-2714.	0.	615.	0.	0.	65564.	2099.	129080.	129080.	0.	1346.
3	3	1407.7	1403.9	0.25045	1.21885	94494.	-320.	0.	0.	0.	-42.	71050.	361.	165544.	165586.	0.	1404.
4	3	1583.5	1565.5	0.22466	1.23642	102028.	5865.	0.	0.	0.	-7940.	78775.	2074.	180802.	188742.	0.	1566.
5	3	1699.1	1661.1	0.21158	1.24821	108464.	8809.	0.	0.	0.	-12420.	54757.	3611.	163221.	175641.	0.	1661.
6	3	1727.4	1703.0	0.20612	1.25707	182518.	9544.	0.	0.	0.	-12742.	90095.	3197.	272613.	285354.	-1.	1703.
7	3	1731.5	1693.9	0.20671	1.26427	166829.	2200.	0.	0.	0.	-4753.	69583.	2553.	236412.	241165.	-1.	1694.
8	3	1692.2	1674.9	0.20883	1.26162	151873.	1509.	0.	0.	0.	-3691.	69246.	2181.	221119.	224809.	-1.	1675.
9	3	1598.6	1586.3	0.22033	1.24351	181369.	1230.	0.	0.	0.	-3320.	69359.	2089.	250728.	254048.	-1.	1586.
10	3	1564.5	1542.5	0.22660	1.23880	117448.	-1229.	0.	332.	0.	-1082.	53080.	1978.	170528.	171609.	0.	1542.
11	3	1505.2	1461.6	0.23915	1.22961	102956.	-3934.	0.	1148.	0.	-201.	51182.	2987.	154138.	154338.	0.	1462.
12	3	1427.5	1388.7	0.25170	1.22100	95781.	-3613.	0.	1063.	0.	-31.	46595.	2582.	142376.	142407.	0.	1389.
13	3	1360.9	1327.3	0.26333	1.21349	89571.	-3122.	0.	978.	0.	0.	42693.	2143.	132264.	132264.	0.	1327.
14	3	1327.3	1280.3	0.27301	1.20755	64166.	-3234.	0.	1097.	0.	0.	39330.	2137.	103496.	103496.	0.	1280.
3	4	1453.2	1395.6	0.25199	1.21735	38664.	-909.	0.	592.	0.	-1397.	33872.	1714.	72536.	73933.	0.	1396.
4	4	1607.7	1474.3	0.23746	1.23086	53490.	14062.	0.	455.	-36.	-20281.	39222.	5765.	92676.	112993.	0.	1474.
5	4	1586.7	1471.2	0.23662	1.23738	54982.	18235.	0.	274.	-54.	-22134.	30815.	3625.	85743.	107931.	0.	1471.
6	4	1642.8	1553.4	0.22441	1.24982	89268.	20508.	0.	473.	-54.	-29524.	46709.	8543.	135923.	165501.	0.	1553.
7	4	1648.2	1607.3	0.21606	1.28311	83985.	5487.	0.	410.	0.	-8852.	31084.	2955.	115069.	123920.	0.	1607.
8	4	1691.3	1636.2	0.21292	1.26976	73247.	2110.	0.	438.	0.	-4352.	32011.	1804.	105258.	109610.	0.	1636.
9	4	1501.0	1479.4	0.23593	1.22280	68440.	1756.	0.	539.	0.	-3336.	27334.	1041.	95774.	99110.	0.	1479.

HEAT BALANCE FOR VOLUME ZONES: 4.11E+06 3.93E+04 0. 2.3E+04-1.4E+02-1.4E+05 1.8E+06 7.9E+04 6.0E+06 6.1E+06-9.1E+00

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	DTMAX K	I	J	RDTMAX %	I	J	DQMAX KW	I	J	RDQMAX %	DQTOTAL KW	RDQTOTAL %
7	1	0.00	7	1	0.000	8	3	-0.7	8	1	0.000	-9.1	0.000

HEAT FLUX TO ADDITIONAL HEAT SINKS IN KW

CONVECTIVE FLUX	RADIATIVE FLUX	TOTAL FLUX
15842.3271	21289.3789	37131.7070

SURFACE TEMPERATURES OF ADDITIONAL HEAT SINKS IN K --- represented by TWSINK(i,j)

TWSINK(10, j) =	911.89	0.00	0.00
TWSINK(11, j) =	843.14	835.60	831.04
TWSINK(12, j) =	834.44	821.48	810.45
TWSINK(13, j) =	0.00	0.00	797.67
TWSINK(14, j) =	0.00	0.00	788.54
TWSINK(15, j) =	838.99	847.88	
TWSINK(16, j) =	833.35	837.07	
TWSINK(17, j) =	804.51	805.64	
TWSINK(18, j) =	796.30	799.82	
TWSINK(19, j) =	798.42	792.34	

MEAN FURNACE EXIT TEMPERATURE = 1045.78K AFTER 100 ITERATIONS
TOTAL FURNACE EFFICIENCY = 66.5870 % WITH 140710. KW HEAT RELEASE AND 11572. KW SENSIBLE INPUT

CHEM. HEAT OUTFLUX IN KW :
FUEL= 6.2 SULF.= 0.0 SUM = 6.2

SENS. HEAT OUTFLUX IN KW :
EXT.= 50876.0 REC. = 0.0 SUM = 50876.0

OUTFLUX TO HEAT SINKS IN KW :
RAD.= 78771.0 CONV.= 22629.3 SUM = 101400.3

TOTAL HEAT OUTFLUX : 152282.5 KW

CHEM. HEAT INFLUX IN KW :
FUEL= 140873.8 EVAP.= -143.5 CALC.= 0.0
SULF= 0.0 SUM = 140730.3

SENS. HEAT AIR INFLUX IN KW :
SEC.= 10553.1 PRIM.= 0.0 TRANS.= 0.0
REC.= 0.0 SUM = 10553.1

SENS. HEAT FUEL INFLUX IN KW :
DRY = 466.9 H2OG = 8.6 SUM = 475.5

SENS. HEAT SORBENT INFLUX IN KW :
CAO = 0.0 H2OG = 0.0 CO2G = 0.0 SUM = 0.0

SENS. HEAT BURNER-STEAM INFLUX IN KW: 0.0

SENS. HEAT FLUE GAS INFLUX IN KW: 543.6

TOTAL HEAT INFLUX : 152302.5 KW

GAS ZONE HEAT BALANCE :

HEAT BALANCE -> OUT - IN : -20.0 KW
HEAT BALANCE -> (OUT-IN)/IN : -0.013101 %

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW K	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTN KW	TNEWW K
1	2	1	701.1	0.	903.	118.	-118.	905.	-785.	1023.	1023.	0.	701.1
2	3	1	733.3	0.	2254.	208.	-208.	2311.	-2047.	2519.	2519.	0.	733.3
3	4	1	720.9	0.	1024.	116.	-116.	1033.	-908.	1149.	1149.	0.	720.9

SURFACE ZONE HEAT BALANCE : 0.0E-01 4.2E+03 4.4E+02-4.4E+02 4.2E+03-3.7E+03 4.7E+03 4.7E+03-9.7E-05

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX K	I	J	M	RDTMAX %	I	J	M	DQMAX KW	I	J	M	RDQMAX %	DQTOTAL KW	RDQTOTAL %
3	4	1	0.00	3	4	1	0.000	1	2	1	0.0	1	2	1	0.000	0.0	0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW K	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTN KW	TNEWW K
14	3	3	732.8	0.	1123.	186.	-186.	1201.	-937.	1387.	1387.	0.	732.8
9	4	3	843.6	0.	1084.	109.	-109.	1209.	-975.	1318.	1318.	0.	843.6

SURFACE ZONE HEAT BALANCE : 0.0E-01 2.2E+03 2.9E+02-2.9E+02 2.4E+03-1.9E+03 2.7E+03 2.7E+03-1.1E-04

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX K	I	J	M	RDTMAX %	I	J	M	DQMAX KW	I	J	M	RDQMAX %	DQTOTAL KW	RDQTOTAL %
9	4	3	0.00	9	4	3	0.000	9	4	3	0.0	9	4	3	0.000	0.0	0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW K	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTN KW	TNEWW K
1	2	4	694.6	0.	1914.	273.	-273.	1905.	-1641.	2178.	2178.	0.	694.6
2	3	4	718.0	0.	3777.	408.	-408.	3835.	-3369.	4243.	4243.	0.	718.0
3	4	4	731.4	0.	4698.	477.	-477.	4776.	-4222.	5253.	5253.	0.	731.4
4	4	4	797.4	0.	6821.	455.	-455.	7100.	-6365.	7555.	7555.	0.	797.4
5	4	4	833.0	0.	5190.	274.	-274.	5475.	-4916.	5749.	5749.	0.	833.0
6	4	4	850.8	0.	8777.	473.	-473.	9256.	-8304.	9728.	9728.	0.	850.8
7	4	4	817.2	0.	5806.	409.	-409.	6021.	-5397.	6430.	6430.	0.	817.2
8	4	4	790.0	0.	5040.	438.	-438.	5146.	-4602.	5584.	5584.	0.	790.0
9	4	4	753.6	0.	4593.	430.	-430.	4679.	-4163.	5109.	5109.	0.	753.6
10	3	4	741.2	0.	2938.	332.	-332.	2944.	-2606.	3276.	3276.	0.	741.2
11	3	4	765.0	0.	1872.	311.	-311.	1974.	-1560.	2285.	2285.	0.	765.0
12	3	4	726.0	0.	1398.	296.	-296.	1437.	-1101.	1733.	1733.	0.	726.0
13	3	4	710.9	0.	1213.	276.	-276.	1246.	-938.	1522.	1522.	0.	710.9
14	3	4	701.4	0.	1099.	259.	-259.	1132.	-840.	1391.	1391.	0.	701.4
15	2	4	652.6	0.	396.	206.	-206.	361.	-190.	567.	567.	0.	652.6
16	2	4	646.3	0.	335.	191.	-191.	309.	-144.	500.	500.	0.	646.3
17	2	4	628.7	0.	266.	183.	-183.	239.	-83.	422.	422.	0.	628.7
18	2	4	625.2	0.	213.	164.	-164.	201.	-49.	366.	366.	0.	625.2
19	2	4	647.2	0.	724.	197.	-197.	761.	-528.	957.	957.	0.	647.2

SURFACE ZONE HEAT BALANCE : 0.0E-01 5.7E+04 6.1E-03-6.1E+03 5.9E+04-5.1E+04 6.5E+04 6.5E-04-1.2E-03

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX K	I	J	M	RDTMAX %	I	J	M	DQMAX KW	I	J	M	RDQMAX %	DQTOTAL KW	RDQTOTAL %
19	2	4	0.00	19	2	4	0.000	2	3	4	0.0	18	2	4	0.000	0.0	0.000

THE DISTRIBUTION OF T in K AFTER 100 ITERATIONS

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	1.396E+03	1.474E+03	1.471E+03	1.553E+03	1.607E+03	1.636E+03	1.479E+03	0.000E-01
J= 3	0.000E-01	1.346E+03	1.404E+03	1.566E+03	1.661E+03	1.703E+03	1.694E+03	1.675E+03	1.586E+03	1.542E+03
J= 2	1.343E+03	1.382E+03	1.458E+03	1.566E+03	1.645E+03	1.676E+03	1.679E+03	1.662E+03	1.607E+03	1.554E+03
J= 1	1.380E+03	1.414E+03	1.493E+03	1.567E+03	1.626E+03	1.655E+03	1.654E+03	1.637E+03	1.595E+03	1.514E+03

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	1.462E+03	1.389E+03	1.327E+03	1.280E+03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	1.485E+03	1.421E+03	1.380E+03	1.304E+03	1.241E+03	1.192E+03	1.123E+03	1.070E+03	1.047E+03
J= 1	1.444E+03	1.394E+03	1.372E+03	1.310E+03	1.250E+03	1.215E+03	1.129E+03	1.065E+03	1.043E+03

I	J	CO2 KG/KG	H2O KG/KG	N2 KG/KG	O2 KG/KG	VOL KG/KG	SO2 KG/KG	ASH KG/KG	CHAR KG/KG	SOOT KG/KG
1	1	0.1966	0.0805	0.7115	0.0102	0.0000	0.0012	0.0000	0.0000	0.0000
2	1	0.1966	0.0805	0.7115	0.0102	0.0000	0.0012	0.0000	0.0000	0.0000
3	1	0.1968	0.0808	0.7115	0.0098	0.0000	0.0012	0.0000	0.0000	0.0000
4	1	0.1972	0.0814	0.7113	0.0089	0.0000	0.0012	0.0000	0.0000	0.0000
5	1	0.1981	0.0830	0.7109	0.0068	0.0000	0.0012	0.0000	0.0000	0.0000
6	1	0.1988	0.0847	0.7105	0.0048	0.0001	0.0011	0.0000	0.0000	0.0000
7	1	0.1986	0.0856	0.7104	0.0041	0.0002	0.0011	0.0000	0.0000	0.0000
8	1	0.1971	0.0861	0.7109	0.0047	0.0001	0.0011	0.0000	0.0000	0.0000
9	1	0.1935	0.0857	0.7118	0.0080	0.0000	0.0011	0.0000	0.0000	0.0000
10	1	0.1927	0.0856	0.7120	0.0087	0.0000	0.0011	0.0000	0.0000	0.0000
11	1	0.1925	0.0856	0.7119	0.0089	0.0000	0.0011	0.0000	0.0000	0.0000
12	1	0.1921	0.0855	0.7120	0.0094	0.0000	0.0011	0.0000	0.0000	0.0000
13	1	0.1908	0.0852	0.7123	0.0106	0.0000	0.0010	0.0000	0.0000	0.0000
14	1	0.1887	0.0848	0.7128	0.0127	0.0000	0.0010	0.0000	0.0000	0.0000
15	1	0.1882	0.0847	0.7129	0.0132	0.0000	0.0010	0.0000	0.0000	0.0000
16	1	0.1882	0.0847	0.7128	0.0132	0.0000	0.0010	0.0000	0.0000	0.0000
17	1	0.1882	0.0847	0.7128	0.0132	0.0000	0.0010	0.0000	0.0000	0.0000
18	1	0.1882	0.0847	0.7128	0.0132	0.0000	0.0010	0.0000	0.0000	0.0000
19	1	0.1882	0.0847	0.7128	0.0132	0.0000	0.0010	0.0000	0.0000	0.0000
1	2	0.1966	0.0804	0.7115	0.0103	0.0000	0.0012	0.0000	0.0000	0.0000
2	2	0.1965	0.0803	0.7116	0.0104	0.0000	0.0012	0.0000	0.0000	0.0000
3	2	0.1965	0.0802	0.7116	0.0105	0.0000	0.0012	0.0000	0.0000	0.0000
4	2	0.1966	0.0804	0.7114	0.0105	0.0000	0.0012	0.0000	0.0000	0.0000
5	2	0.1976	0.0818	0.7109	0.0085	0.0001	0.0012	0.0000	0.0000	0.0000
6	2	0.1991	0.0841	0.7100	0.0055	0.0002	0.0012	0.0000	0.0000	0.0000
7	2	0.1995	0.0858	0.7096	0.0035	0.0004	0.0011	0.0000	0.0000	0.0000
8	2	0.1974	0.0865	0.7104	0.0042	0.0003	0.0011	0.0000	0.0000	0.0000
9	2	0.1907	0.0852	0.7121	0.0109	0.0001	0.0010	0.0000	0.0000	0.0000
10	2	0.1900	0.0851	0.7123	0.0114	0.0000	0.0010	0.0000	0.0000	0.0000

11	2	0.1901	0.0852	0.7123	0.0114	0.0000	0.0010	0.0000	0.0000	0.0000
12	2	0.1899	0.0851	0.7124	0.0115	0.0000	0.0010	0.0000	0.0000	0.0000
13	2	0.1894	0.0850	0.7125	0.0120	0.0000	0.0010	0.0000	0.0000	0.0000
14	2	0.1874	0.0846	0.7131	0.0139	0.0000	0.0010	0.0000	0.0000	0.0000
15	2	0.1875	0.0846	0.7131	0.0138	0.0000	0.0010	0.0000	0.0000	0.0000
16	2	0.1876	0.0846	0.7130	0.0137	0.0000	0.0010	0.0000	0.0000	0.0000
17	2	0.1876	0.0846	0.7130	0.0138	0.0000	0.0010	0.0000	0.0000	0.0000
18	2	0.1876	0.0846	0.7130	0.0138	0.0000	0.0010	0.0000	0.0000	0.0000
19	2	0.1876	0.0846	0.7130	0.0138	0.0000	0.0010	0.0000	0.0000	0.0000
2	3	0.1964	0.0802	0.7116	0.0106	0.0000	0.0012	0.0000	0.0000	0.0000
3	3	0.1962	0.0799	0.7115	0.0112	0.0000	0.0012	0.0000	0.0000	0.0000
4	3	0.1955	0.0790	0.7121	0.0121	0.0001	0.0012	0.0000	0.0000	0.0000
5	3	0.1935	0.0785	0.7109	0.0149	0.0009	0.0012	0.0000	0.0000	0.0001
6	3	0.1968	0.0813	0.7100	0.0096	0.0012	0.0012	0.0000	0.0000	0.0000
7	3	0.1992	0.0844	0.7080	0.0047	0.0025	0.0011	0.0000	0.0000	0.0000
8	3	0.1977	0.0862	0.7092	0.0042	0.0016	0.0011	0.0000	0.0000	0.0000
9	3	0.1836	0.0829	0.7134	0.0186	0.0006	0.0010	0.0000	0.0000	0.0000
10	3	0.1853	0.0839	0.7136	0.0161	0.0001	0.0010	0.0000	0.0000	0.0000
11	3	0.1855	0.0841	0.7136	0.0157	0.0000	0.0010	0.0000	0.0000	0.0000
12	3	0.1856	0.0841	0.7136	0.0156	0.0000	0.0010	0.0000	0.0000	0.0000
13	3	0.1856	0.0841	0.7137	0.0156	0.0000	0.0010	0.0000	0.0000	0.0000
14	3	0.1856	0.0841	0.7137	0.0156	0.0000	0.0010	0.0000	0.0000	0.0000
3	4	0.1959	0.0794	0.7114	0.0121	0.0000	0.0012	0.0000	0.0000	0.0000
4	4	0.1739	0.0708	0.7125	0.0351	0.0054	0.0011	0.0000	0.0001	0.0011
5	4	0.1508	0.0629	0.7118	0.0594	0.0115	0.0009	0.0000	0.0002	0.0023
6	4	0.1668	0.0699	0.7097	0.0415	0.0093	0.0010	0.0000	0.0002	0.0016
7	4	0.1905	0.0796	0.7017	0.0130	0.0139	0.0011	0.0000	0.0000	0.0002
8	4	0.1921	0.0835	0.7081	0.0083	0.0068	0.0011	0.0000	0.0000	0.0000
9	4	0.1602	0.0739	0.7192	0.0441	0.0018	0.0009	0.0000	0.0000	0.0000

THE DISTRIBUTION OF QG in kW/m**3 AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	7.659E+01	2.748E+02	2.704E+02	4.072E+02	1.830E+02	1.117E+02	5.632E+01	0.000E-01
J= 3	0.000E-01	4.607E+01	8.158E+00	4.998E+01	1.362E+02	7.704E+01	7.993E+01	6.830E+01	5.717E+01	6.798E+01
J= 2	4.888E+01	2.203E+01	2.964E-01	1.999E+01	2.638E-01	3.470E+01	3.218E+01	2.912E+01	3.455E+01	5.587E+01
J= 1	5.493E+01	1.439E+01	1.303E+01	2.428E+01	2.317E+01	1.070E+01	3.649E+01	3.744E+01	4.177E+01	1.475E+02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	9.524E+01	8.232E+01	6.834E+01	6.816E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	7.424E+01	8.031E+01	3.195E+01	2.219E+01	9.369E-01	9.437E+01	6.692E+01	5.707E+01	3.060E+01
J= 1	7.129E+01	5.095E+01	6.856E+00	3.491E+01	7.550E+01	7.828E+01	5.970E+01	5.391E+01	2.576E+01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF TRES in sec AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.883E-01	1.067E-01	5.974E-02	6.480E-02	6.454E-02	8.588E-02	8.376E-02	0.000E-01
J= 3	0.000E-01	2.383E-01	1.597E-01	1.433E-01	9.125E-02	8.579E-02	7.205E-02	7.700E-02	7.564E-02	9.231E-02
J= 2	1.977E-01	9.795E-02	1.329E-01	1.113E-01	7.466E-02	6.499E-02	5.396E-02	6.154E-02	6.788E-02	7.646E-02
J= 1	7.435E-02	6.894E-02	1.095E-01	1.031E-01	7.056E-02	6.354E-02	5.018E-02	6.537E-02	7.426E-02	7.592E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	1.140E-01	1.193E-01	1.237E-01	1.607E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	1.115E-01	1.148E-01	1.116E-01	5.506E-02	6.504E-02	6.903E-02	9.134E-02	9.334E-02	1.560E-01
J= 1	1.137E-01	1.155E-01	9.076E-02	5.204E-02	4.720E-02	5.185E-02	9.174E-02	9.374E-02	1.566E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOHR in kW AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.397E+03	2.032E+04	2.202E+04	2.805E+04	8.852E+03	1.231E+03	1.383E+01	0.000E-01
J= 3	0.000E-01	0.000E-01	4.149E+01	7.800E+03	1.242E+04	1.271E+04	9.681E+02	1.383E+01	1.383E+01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	5.532E+01	3.458E+02	1.660E+02	1.383E+01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.383E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOL in kg/(kg,mixture) AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.210E-05	6.494E-03	1.364E-02	9.210E-03	1.111E-03	7.713E-06	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	5.962E-05	7.790E-04	1.887E-04	2.142E-05	3.873E-06	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	2.511E-05	9.557E-06	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

J= 4	7.209E+02
J= 3	7.333E+02
J= 2	7.011E+02

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J= 1   3.500E+02

        M1= 1

     THE DISTRIBUTION OF  QIN in kW/m**2 AFTER  100 ITERATIONS

J= 4   1.266E+02
J= 3   1.432E+02
J= 2   1.031E+02
J= 1   1.385E+02

        M1= 1

     THE DISTRIBUTION OF  QW in kW/m**2 AFTER  100 ITERATIONS

J= 4  -8.782E+01
J= 3  -9.776E+01
J= 2  -7.201E+01
J= 1  -1.376E+02

        M1= 1

     THE DISTRIBUTION OF  TW in K AFTER  100 ITERATIONS

J= 4   8.436E+02
J= 3   7.328E+02
J= 2   8.000E+02
J= 1   8.000E+02

        MJ= 1

     THE DISTRIBUTION OF  QIN in kW/m**2 AFTER  100 ITERATIONS

J= 4   1.482E+02
J= 3   7.442E+01
J= 2   3.216E+01
J= 1   3.662E+01

        MJ= 1

     THE DISTRIBUTION OF  QW in kW/m**2 AFTER  100 ITERATIONS

J= 4  -9.301E+01
J= 3  -4.870E+01
J= 2  -8.939E+00
J= 1  -1.340E+01

        MJ= 1

     THE DISTRIBUTION OF  TW in K AFTER  100 ITERATIONS

M4= 1   6.946E+02  7.180E+02  7.314E+02  7.974E+02  8.330E+02  8.508E+02  8.172E+02  7.900E+02  7.536E+02  7.412E+02
          I= 1       I= 2       I= 3       I= 4       I= 5       I= 6       I= 7       I= 8       I= 9       I=10

M4= 1   7.650E+02  7.260E+02  7.109E+02  7.014E+02  6.526E+02  6.463E+02  6.287E+02  6.252E+02  6.472E+02
          I=11       I=12       I=13       I=14       I=15       I=16       I=17       I=18       I=19

     THE DISTRIBUTION OF  QIN in kW/m**2 AFTER  100 ITERATIONS

M4= 1   9.504E+01  1.240E+02  1.398E+02  2.216E+02  2.675E+02  2.890E+02  2.443E+02  2.088E+02  1.659E+02  1.490E+02
          I= 1       I= 2       I= 3       I= 4       I= 5       I= 6       I= 7       I= 8       I= 9       I=10

M4= 1   9.272E+01  6.750E+01  5.854E+01  5.320E+01  2.168E+01  1.854E+01  1.357E+01  1.143E+01  3.249E+01
          I=11       I=12       I=13       I=14       I=15       I=16       I=17       I=18       I=19

     THE DISTRIBUTION OF  QW in kW/m**2 AFTER  100 ITERATIONS

M4= 1  -6.682E+01 -8.550E+01 -9.625E+01 -1.491E+02 -1.775E+02 -1.918E+02 -1.649E+02 -1.431E+02 -1.140E+02 -1.041E+02
          I= 1       I= 2       I= 3       I= 4       I= 5       I= 6       I= 7       I= 8       I= 9       I=10

M4= 1  -6.155E+01 -4.597E+01 -3.990E+01 -3.614E+01 -1.662E+01 -1.407E+01 -1.056E+01 -8.474E+00 -2.166E+01
          I=11       I=12       I=13       I=14       I=15       I=16       I=17       I=18       I=19
iter. no.=100,  act.err.=   0.0672 %,  avg.err.=   4.2807 %,  20 it.err.=  -0.1875 %,  hb.err.=  -0.0131 %

BALANCE OF TOTAL RADIATIVE EXCHANGE
-----------------------------------

NUMBER OF BEAMS =  354960

SUM OF EMITTED RADIATION (KW) :
VOLUME ZONES      WALL SECTIONS          M=1        M=2        M=3        M=4          TOTAL
 1.918E+06         2.439E+04        5.146E+02  7.609E+03  8.707E+02  1.540E+04      1.942E+06

SUM OF ABSORBED RADIATION (KW) :
VOLUME ZONES      WALL SECTIONS          M=1        M=2        M=3        M=4          TOTAL
 1.875E+06         6.659E+04        4.828E+03  0.000E-01  2.967E+03  5.880E+04      1.942E+06

SUM OF NET EMITTED RADIATION (KW) :
VOLUME ZONES      WALL SECTIONS          M=1        M=2        M=3        M=4          TOTAL
 4.218E+04        -4.220E+04        -4.313E+03  7.609E+03 -2.096E+03 -4.340E+04     -1.496E+01
```

ERROR OF RADIATIVE ENERGY BALANCE =-7.704E-04 %

TOTAL HEAT BALANCE :
HEAT TO FURNACE WALLS IN KW :
RAD.= 56670.1 CONV.= 6787.2 SUM = 63457.3
HEAT TO FURNACE EXIT IN KW :
RAD.= 168.1 CONV.= 0.0 SUM = 168.1
HEAT TO FURNACE HOPPER IN KW :
RAD.= 575.2 CONV.= 0.0 SUM = 575.2

HEAT FLUXES TO ZONAL HEAT EXCHANGERS IN KW :

ZONE I	BY RADI.	BY CONV.	SUM
10	1839.1	156.5	1995.5
11	4402.4	1676.1	6078.5
12	3661.4	1544.4	5205.7
13	1357.8	702.6	2060.4
14	1165.9	652.3	1818.2
15	2716.3	1414.1	4130.4
16	2206.1	1289.4	3495.5
17	1953.6	3986.9	5940.4
18	1588.4	3362.8	4951.2
19	398.5	1057.3	1455.8

CLOSURE OF TOTAL HEAT BALANCE :
HEAT FLUX FROM FLUE GAS : 101400.3 KW
HEAT FLUX TO HEAT SINKS : 101332.2 KW
DIFFERENCE : -68.1 KW
ACT. PERCENTAGE ERROR : 0.067176 %
AVG. PERCENTAGE ERRRR : 4.280663 %
AVG. ERROR OF LAST 20 IT. : -0.187462 %

I INDEX	X-CO-ORDINATE M	NET NORM. MASS FLUX -	MEAN TEMP. K	MEAN RES. TIME Sec	SUM OF RES. TIME Sec
1	0.988	0.2466	1343.11	0.6020	1.6432
2	2.964	0.5754	1374.98	0.6086	1.0379
3	4.912	0.5754	1440.12	0.7336	0.3668
4	6.772	0.5489	1546.61	0.6634	0.3317
5	8.247	0.6221	1600.37	0.3587	0.8427
6	9.722	0.9348	1647.36	0.3622	1.2032
7	11.314	0.9619	1664.76	0.2685	1.5185
8	12.700	0.8578	1660.81	0.3023	1.8040
9	14.185	1.0000	1593.71	0.3145	2.1124
10	15.608	1.0000	1543.17	0.1966	2.3679
11	16.919	1.0000	1467.13	0.2229	2.5777
12	18.279	1.0000	1399.44	0.2337	2.8059
13	19.640	1.0000	1348.62	0.2425	3.0440
14	21.000	1.0000	1305.51	0.2533	3.2919
15	22.501	1.0000	1244.88	0.1336	3.4853
16	24.144	1.0000	1197.37	0.1387	3.6214
17	25.834	1.0000	1124.47	0.1560	3.7688
18	27.570	1.0000	1068.72	0.1641	3.9288
19	29.592	1.0000	1045.78	0.2230	4.1224

MEAN GAS SPECIES CONCENTRATION ALONG FURNACE :

I	X-CO-ORD. M	CO2 VOL% WET	H2O VOL% WET	N2 VOL% WET	O2 VOL% WET	VOL VOL% WET	SO2 VOL% WET
1	0.988	12.8839	12.8788	73.2591	0.9253	0.0000	0.0529
2	2.964	12.8802	12.8614	73.2667	0.9388	0.0000	0.0529
3	4.912	12.8721	12.8269	73.2717	0.9758	0.0003	0.0531
4	6.772	12.5438	12.4881	73.2604	1.4449	0.2107	0.0521
5	8.247	11.8646	11.8970	73.0581	2.4288	0.7023	0.0492
6	9.722	12.1350	12.3066	72.8505	1.9146	0.7437	0.0497
7	11.314	12.8089	13.2329	72.2874	0.6285	0.9914	0.0510
8	12.700	12.7745	13.6077	72.5812	0.4826	0.5047	0.0493
9	14.185	12.1794	13.3583	73.0001	1.3531	0.0633	0.0458
10	15.608	12.2275	13.4526	73.0199	1.2420	0.0122	0.0458
11	16.919	12.2353	13.4709	73.0244	1.2220	0.0016	0.0458
12	18.279	12.2299	13.4701	73.0268	1.2274	0.0000	0.0457
13	19.640	12.2103	13.4593	73.0324	1.2524	0.0000	0.0456
14	21.000	12.2385	13.4752	73.0227	1.2179	0.0000	0.0458
15	22.501	12.2443	13.4783	73.0183	1.2132	0.0000	0.0458
16	24.144	12.2400	13.4761	73.0189	1.2192	0.0000	0.0458
17	25.834	12.2400	13.4762	73.0181	1.2200	0.0000	0.0458
18	27.570	12.2399	13.4762	73.0175	1.2206	0.0000	0.0458
19	29.592	12.2399	13.4762	73.0175	1.2206	0.0000	0.0458

OTHER MEAN QUANTITIES ALONG FURNACE :

I	X-CO-ORD. M	CARBON IN ASH %	TOT. FUEL HEAT REL. %	VOLATILE HEAT REL. %	SO2 REDUCTION %	CAO UTIL. %
1	0.988	39.6596	0.0000	0.0000	0.0000	0.0000
2	2.964	39.8560	0.0001	0.0000	0.0000	0.0000
3	4.912	40.3654	1.0212	1.2352	0.0000	0.0000
4	6.772	41.8043	21.1298	25.4276	0.0000	0.0000
5	8.247	43.2646	46.1386	55.3088	0.0000	0.0000
6	9.722	42.9461	76.8787	90.4513	0.0000	0.0000
7	11.314	41.4741	87.3030	98.8955	0.0000	0.0000
8	12.700	40.6436	93.7800	99.9644	0.0000	0.0000
9	14.185	39.2276	98.9875	99.9881	0.0000	0.0000
10	15.608	38.6403	99.7992	99.9881	0.0000	0.0000
11	16.919	38.3220	99.9638	99.9881	0.0000	0.0000
12	18.279	38.1543	99.9858	99.9881	0.0000	0.0000
13	19.640	38.0610	99.9858	99.9881	0.0000	0.0000
14	21.000	37.9958	99.9858	99.9881	0.0000	0.0000
15	22.501	37.9755	99.9858	99.9881	0.0000	0.0000
16	24.144	37.9671	99.9858	99.9881	0.0000	0.0000
17	25.834	37.9622	99.9858	99.9881	0.0000	0.0000
18	27.570	37.9592	99.9858	99.9881	0.0000	0.0000
19	29.592	37.9584	99.9858	99.9881	0.0000	0.0000

Listing 3.7. Contents of file BOILER.DAT (Case 2).

0201075.0 075

```
 63457.26      0.00      0.00      0.00      0.00
     0.00      0.00      0.00      0.00   2163.72
  6078.51   5205.73   2060.39   1818.15   4130.42
  3495.49   5940.44   4951.18   1455.75      0.00
     0.00      0.00      0.00      0.00      0.00
     0.00      0.00      0.00      0.00      0.00
1343.11 1374.98 1440.12 1546.61 1600.37
1647.36 1664.76 1660.81 1593.71 1543.17
1467.13 1399.44 1348.62 1305.51 1244.88
1197.37 1124.47 1068.72 1045.78    0.00
   0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00
 0.1288  0.1288  0.1287  0.1254  0.1186
 0.1213  0.1281  0.1277  0.1218  0.1223
 0.1224  0.1223  0.1221  0.1224  0.1224
 0.1224  0.1224  0.1224  0.1224  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.1288  0.1286  0.1283  0.1249  0.1190
 0.1231  0.1323  0.1361  0.1336  0.1345
 0.1347  0.1347  0.1346  0.1348  0.1348
 0.1348  0.1348  0.1348  0.1348  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.7331  0.7332  0.7333  0.7352  0.7381
 0.7364  0.7333  0.7314  0.7311  0.7308
 0.7307  0.7307  0.7308  0.7307  0.7306
 0.7306  0.7306  0.7306  0.7306  1.0000
 1.0000  1.0000  1.0000  1.0000  1.0000
 1.0000  1.0000  1.0000  1.0000  1.0000
 0.0093  0.0094  0.0098  0.0144  0.0243
 0.0191  0.0063  0.0048  0.0135  0.0124
 0.0122  0.0123  0.0125  0.0122  0.0121
 0.0122  0.0122  0.0122  0.0122  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0156  0.7776  0.2067
  57.8488
  52.5703
   3.4903
 0.0001  0.9830  0.0168  0.0001
 43277.40
 41052.96
152426.06
```

Listing 3.8. Contents of file REBURN.DAT (Case 2).

```
c UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
c GAS REBURNING
c
c
c
c
c
c
c
c
0201075.0
   0    1    0
  19    3    1    1
   4    5    6
   7
   9
  0.0200  0.0000
  0.8603  0.1174  0.0100  0.0061  0.0061  3.227536
  0.9880  2.9639  4.9119  6.7719  8.2469  9.7219 11.3145 12.6996 14.1847 15.6083
 16.9194 18.2795 19.6396 20.9997 22.5012 24.1442 25.8338 27.5699 29.5919
 1343.11 1374.98 1440.12 1546.61 1600.37 1647.36 1664.76 1660.81 1593.71 1543.17
 1467.13 1399.44 1348.62 1305.51 1244.88 1197.37 1124.47 1068.72 1045.78
  0.6020  0.6086  0.7336  0.6634  0.3587  0.3622  0.2685  0.3023  0.3145  0.1966
  0.2229  0.2337  0.2425  0.2533  0.1336  0.1387  0.1560  0.1641  0.2230
```

Listing 3.9. Record of RBINPT interactive session (Case 2).

```
RBINPT

-- This is an interactive program (RBINPT) for preparing
   a data file to run the EER Reburing NOx Model
-- Version 6.60, May, 1992


************************ Attention *********************
 This interactive program accepts inputs from keyboard
 in UPPER case only.
 -- Please set your keyboard to the UPPER case symbols
    (i.e., Caps Lock !).
 -- To continue, type C and press Return (or Enter)
*****************************************************

C

 Chapter 1 :
-------------
PARAMETERS OF FILE SPECIFICATION


Default output-file name (from the RBINPT code) : RBIN0201.075

          Press: D for the default file name
                 C to change the file name
                 Return to continue

Default output-file name (from the RBNOX code) : RBOT0201.075

          Press: D for the default file name
                 C to change the file name
                 Return to continue

You can include your comments on the front page
of the printout :
-- Comment block may consist of 10 lines
-- Each line may have a max. of 78 characters
To continue, press Return

Current comments are:
OIL FIRING WITH GAS REBURN AT 75% LOAD
SR1=1.06 SR2=0.9 SR3=1.06
0.24 SECONDS MIXING TIME FOR OFA AND RBN FUEL
* Line  4 is blank *
* Line  5 is blank *
* Line  6 is blank *
* Line  7 is blank *
* Line  8 is blank *
* Line  9 is blank *
* Line 10 is blank *

-- Default comments are those used in the 2DHT runs

          Press: D for the default comments
                 C to change the current comments
                 Return to continue  C

OIL FIRING WITH GAS REBURN AT 75% LOAD

          Press: C to change
                 Return to continue

SR1=1.06 SR2=0.9 SR3=1.06
```

```
         Press: C to change
                Return to continue  C
SR1=1.1 SR2=0.9 SR3=1.06

0.24 SECONDS MIXING TIME FOR OFA AND RBN FUEL

         Press: C to change
                Return to continue

" Line  4 is blank "

         Press: C to change
                Return to continue

" Line  5 is blank "

         Press: C to change
                Return to continue

" Line  6 is blank "

         Press: C to change
                Return to continue

" Line  7 is blank "

         Press: C to change
                Return to continue

" Line  8 is blank "

         Press: C to change
                Return to continue

" Line  9 is blank "

         Press: C to change
                Return to continue

" Line 10 is blank "

         Press: C to change
                Return to continue


Please wait: reading reactor 1 data file ...

Scan reaction mechanism ?
Enter Y or N  Y

                  **********************************
                  *  Reaction mechanism follows    *
                  **********************************

Press Return to continue

  1  1H    + 1O2   + 0     = 1HO   + 1O    + 0      1 0.51E+17 0.82  16.500
  2  1H2   + 1O    + 0     = 1HO   + 1H    + 0      1 0.18E+11-1.00   8.800
  3  1H2   + 1HO   + 0     = 1H2O  + 1H    + 0      1 0.12E+10-1.30   3.600
  4  1H    + 1H    + 1M    = 1H2   + 1M    + 0      2 0.10E+19 1.00   0.000
  5  1H    + 1H    + 1H2   = 1H2   + 1H2   + 0      2 0.97E+17 0.60   0.000
  6  1H    + 1H    + 1H2O  = 1H2   + 1H2O  + 0      2 0.60E+20 1.20   0.000
  7  1H    + 1H    + 1CO2  = 1H2   + 1CO2  + 0      2 0.55E+21 2.00   0.000
```

8	1H	+	1O2	+	1M	=	1HO2	+	1M	+	0	2	0.21E+19	1.00	0.000
9	1HO	+	1HO	+	0	=	1H2O	+	1O	+	0	1	0.60E+09	-1.30	0.000
10	1HO	+	1H	+	1M	=	1H2O	+	1M	+	0	2	0.75E+24	2.60	0.000
11	1HO2	+	1H	+	0	=	1H2	+	1O2	+	0	1	0.25E+14	0.00	0.700
12	1HO2	+	1H	+	0	=	1HO	+	1HO	+	0	1	0.25E+15	0.00	1.900
13	1HO2	+	1H	+	0	=	1H2O	+	1O	+	0	1	0.50E+14	0.00	1.000
14	1HO2	+	1O	+	0	=	1HO	+	1O2	+	0	1	0.48E+14	0.00	1.000
15	1HO2	+	1HO	+	0	=	1H2O	+	1O2	+	0	1	0.50E+14	0.00	1.000
16	1HO2	+	1HO2	+	0	=	1H2O2	+	1O2	+	0	1	0.20E+13	0.00	0.000
17	1H2O2	+	1M	+	0	=	1HO	+	1HO	+	1M	5	0.13E+34	4.86	53.210
18	1H2O2	+	1H	+	0	=	1HO2	+	1H2	+	0	1	0.17E+13	0.00	3.700
19	1H2O2	+	1H	+	0	=	1H2O	+	1HO	+	0	1	0.32E+15	0.00	8.900
20	1H2O2	+	1HO	+	0	=	1H2O	+	1HO2	+	0	1	0.10E+14	0.00	1.800

Press Return to continue

21	1O2	+	1M	+	0	=	1O	+	1O	+	1M	5	0.19E+12	-0.50	95.600
22	1O	+	1H	+	1M	=	1HO	+	1M	+	0	2	0.10E+17	0.00	0.000
23	1O	+	1HO	+	1M	=	1HO2	+	1M	+	0	2	0.10E+18	0.00	0.000
24	1CO	+	1O	+	1M	=	1CO2	+	1M	+	0	2	0.24E+16	0.00	4.340
25	1CO	+	1O2	+	0	=	1CO2	+	1O	+	0	1	0.25E+13	0.00	47.700
26	1CH4	+	1M	+	0	=	1CH3	+	1H	+	1M	5	0.20E+18	0.00	88.000
27	1CH4	+	1H	+	0	=	1CH3	+	1H2	+	0	1	0.22E+05	-3.00	8.700
28	1CH4	+	1CH2	+	0	=	1CH3	+	1CH3	+	0	1	0.13E+14	0.00	9.500
29	1CH4	+	1CH	+	0	=	1C2H4	+	1H	+	0	1	0.60E+14	0.00	0.000
30	1CH3	+	1CH3	+	1M	=	1C2H6	+	1M	+	0	2	0.19E+33	4.74	0.000
31	1C2H5	+	1H	+	0	=	1CH3	+	1CH3	+	0	1	0.30E+14	0.00	0.000
32	1CH3	+	1CH3	+	0	=	1C2H4	+	1H2	+	0	1	0.21E+15	0.00	19.200
33	1CH3	+	1M	+	0	=	1CH2	+	1H	+	1M	5	0.10E+17	0.00	90.600
34	1CH3	+	1H	+	0	=	1CH2	+	1H2	+	0	1	0.90E+14	0.00	15.100
35	1CH3	+	1CH2	+	0	=	1C2H4	+	1H	+	0	1	0.40E+14	0.00	0.000
36	1CH3	+	1CH	+	0	=	1C2H3	+	1H	+	0	1	0.30E+14	0.00	0.000
37	1CH3	+	1C	+	0	=	1C2H2	+	1H	+	0	1	0.50E+14	0.00	0.000
38	1CH2	+	1C2H6	+	0	=	1C2H5	+	1CH3	+	0	1	0.22E+14	0.00	8.700
39	1CH2	+	1C2H3	+	0	=	1C2H2	+	1CH3	+	0	1	0.30E+14	0.00	0.000
40	1CH2	+	1H	+	0	=	1CH	+	1H2	+	0	1	0.62E+18	1.45	0.000

Press Return to continue

41	1CH2	+	1CH	+	0	=	1C2H2	+	1H	+	0	1	0.40E+14	0.00	0.000
42	1CH2	+	1CH2	+	0	=	1C2H2	+	1H2	+	0	1	0.32E+14	0.00	0.000
43	1CH2	+	1CH2	+	0	=	1C2H3	+	1H	+	0	1	0.50E+13	0.00	0.000
44	1CH2	+	1C	+	0	=	1C2H	+	1H	+	0	1	0.50E+14	0.00	0.000
45	1CH	+	1H	+	0	=	1C	+	1H2	+	0	1	0.50E+14	0.00	0.000
46	1C2H6	+	1H	+	0	=	1C2H5	+	1H2	+	0	1	0.54E+03	-3.50	5.200
47	1C2H5	+	1M	+	0	=	1C2H4	+	1H	+	1M	5	0.41E+40	-7.05	39.720
48	1C2H4	+	1M	+	0	=	1C2H2	+	1H2	+	1M	5	0.26E+18	0.00	79.300
49	1C2H4	+	1H	+	0	=	1C2H3	+	1H2	+	0	1	0.15E+08	-2.00	6.000
50	1C2H3	+	1M	+	0	=	1C2H2	+	1H	+	1M	5	0.31E+45	8.25	49.650
51	1C2H3	+	1H	+	0	=	1C2H2	+	1H2	+	0	1	0.20E+14	0.00	0.000
52	1C2H3	+	1C2H	+	0	=	1C2H2	+	1C2H2	+	0	1	0.30E+14	0.00	0.000
53	1C2H2	+	1M	+	0	=	1C2H	+	1H	+	1M	5	0.40E+17	0.00	107.000
54	1C2H	+	1H2	+	0	=	1C2H2	+	1H	+	0	1	0.41E+07	-2.40	0.900
55	1CH4	+	1O2	+	0	=	1CH3	+	1HO2	+	0	1	0.79E+14	0.00	56.000
56	1CH4	+	1HO	+	0	=	1CH3	+	1H2O	+	0	1	0.35E+04	-3.10	2.000
57	1CH4	+	1HO2	+	0	=	1CH3	+	1H2O2	+	0	1	0.20E+14	0.00	18.000
58	1CH4	+	1O	+	0	=	1CH3	+	1HO	+	0	1	0.12E+08	-2.10	7.600
59	1CH3	+	1O2	+	0	=	1CH3O	+	1O	+	0	1	0.70E+13	0.00	25.700
60	1CH3	+	1O	+	0	=	1CH2O	+	1H	+	0	1	0.10E+15	0.00	0.000

Press Return to continue

61	1CH3	+	1HO	+	0	=	1CH3O	+	1H	+	0	1	0.54E+14	0.00	0.000
62	1CH3	+	1HO	+	0	=	1CH2	+	1H2O	+	0	1	0.15E+14	0.00	5.000

```
 63  1CH3   + 1HO2  + 0     = 1CH3O  + 1HO   + 0      1 0.20E+14 0.00   0.000
 64  1CH3   + 1CH2O + 0     = 1CHO   + 1CH4  + 0      1 0.10E+11-0.50   6.000
 65  1CH3   + 1CHO  + 0     = 1CO    + 1CH4  + 0      1 0.30E+12-0.50   0.000
 66  1CH2   + 1O2   + 0     = 1CO    + 1H2O  + 0      1 0.39E+13 0.00   1.400
 67  1CH2   + 1O2   + 0     = 1CO    + 1HO   + 1H     3 0.91E+13 0.00   1.400
 68  1CH2   + 1O    + 0     = 1CO    + 1H    + 1H     3 0.30E+14 0.00   0.000
 69  1CH2   + 1O    + 0     = 1CO    + 1H2   + 0      1 0.50E+14 0.00   0.000
 70  1CH2   + 1HO   + 0     = 1CH2O  + 1H    + 0      1 0.30E+14 0.00   0.000
 71  1CH2   + 1HO   + 0     = 1CH    + 1H2O  + 0      1 0.45E+14 0.00   3.000
 72  1CH2   + 1CO2  + 0     = 1CO    + 1CH2O + 0      1 0.11E+12 0.00   1.000
 73  1CH    + 1O    + 0     = 1CO    + 1H    + 0      1 0.40E+14 0.00   0.000
 74  1CH    + 1HO   + 0     = 1CHO   + 1H    + 0      1 0.30E+14 0.00   0.000
 75  1CH    + 1O2   + 0     = 1CO    + 1HO   + 0      1 0.20E+14 0.00   0.000
 76  1CH    + 1CO2  + 0     = 1CHO   + 1CO   + 0      1 0.34E+13 0.00   0.700
 77  1C2H6  + 1O    + 0     = 1C2H5  + 1HO   + 0      1 0.30E+08-2.00   5.100
 78  1C2H6  + 1HO   + 0     = 1C2H5  + 1H2O  + 0      1 0.63E+07-2.00   0.600
 79  1C2H6  + 1O2   + 0     = 1C2H5  + 1HO2  + 0      1 0.10E+14 0.00  51.000
 80  1C2H5  + 1O2   + 0     = 1C2H4  + 1HO2  + 0      1 0.20E+13 0.00   5.000

Press Return to continue

 81  1C2H5  + 1O    + 0     = 1CH2O  + 1CH3  + 0      1 0.50E+14 0.00   0.000
 82  1C2H4  + 1HO   + 0     = 1C2H3  + 1H2O  + 0      1 0.63E+13 0.00   1.200
 83  1C2H4  + 1HO   + 0     = 1CH2O  + 1CH3  + 0      1 0.20E+13 0.00   1.000
 84  1C2H4  + 1O    + 0     = 1CHO   + 1CH3  + 0      1 0.16E+10-1.20   0.700
 85  1C2H4  + 1O    + 0     = 1CH2O  + 1CH2  + 0      1 0.25E+14 0.00   5.000
 86  1C2H3  + 1O2   + 0     = 1C2H2  + 1HO2  + 0      1 0.10E+13 0.00  10.000
 87  1C2H3  + 1HO   + 0     = 1C2H2  + 1H2O  + 0      1 0.50E+13 0.00   0.000
 88  1C2H2  + 1O2   + 0     = 1CHO   + 1CHO  + 0      1 0.40E+13 0.00  28.000
 89  1C2H2  + 1O    + 0     = 1CH2   + 1CO   + 0      1 0.41E+09-1.50   1.700
 90  1C2H2  + 1HO   + 0     = 1C2H   + 1H2O  + 0      1 0.63E+13 0.00   7.000
 91  1C2H   + 1O    + 0     = 1CH    + 1CO   + 0      1 0.50E+14 0.00   0.000
 92  1C2H   + 1O2   + 0     = 1CHO   + 1CO   + 0      1 0.24E+13 0.00   0.000
 93  1CH3O  + 1M    + 0     = 1CH2O  + 1H    + 1M     5 0.10E+15 0.00  25.000
 94  1CH3O  + 1O    + 0     = 1CH2O  + 1HO   + 0      1 0.10E+14 0.00   0.000
 95  1CH3O  + 1O2   + 0     = 1CH2O  + 1HO2  + 0      1 0.66E+11 0.00   2.600
 96  1CH3O  + 1H    + 0     = 1CH2O  + 1H2   + 0      1 0.20E+14 0.00   0.000
 97  1CH3O  + 1HO   + 0     = 1CH2O  + 1H2O  + 0      1 0.10E+14 0.00   0.000
 98  1CH2O  + 1M    + 0     = 1CHO   + 1H    + 1M     5 0.33E+17 0.00  81.000
 99  1CH2O  + 1O    + 0     = 1CHO   + 1HO   + 0      1 0.35E+14 0.00   3.500
100  1CH2O  + 1H    + 0     = 1CHO   + 1H2   + 0      1 0.22E+09-1.80  10.500

Press Return to continue

101  1CH2O  + 1HO   + 0     = 1CHO   + 1H2O  + 0      1 0.34E+10-1.20  -0.400
102  1CH2O  + 1HO2  + 0     = 1CHO   + 1H2O2 + 0      1 0.10E+13 0.00   8.000
103  1CHO   + 1M    + 0     = 1CO    + 1H    + 1M     5 0.15E+15 0.00  14.700
104  1CHO   + 1O2   + 0     = 1CO    + 1HO2  + 0      1 0.51E+14 0.00   1.690
105  1CHO   + 1O    + 0     = 1CO    + 1HO   + 0      1 0.30E+14 0.00   0.000
106  1CHO   + 1O    + 0     = 1CO2   + 1H    + 0      1 0.30E+14 0.00   0.000
107  1CHO   + 1HO   + 0     = 1CO    + 1H2O  + 0      1 0.30E+14 0.00   0.000
108  1CHO   + 1H    + 0     = 1CO    + 1H2   + 0      1 0.12E+15 0.00   0.000
109  1CO    + 1HO   + 0     = 1CO2   + 1H    + 0      1 0.55E+01-3.14  -4.970
110  1CO    + 1HO2  + 0     = 1CO2   + 1HO   + 0      1 0.15E+15 0.00  23.600
111  1C     + 1HO   + 0     = 1CO    + 1H    + 0      1 0.50E+14 0.00   0.000
112  1N     + 1NO   + 0     = 1N2    + 1O    + 0      1 0.33E+13-0.30   0.000
113  1N     + 1O2   + 0     = 1NO    + 1O    + 0      1 0.64E+10-1.00   6.300
114  1NO2   + 1M    + 0     = 1NO    + 1O    + 1M     5 0.11E+17 0.00  66.000
115  1NO2   + 1O    + 0     = 1NO    + 1O2   + 0      1 0.10E+14 0.00   0.600
116  1N2O   + 1M    + 0     = 1N2    + 1O    + 1M     5 0.16E+15 0.00  51.600
117  1N2O   + 1O    + 0     = 1NO    + 1NO   + 0      1 0.69E+14 0.00  26.600
118  1N2O   + 1O    + 0     = 1N2    + 1O2   + 0      1 0.10E+15 0.00  28.200
119  1NH3   + 1M    + 0     = 1NH2   + 1H    + 1M     5 0.48E+17 0.00  93.900
120  1NH3   + 1H    + 0     = 1NH2   + 1H2   + 0      1 0.70E+07-2.40  10.200
```

Press Return to continue

121	1NH2	+	1H	+	0	=	1NH	+	1H2	+	0	1	0.69E+14	0.00	3.600
122	1NH2	+	1HN2	+	0	=	1N2	+	1NH3	+	0	1	0.10E+14	0.00	0.000
123	1NH2	+	1NH	+	0	=	1N2H2	+	1H	+	0	1	0.50E+14	0.00	0.000
124	1NH2	+	1N	+	0	=	1N2	+	1H	+	1H	3	0.72E+14	0.00	0.000
125	1NH	+	1N	+	0	=	1N2	+	1H	+	0	1	0.30E+14	0.00	0.000
126	1NH	+	1H	+	0	=	1N	+	1H2	+	0	1	0.30E+14	0.00	0.000
127	1NH	+	1NH	+	0	=	1N2	+	1H2	+	0	1	0.36E+12	-0.60	1.900
128	1NH	+	1M	+	0	=	1N	+	1H	+	1M	5	0.32E+22	2.00	83.400
129	1HN2	+	1M	+	0	=	1N2	+	1H	+	1M	5	0.20E+15	0.00	30.000
130	1HN2	+	1H	+	0	=	1N2	+	1H2	+	0	1	0.37E+14	0.00	3.000
131	1N2H2	+	1M	+	0	=	1HN2	+	1H	+	1M	5	0.50E+17	0.00	50.000
132	1N2H2	+	1H	+	0	=	1HN2	+	1H2	+	0	1	0.50E+14	0.00	1.000
133	1NH3	+	1O	+	0	=	1NH2	+	1HO	+	0	1	0.21E+14	0.00	9.000
134	1NH3	+	1HO	+	0	=	1NH2	+	1H2O	+	0	1	0.33E+13	0.00	2.100
135	1NH2	+	1O	+	0	=	1HNO	+	1H	+	0	1	0.66E+15	0.50	0.000
136	1NH2	+	1O	+	0	=	1NH	+	1HO	+	0	1	0.17E+14	0.00	1.000
137	1NH2	+	1NO	+	0	=	1HN2	+	1HO	+	0	1	0.61E+20	2.46	1.870
138	1NH2	+	1NO	+	0	=	1N2	+	1H2O	+	0	1	0.91E+20	2.46	1.870
139	1NH2	+	1O2	+	0	=	1HNO	+	1HO	+	0	1	0.51E+14	0.00	30.000
140	1NH2	+	1HO	+	0	=	1NH	+	1H2O	+	0	1	0.55E+11	-0.70	1.300

Press Return to continue

141	1NH2	+	1HNO	+	0	=	1NH3	+	1NO	+	0	1	0.18E+15	0.00	1.000
142	1NH	+	1O2	+	0	=	1HNO	+	1O	+	0	1	0.10E+14	0.00	12.000
143	1NH	+	1O2	+	0	=	1NO	+	1HO	+	0	1	0.14E+12	0.00	2.000
144	1NH	+	1NO	+	0	=	1N2O	+	1H	+	0	1	0.43E+15	0.50	0.000
145	1NH	+	1HO	+	0	=	1HNO	+	1H	+	0	1	0.20E+14	0.00	0.000
146	1NH	+	1HO	+	0	=	1N	+	1H2O	+	0	1	0.50E+12	-0.50	2.000
147	1N	+	1HO	+	0	=	1NO	+	1H	+	0	1	0.38E+14	0.00	0.000
148	1HN2	+	1HO	+	0	=	1N2	+	1H2O	+	0	1	0.30E+14	0.00	0.000
149	1HN2	+	1NO	+	0	=	1N2	+	1HNO	+	0	1	0.91E+12	0.00	0.000
150	1NO	+	1HO2	+	0	=	1NO2	+	1HO	+	0	1	0.34E+13	0.00	-0.300
151	1NO2	+	1H	+	0	=	1NO	+	1HO	+	0	1	0.35E+15	0.00	1.500
152	1N2O	+	1H	+	0	=	1N2	+	1HO	+	0	1	0.76E+14	0.00	15.200
153	1HNO	+	1M	+	0	=	1H	+	1NO	+	1M	5	0.19E+17	0.00	48.700
154	1HNO	+	1HO	+	0	=	1NO	+	1H2O	+	0	1	0.36E+14	0.00	0.000
155	1HNO	+	1H	+	0	=	1H2	+	1NO	+	0	1	0.50E+13	0.00	0.000
156	1C	+	1NO	+	0	=	1CN	+	1O	+	0	1	0.66E+14	0.00	0.000
157	1C	+	1N2O	+	0	=	1CN	+	1NO	+	0	1	0.10E+14	0.00	0.000
158	1CN	+	1O	+	0	=	1CO	+	1N	+	0	1	0.18E+14	0.00	0.000
159	1CN	+	1O2	+	0	=	1NCO	+	1O	+	0	1	0.56E+13	0.00	0.000
160	1CN	+	1NO2	+	0	=	1NCO	+	1NO	+	0	1	0.30E+14	0.00	0.000

Press Return to continue

161	1CN	+	1N2O	+	0	=	1NCO	+	1N2	+	0	1	0.10E+14	0.00	0.000
162	1NCO	+	1O	+	0	=	1NO	+	1CO	+	0	1	0.56E+14	0.00	0.000
163	1NCO	+	1N	+	0	=	1N2	+	1CO	+	0	1	0.20E+14	0.00	0.000
164	1NCO	+	1M	+	0	=	1N	+	1CO	+	1M	5	0.31E+17	0.50	48.000
165	1NCO	+	1NO	+	0	=	1N2O	+	1CO	+	0	1	0.10E+14	0.00	-0.400
166	1N	+	1CO2	+	0	=	1NO	+	1CO	+	0	1	0.19E+12	0.00	3.400
167	1CH4	+	1N	+	0	=	1NH	+	1CH3	+	0	1	0.10E+14	0.00	24.000
168	1CH4	+	1CN	+	0	=	1CH3	+	1CHN	+	0	1	0.32E+12	-0.70	5.000
169	1CH3	+	1N	+	0	=	1CHN	+	1H	+	1H	3	0.50E+14	0.00	0.000
170	1CH3	+	1CN	+	0	=	1CH2	+	1CHN	+	0	1	0.10E+12	-0.70	3.000
171	1CH2	+	1N2	+	0	=	1CHN	+	1NH	+	0	1	0.10E+14	0.00	74.000
172	1CH2	+	1NH	+	0	=	1CHN	+	1H	+	1H	3	0.30E+14	0.00	0.000
173	1CH2	+	1N	+	0	=	1CHN	+	1H	+	0	1	0.50E+14	0.00	0.000
174	1CH	+	1N2	+	0	=	1CHN	+	1N	+	0	1	0.15E+13	0.00	13.600
175	1CH	+	1N	+	0	=	1CN	+	1H	+	0	1	0.13E+14	0.00	0.000
176	1CH	+	1NH2	+	0	=	1CHN	+	1H	+	1H	3	0.30E+14	0.00	0.000

```
177  1CH   + 1NH   + 0     = 1CHN  + 1H    + 0      1 0.50E+14 0.00   0.000
178  1CN   + 1H2   + 0     = 1CHN  + 1H    + 0      1 0.30E+06-2.50   2.200
179  1CHN  + 1HO   + 0     = 1CN   + 1H2O  + 0      1 0.15E+14 0.00  10.900
180  1CHN  + 1HO   + 0     = 1HNCO + 1H    + 0      1 0.48E+12 0.00  11.000

Press Return to continue

181  1CHN  + 1HO   + 0     = 1HOCN + 1H    + 0      1 0.46E+13 0.00  15.000
182  1CHN  + 1O    + 0     = 1NCO  + 1H    + 0      1 0.14E+05-2.60   5.000
183  1CHN  + 1O    + 0     = 1NH   + 1CO   + 0      1 0.35E+04-2.60   5.000
184  1CN   + 1HO   + 0     = 1NCO  + 1H    + 0      1 0.60E+14 0.00   0.000
185  1CH2  + 1NO   + 0     = 1CHN  + 1HO   + 0      1 0.50E+13 0.00  -1.100
186  1CH   + 1NO   + 0     = 1CHN  + 1O    + 0      1 0.10E+15 0.00   0.000
187  1CH   + 1NO   + 0     = 1CHO  + 1N    + 0      1 0.10E+14 0.00   0.000
188  1NCO  + 1H    + 0     = 1NH   + 1CO   + 0      1 0.50E+14 0.00   0.000
189  1NCO  + 1HO   + 0     = 1NO   + 1CO   + 1H     3 0.10E+14 0.00   0.000
190  1NCO  + 1H2   + 0     = 1HNCO + 1H    + 0      1 0.86E+13 0.00   9.000
191  1HOCN + 1H    + 0     = 1HNCO + 1H    + 0      1 0.10E+14 0.00   0.000
192  1HNCO + 1H    + 0     = 1NH2  + 1CO   + 0      1 0.20E+14 0.00   3.000
193  1HNCO + 1O    + 0     = 1NH   + 1CO2  + 0      1 0.32E+13 0.00  10.380
194  1HNCO + 1HO   + 0     = 1NCO  + 1H2O  + 0      1 0.26E+13 0.00   5.540
195  1C2H  + 1N2   + 0     = 1CHN  + 1CN   + 0      1 0.13E+13 0.00  25.000
196  1C2H2 + 1NO   + 0     = 1CHN  + 1CHO  + 0      1 0.22E+06 0.00 -14.140
197  1O    + 1SO3  + 0     = 1O2   + 1SO2  + 0      1 0.12E+13 0.00   7.500
198  1O    + 1SO2  + 1M    = 1SO3  + 1M    + 0      2 0.54E+29 3.75   5.265
199  1H    + 1SO3  + 0     = 1HO   + 1SO2  + 0      1 0.15E+14 0.00   0.000
200  1HO   + 1SO2  + 1M    = 1HSO3 + 1M    + 0      2 0.17E+25 2.90   0.000

Press Return to continue

201  1HSO3 + 1O2   + 0     = 1SO3  + 1HO2  + 0      1 0.21E+12 0.00   0.000

Press Return to continue

 Chapter 6 :
-------------
PROPERTIES OF FURNACE FLUE GAS

         Press: P to by-pass this chapter
                Return to proceed through

Oil fired furnace

Current flue gas composition, in volume fractions :
    CO2         H2O         O2          N2          NO          SO2
 0.131008   0.121282   0.010769   0.735770   0.000600   0.000570

         Press: D for default values
                C to change
                Return to continue  D

You chose default flue gas composition
Press Return to continue

Enter burner zone stoichiometric air ratio (SR1):  1.1

The following is for information only
(1) Ultimate analysis of the burner fuel (kg/kg-dry):
     C          H          N          O          S
  0.8603     0.1174     0.0061     0.0061     0.0100
(2) Burner fuel stochiometric O2 requirement :  3.2275 kg-O2/kg-dry-fuel
Press Return to continue

Default flue gas composition, in volume fraction :
```

```
   CO2         H2O         O2          N2         NO         SO2
 0.126493   0.117640   0.017813   0.737504   0.000000   0.000551

Enter NO concentration in ppm :  600

Default flue gas composition, in volume fraction :
   CO2         H2O         O2          N2         NO         SO2
 0.126493   0.117640   0.017513   0.737204   0.000600   0.000551

Do you want to change the NO concentration ?

         Press: C to change
                Return to continue

Check the flue gas composition one more time ?

         Press: C to check
                Return to continue  C

Current flue gas composition, in volume fractions :
   CO2         H2O         O2          N2         NO         SO2
 0.126493   0.117640   0.017513   0.737204   0.000600   0.000551

         Press: D for default values
                C to change
                Return to continue

Check the flue gas composition one more time ?

         Press: C to check
                Return to continue


The following is for information only.
Mean molecular weight of the flue gas : 28.9515 kg/kg-mole

 Chapter 7 :
-------------
PROPERTIES OF REBURN AND OFA JETS

         Press: P to by-pass this chapter
                Return to proceed through


--- Reactor No. 1: Reburn Reactor ---

Current reburn gas composition, in volume fractions :
   CO2         H2O         O2          N2         CH4        C2H6
 0.005000   0.000000   0.000000   0.025000   0.940000   0.020000
    CO          NO         SO2          H2        C2H4        C2H2
 0.000000   0.000000   0.000000   0.000000   0.010000   0.000000
-- Default reburn fuel is 100 % CH4

         Press: D for default values
                C to change
                Return to continue

Check reburn fuel compositions one more time ?

         Press: C to check
                Return to continue

Enter reburn zone stoichiometric O2 ratio (SR2):  0.9
```

```
The following is for information only
(1) Reburn fuel stochiometric O2 requirement :  3.7584 kg-O2/kg-wet-fuel
(2) Mean molecular weight of the reburn fuel : 16.6022 kg/kg-mole
Press Return to continue

Enter reburn-jet characteristic mixing time (sec) :0.24


--- Reactor No. 2: Rich-Zone Reactor ---

This reactor does not contain external jets
Press Return to continue


--- Reactor No. 3: Over-Fired Air Reactor ---

Enter stoichiometric O2 ratio (SR3) of the OFA zone:  1.067

NOTE:
The following is for information only.
-- SR3 less than SR1.
Press Return to continue

Enter OFA-jet characteristic mixing time (sec) :0.24


--- Reactor No. 4: Quench Reactor ---

This reactor does not contain external jets
Press Return to continue

 Chapter 8 :
-------------
REACTOR DEFAULT OPERATING CONDITIONS

         Press: P to by-pass this chapter
                Return to proceed through


Zone numbers at which reburn-fuel were injected:   7

         Press: C to change
                Return to continue

Zone-numbers at which OFA were injected:   9

         Press: C to change
                Return to continue


The following data have been set for reactor default values :

            Reactor 1   Reactor 2   Reactor 3   Reactor 4
SR             0.9000      0.9000      1.0670      1.0670
Reac. Time     0.2400      0.3308      0.2400      2.0389
Init. Temp.    1656.1      1662.1      1627.3      1582.4
Final Temp.    1662.1      1627.3      1582.4      1045.8

Press Return to continue


 Chapter 9 :
-------------
SPECIFICATION OF REACTOR RESIDENCE TIMES
```

```
Reactor No. 1: Reburn Reactor
Press Return to continue

Specification of reactor residence time (XMAX) :
Currently, XMAX =  0.2400 sec
-- Default time is  0.2400 sec

         Press: D for default values
                C to change
                Return to continue

 Chapter 10 :
--------------
SPECIFICATION OF REACTOR TEMPERATURES

Reactor No. 1: Reburn Reactor
Press Return to continue

Specification of reactor initial (Ti) and final (Tf) temperatures :
Currently, Ti= 1655.3 K, Tf= 1660.0 K
-- Default temperatures are 1656.1 K and 1662.1 K, respectively

         Press: D for default values
                C to change
                Return to continue  D


Please wait: writing reactor 1 data file ...


Please wait: reading reactor 2 data file ...

 Chapter 9 :
-------------
SPECIFICATION OF REACTOR RESIDENCE TIMES

Reactor No. 2: Rich-Zone Reactor
Press Return to continue

Specification of reactor residence time (XMAX) :
Currently, XMAX =  0.3313 sec
-- Default time is  0.3308 sec

         Press: D for default values
                C to change
                Return to continue  D

 Chapter 10 :
--------------
SPECIFICATION OF REACTOR TEMPERATURES

Reactor No. 2: Rich-Zone Reactor
Press Return to continue

Specification of reactor initial (Ti) and final (Tf) temperatures :
Currently, Ti= 1660.0 K, Tf= 1624.9 K
-- Default temperatures are 1662.1 K and 1627.3 K, respectively

         Press: D for default values
                C to change
                Return to continue  D


Please wait: writing reactor 2 data file ...
```

```
Please wait: reading reactor 3 data file ...

 Chapter 9 :
-------------
SPECIFICATION OF REACTOR RESIDENCE TIMES

Reactor No. 3: Over-Fired Air Reactor
Press Return to continue

Specification of reactor residence time (XMAX) :
Currently, XMAX =  0.2400 sec
-- Default time is  0.2400 sec

         Press: D for default values
                C to change
                Return to continue

 Chapter 10 :
--------------
SPECIFICATION OF REACTOR TEMPERATURES

Reactor No. 3: Over-Fired Air Reactor
Press Return to continue

Specification of reactor initial (Ti) and final (Tf) temperatures :
Currently, Ti= 1624.9 K, Tf= 1580.4 K
-- Default temperatures are 1627.3 K and 1582.4 K, respectively

         Press: D for default values
                C to change
                Return to continue  D


Please wait: writing reactor 3 data file ...


Please wait: reading reactor 4 data file ...

 Chapter 9 :
-------------
SPECIFICATION OF REACTOR RESIDENCE TIMES

Reactor No. 4: Quench Reactor
Press Return to continue

Specification of reactor residence time (XMAX) :
Currently, XMAX =  2.0390 sec
-- Default time is  2.0389 sec

         Press: D for default values
                C to change
                Return to continue  D

 Chapter 10 :
--------------
SPECIFICATION OF REACTOR TEMPERATURES

Reactor No. 4: Quench Reactor
Press Return to continue

Specification of reactor initial (Ti) and final (Tf) temperatures :
Currently, Ti= 1580.4 K, Tf= 1046.6 K
-- Default temperatures are 1582.4 K and 1045.8 K, respectively
```

```
        Press: D for default values
               C to change
               Return to continue  D


Please wait: writing reactor 4 data file ...

NOTE:
-- Output file was saved as file RBIN0201.075
-- To update RBIN0201.075 further, you have to copy file RBIN0201.075
   to file RINPUT.DAT under DOS, then rerun RBINPT
-- If you want to save the original contents of file
   RINPUT.DAT, make sure you save it with a different name
```

Listing 3.10. Contents of file RBIN0201.075 (Case 2).

```
c.OIL FIRING WITH GAS REBURN AT 75% LOAD
c.SR1=1.1 SR2=0.9 SR3=1.06
c.0.24 SECONDS MIXING TIME FOR OFA AND RBN FUEL
c.
c.
c.
c.
c.
c.
c.
0201075RBOT0201.075
-------------------- RXR NO. 1 : REBURNING REACTOR -------------------
id(1):
    0    0    4
id(2):
    1   43  201
id(3):
    1    0.0000    0.0000
id(4):
    0    0.0000
id(5):
  100   -1    0    0    0    0
id(6):
 1656.0601    1.0000    1.0000    1.0000
 0.0000000 0.0175130 0.0000000 0.0000000 0.0000000 0.1176396 0.1264926
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0006000 0.7372040 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0005508 0.0000000
 0.0000000
id(7):
    0
id(8):
   18
    7    6    1    1    2    6    7   10   27    6    7   10   27    6
    1    6   27    6
    4    4    4    8    8    8    8    8    8   10   24   24   24   26
  153  153  153  153
 0.00 0.00 0.00 3.30 1.0021.00 5.00 2.00 1.0020.00 1.53 1.00 0.57 5.00
 2.00 2.00 2.00 6.00
id(9):
    0    0    0
id(10):
    0
id(11):
    0
id(12):
    0
id(13):
    0
id(14):
    0
id(15):
    3
 0.000E-01 2.400E-01 1.000E+03
 1656.0601 1662.0712 1662.0712
id(16):
    0
id(17):
    4
 0.000E-01 2.400E-01 2.402E-01 1.000E+03
 4.956E-02 4.956E-02 0.000E-01 0.000E-01
  545.0000  545.0000  545.0000  545.0000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0050000
 0.0000000 0.0000000 0.0000000 0.9400000 0.0000000 0.0000000 0.0000000
 0.0100000 0.0200000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0250000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000
id(18):
```

```
   1
 0.0000000 0.2100000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.7900000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000
 0.0000000 0.0175130 0.0000000 0.0000000 0.0000000 0.1176396 0.1264926
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0006000 0.7372040 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0005508 0.0000000
 0.0000000
 0.000E-01 0.000E-01 1.000E-16
 1.656E+03 1.656E+03
id(19):
    0
id(20):
 0.000E-01 2.400E-01 8.000E-04 1.000E-12 3.000E-08
id(21):
    0    0    0    0    0    0
id(22):
-1.000E-10 1.000E-20 2.000E-01 1.000E-06 2.000E-02 5.000E-02
id(23):
 6.000E+02 6.000E+02
H2            2.0160    0.0000
O2           32.0000    0.0000
HO           17.0080    9.4920
O            16.0000   59.5590
H             1.0080   52.1020
H2O          18.0160  -57.7979
CO2          44.0110  -94.0540
HO2          33.0080    5.0000
H2O2         34.0160  -32.5300
CO           28.0110  -26.4165
CH4          16.0430  -17.8950
CH3          15.0350   34.8200
CH2          14.0270   92.3500
CH           13.0190  142.0000
C2H4         28.0540   12.5400
C2H6         30.0700  -20.2700
C2H5         29.0620   27.4800
C2H3         27.0460   66.1700
C            12.0110  170.8860
C2H2         26.0380   54.1900
C2H          25.0300  130.7600
CH2O         30.0270  -25.9500
CH3O         31.0350    3.0000
CHO          29.0190    9.0000
N            14.0080  113.0000
NO           30.0080   21.5800
N2           28.0160    0.0000
NO2          46.0080    7.9100
N2O          44.0160   19.6100
NH3          17.0320  -10.9700
NH2          16.0240   45.5000
NH           15.0160   84.2000
HN2          29.0240   58.5680
N2H2         30.0320   50.9000
HNO          31.0160   23.8000
CN           26.0190  104.0000
NCO          42.0190   38.0000
CHN          27.0270   32.3000
HNCO         43.0270  -24.3000
HOCN         43.0270   -2.2800
SO2          64.0640  -70.9470
SO3          80.0640  -94.5900
HSO3         81.0680  -98.0000
 1H    + 1O2   + 0     = 1HO   + 1O    + 0       1 0.51E+17 0.82  16.500  1000.0
 1H2   + 1O    + 0     = 1HO   + 1H    + 0       1 0.18E+11-1.00   8.800   400.0
```

1H2	+ 1HO	+ 0	= 1H2O	+ 1H	+ 0	1	0.12E+10	-1.30	3.600	1000.0
1H	+ 1H	+ 1M	= 1H2	+ 1M	+ 0	2	0.10E+19	1.00	0.000	1000.0
1H	+ 1H	+ 1H2	= 1H2	+ 1H2	+ 0	2	0.97E+17	0.60	0.000	300.0
1H	+ 1H	+ 1H2O	= 1H2	+ 1H2O	+ 0	2	0.60E+20	1.20	0.000	1000.0
1H	+ 1H	+ 1CO2	= 1H2	+ 1CO2	+ 0	2	0.55E+21	2.00	0.000	1000.0
1H	+ 1O2	+ 1M	= 1HO2	+ 1M	+ 0	2	0.21E+19	1.00	0.000	1000.0
1HO	+ 1HO	+ 0	= 1H2O	+ 1O	+ 0	1	0.60E+09	-1.30	0.000	1000.0
1HO	+ 1H	+ 1M	= 1H2O	+ 1M	+ 0	2	0.75E+24	2.60	0.000	1000.0
1HO2	+ 1H	+ 0	= 1H2	+ 1O2	+ 0	1	0.25E+14	0.00	0.700	300.0
1HO2	+ 1H	+ 0	= 1HO	+ 1HO	+ 0	1	0.25E+15	0.00	1.900	300.0
1HO2	+ 1H	+ 0	= 1H2O	+ 1O	+ 0	1	0.50E+14	0.00	1.000	1000.0
1HO2	+ 1O	+ 0	= 1HO	+ 1O2	+ 0	1	0.48E+14	0.00	1.000	300.0
1HO2	+ 1HO	+ 0	= 1H2O	+ 1O2	+ 0	1	0.50E+14	0.00	1.000	1000.0
1HO2	+ 1HO2	+ 0	= 1H2O2	+ 1O2	+ 0	1	0.20E+13	0.00	0.000	300.0
1H2O2	+ 1M	+ 0	= 1HO	+ 1HO	+ 1M	5	0.13E+34	4.86	53.210	700.0
1H2O2	+ 1H	+ 0	= 1HO2	+ 1H2	+ 0	1	0.17E+13	0.00	3.700	300.0
1H2O2	+ 1H	+ 0	= 1H2O	+ 1HO	+ 0	1	0.32E+15	0.00	8.900	400.0
1H2O2	+ 1HO	+ 0	= 1H2O	+ 1HO2	+ 0	1	0.10E+14	0.00	1.800	300.0
1O2	+ 1M	+ 0	= 1O	+ 1O	+ 1M	5	0.19E+12	-0.50	95.600	1000.0
1O	+ 1H	+ 1M	= 1HO	+ 1M	+ 0	2	0.10E+17	0.00	0.000	1000.0
1O	+ 1HO	+ 1M	= 1HO2	+ 1M	+ 0	2	0.10E+18	0.00	0.000	1000.0
1CO	+ 1O	+ 1M	= 1CO2	+ 1M	+ 0	2	0.24E+16	0.00	4.340	300.0
1CO	+ 1O2	+ 0	= 1CO2	+ 1O	+ 0	1	0.25E+13	0.00	47.700	1500.0
1CH4	+ 1M	+ 0	= 1CH3	+ 1H	+ 1M	5	0.20E+18	0.00	88.000	1500.0
1CH4	+ 1H	+ 0	= 1CH3	+ 1H2	+ 0	1	0.22E+05	-3.00	8.700	300.0
1CH4	+ 1CH2	+ 0	= 1CH3	+ 1CH3	+ 0	1	0.13E+14	0.00	9.500	1000.0
1CH4	+ 1CH	+ 0	= 1C2H4	+ 1H	+ 0	1	0.60E+14	0.00	0.000	1000.0
1CH3	+ 1CH3	+ 1M	= 1C2H6	+ 1M	+ 0	2	0.19E+33	4.74	0.000	300.0
1C2H5	+ 1H	+ 0	= 1CH3	+ 1CH3	+ 0	1	0.30E+14	0.00	0.000	300.0
1CH3	+ 1CH3	+ 0	= 1C2H4	+ 1H2	+ 0	1	0.21E+15	0.00	19.200	1500.0
1CH3	+ 1M	+ 0	= 1CH2	+ 1H	+ 1M	5	0.10E+17	0.00	90.600	1500.0
1CH3	+ 1H	+ 0	= 1CH2	+ 1H2	+ 0	1	0.90E+14	0.00	15.100	1000.0
1CH3	+ 1CH2	+ 0	= 1C2H4	+ 1H	+ 0	1	0.40E+14	0.00	0.000	300.0
1CH3	+ 1CH	+ 0	= 1C2H3	+ 1H	+ 0	1	0.30E+14	0.00	0.000	1000.0
1CH3	+ 1C	+ 0	= 1C2H2	+ 1H	+ 0	1	0.50E+14	0.00	0.000	1000.0
1CH2	+ 1C2H6	+ 0	= 1C2H5	+ 1CH3	+ 0	1	0.22E+14	0.00	8.700	1000.0
1CH2	+ 1C2H3	+ 0	= 1C2H2	+ 1CH3	+ 0	1	0.30E+14	0.00	0.000	1000.0
1CH2	+ 1H	+ 0	= 1CH	+ 1H2	+ 0	1	0.62E+18	1.45	0.000	300.0
1CH2	+ 1CH	+ 0	= 1C2H2	+ 1H	+ 0	1	0.40E+14	0.00	0.000	1000.0
1CH2	+ 1CH2	+ 0	= 1C2H2	+ 1H2	+ 0	1	0.32E+14	0.00	0.000	1000.0
1CH2	+ 1CH2	+ 0	= 1C2H3	+ 1H	+ 0	1	0.50E+13	0.00	0.000	1000.0
1CH2	+ 1C	+ 0	= 1C2H	+ 1H	+ 0	1	0.50E+14	0.00	0.000	1000.0
1CH	+ 1H	+ 0	= 1C	+ 1H2	+ 0	1	0.50E+14	0.00	0.000	1000.0
1C2H6	+ 1H	+ 0	= 1C2H5	+ 1H2	+ 0	1	0.54E+03	-3.50	5.200	300.0
1C2H5	+ 1M	+ 0	= 1C2H4	+ 1H	+ 1M	5	0.41E+40	7.05	39.720	700.0
1C2H4	+ 1M	+ 0	= 1C2H2	+ 1H2	+ 1M	5	0.26E+18	0.00	79.300	1500.0
1C2H4	+ 1H	+ 0	= 1C2H3	+ 1H2	+ 0	1	0.15E+08	-2.00	6.000	1000.0
1C2H3	+ 1M	+ 0	= 1C2H2	+ 1H	+ 1M	5	0.31E+45	8.25	49.650	500.0
1C2H3	+ 1H	+ 0	= 1C2H2	+ 1H2	+ 0	1	0.20E+14	0.00	0.000	300.0
1C2H3	+ 1C2H	+ 0	= 1C2H2	+ 1C2H2	+ 0	1	0.30E+14	0.00	0.000	1000.0
1C2H2	+ 1M	+ 0	= 1C2H	+ 1H	+ 1M	5	0.40E+17	0.00	107.000	1500.0
1C2H	+ 1H2	+ 0	= 1C2H2	+ 1H	+ 0	1	0.41E+07	-2.40	0.900	1000.0
1CH4	+ 1O2	+ 0	= 1CH3	+ 1HO2	+ 0	1	0.79E+14	0.00	56.000	1000.0
1CH4	+ 1HO	+ 0	= 1CH3	+ 1H2O	+ 0	1	0.35E+04	-3.10	2.000	300.0
1CH4	+ 1HO2	+ 0	= 1CH3	+ 1H2O2	+ 0	1	0.20E+14	0.00	18.000	1000.0
1CH4	+ 1O	+ 0	= 1CH3	+ 1HO	+ 0	1	0.12E+08	-2.10	7.600	300.0
1CH3	+ 1O2	+ 0	= 1CH3O	+ 1O	+ 0	1	0.70E+13	0.00	25.700	300.0
1CH3	+ 1O	+ 0	= 1CH2O	+ 1H	+ 0	1	0.10E+15	0.00	0.000	300.0
1CH3	+ 1HO	+ 0	= 1CH3O	+ 1H	+ 0	1	0.54E+14	0.00	0.000	1000.0
1CH3	+ 1HO	+ 0	= 1CH2	+ 1H2O	+ 0	1	0.15E+14	0.00	5.000	1000.0
1CH3	+ 1HO2	+ 0	= 1CH3O	+ 1HO	+ 0	1	0.20E+14	0.00	0.000	1000.0
1CH3	+ 1CH2O	+ 0	= 1CHO	+ 1CH4	+ 0	1	0.10E+11	-0.50	6.000	1000.0
1CH3	+ 1CHO	+ 0	= 1CO	+ 1CH4	+ 0	1	0.30E+12	-0.50	0.000	1000.0
1CH2	+ 1O2	+ 0	= 1CO	+ 1H2O	+ 0	1	0.39E+13	0.00	1.400	1000.0
1CH2	+ 1O2	+ 0	= 1CO	+ 1HO	+ 1H	3	0.91E+13	0.00	1.400	1000.0
1CH2	+ 1O	+ 0	= 1CO	+ 1H	+ 1H	3	0.30E+14	0.00	0.000	1000.0
1CH2	+ 1O	+ 0	= 1CO	+ 1H2	+ 0	1	0.50E+14	0.00	0.000	1000.0
1CH2	+ 1HO	+ 0	= 1CH2O	+ 1H	+ 0	1	0.30E+14	0.00	0.000	1000.0
1CH2	+ 1HO	+ 0	= 1CH	+ 1H2O	+ 0	1	0.45E+14	0.00	3.000	1000.0
1CH2	+ 1CO2	+ 0	= 1CO	+ 1CH2O	+ 0	1	0.11E+12	0.00	1.000	1000.0
1CH	+ 1O	+ 0	= 1CO	+ 1H	+ 0	1	0.40E+14	0.00	0.000	300.0
1CH	+ 1HO	+ 0	= 1CHO	+ 1H	+ 0	1	0.30E+14	0.00	0.000	1000.0

1CH	+ 1O2	+ 0	= 1CO	+ 1HO	+ 0	1	0.20E+14	0.00	0.000	300.0
1CH	+ 1CO2	+ 0	= 1CHO	+ 1CO	+ 0	1	0.34E-13	0.00	0.700	297.0
1C2H6	+ 1O	+ 0	= 1C2H5	+ 1HO	+ 0	1	0.30E+08	-2.00	5.100	300.0
1C2H6	+ 1HO	+ 0	= 1C2H5	+ 1H2O	+ 0	1	0.63E+07	-2.00	0.500	300.0
1C2H6	+ 1O2	+ 0	= 1C2H5	+ 1HO2	+ 0	1	0.10E+14	0.00	52.000	1000.0
1C2H5	+ 1O2	+ 0	= 1C2H4	+ 1HO2	+ 0	1	0.20E+13	0.00	5.000	700.0
1C2H5	+ 1O	+ 0	= 1CH2O	+ 1CH3	+ 0	1	0.50E+14	0.00	0.000	1000.0
1C2H4	+ 1HO	+ 0	= 1C2H3	+ 1H2O	+ 0	1	0.63E+13	0.00	1.200	300.0
1C2H4	+ 1HO	+ 0	= 1CH2O	+ 1CH3	+ 0	1	0.20E+13	0.00	1.000	810.0
1C2H4	+ 1O	+ 0	= 1CHO	+ 1CH3	+ 0	1	0.16E+10	-1.20	0.700	300.0
1C2H4	+ 1O	+ 0	= 1CH2O	+ 1CH2	+ 0	1	0.25E+14	0.00	5.000	300.0
1C2H3	+ 1O2	+ 0	= 1C2H2	+ 1HO2	+ 0	1	0.10E+13	0.00	10.000	1058.0
1C2H3	+ 1HO	+ 0	= 1C2H2	+ 1H2O	+ 0	1	0.50E+13	0.00	0.000	1000.0
1C2H2	+ 1O2	+ 0	= 1CHO	+ 1CHO	+ 0	1	0.40E+13	0.00	28.000	1000.0
1C2H2	+ 1O	+ 0	= 1CH2	+ 1CO	+ 0	1	0.41E+09	-1.50	1.700	300.0
1C2H2	+ 1HO	+ 0	= 1C2H	+ 1H2O	+ 0	1	0.63E+13	0.00	7.000	1000.0
1C2H	+ 1O	+ 0	= 1CH	+ 1CO	+ 0	1	0.50E+14	0.00	0.000	1000.0
1C2H	+ 1O2	+ 0	= 1CHO	+ 1CO	+ 0	1	0.24E+13	0.00	0.000	1000.0
1CH3O	+ 1M	+ 0	= 1CH2O	+ 1H	+ 1M	5	0.10E+15	0.00	25.000	300.0
1CH3O	+ 1O	+ 0	= 1CH2O	+ 1HO	+ 0	1	0.10E+14	0.00	0.000	300.0
1CH3O	+ 1O2	+ 0	= 1CH2O	+ 1HO2	+ 0	1	0.66E+11	0.00	2.600	300.0
1CH3O	+ 1H	+ 0	= 1CH2O	+ 1H2	+ 0	1	0.20E+14	0.00	0.000	300.0
1CH3O	+ 1HO	+ 0	= 1CH2O	+ 1H2O	+ 0	1	0.10E+14	0.00	0.000	
1CH2O	+ 1M	+ 0	= 1CHO	+ 1H	+ 1M	5	0.33E+17	0.00	81.000	1600.0
1CH2O	+ 1O	+ 0	= 1CHO	+ 1HO	+ 0	1	0.35E+14	0.00	3.500	300.0
1CH2O	+ 1H	+ 0	= 1CHO	+ 1H2	+ 0	1	0.22E+09	-1.80	10.500	1000.0
1CH2O	+ 1HO	+ 0	= 1CHO	+ 1H2O	+ 0	1	0.34E+10	-1.20	-0.400	300.0
1CH2O	+ 1HO2	+ 0	= 1CHO	+ 1H2O2	+ 0	1	0.10E+13	0.00	8.000	1000.0
1CHO	+ 1M	+ 0	= 1CO	+ 1H	+ 1M	5	0.15E+15	0.00	14.700	1000.0
1CHO	+ 1O2	+ 0	= 1CO	+ 1HO2	+ 0	1	0.51E+14	0.00	1.690	300.0
1CHO	+ 1O	+ 0	= 1CO	+ 1HO	+ 0	1	0.30E+14	0.00	0.000	300.0
1CHO	+ 1O	+ 0	= 1CO2	+ 1H	+ 0	1	0.30E+14	0.00	0.000	300.0
1CHO	+ 1HO	+ 0	= 1CO	+ 1H2O	+ 0	1	0.30E+14	0.00	0.000	300.0
1CHO	+ 1H	+ 0	= 1CO	+ 1H2	+ 0	1	0.12E+15	0.00	0.000	1000.0
1CO	+ 1HO	+ 0	= 1CO2	+ 1H	+ 0	1	0.55E+01	-3.14	-4.970	1000.0
1CO	+ 1HO2	+ 0	= 1CO2	+ 1HO	+ 0	1	0.15E+15	0.00	23.600	700.0
1C	+ 1HO	+ 0	= 1CO	+ 1H	+ 0	1	0.50E+14	0.00	0.000	1000.0
1N	+ 1NO	+ 0	= 1N2	+ 1O	+ 0	1	0.33E+13	-0.30	0.000	2000.0
1N	+ 1O2	+ 0	= 1NO	+ 1O	+ 0	1	0.64E+10	-1.00	6.300	1000.0
1NO2	+ 1M	+ 0	= 1NO	+ 1O	+ 1M	5	0.11E+17	0.00	66.000	1000.0
1NO2	+ 1O	+ 0	= 1NO	+ 1O2	+ 0	1	0.10E+14	0.00	0.600	1000.0
1N2O	+ 1M	+ 0	= 1N2	+ 1O	+ 1M	5	0.16E+15	0.00	51.600	1810.0
1N2O	+ 1O	+ 0	= 1NO	+ 1NO	+ 0	1	0.69E+14	0.00	26.600	1200.0
1N2O	+ 1O	+ 0	= 1N2	+ 1O2	+ 0	1	0.10E+15	0.00	28.200	1200.0
1NH3	+ 1M	+ 0	= 1NH2	+ 1H	+ 1M	5	0.48E+17	0.00	93.900	2200.0
1NH3	+ 1H	+ 0	= 1NH2	+ 1H2	+ 0	1	0.70E+07	-2.40	10.200	1000.0
1NH2	+ 1H	+ 0	= 1NH	+ 1H2	+ 0	1	0.69E+14	0.00	3.600	2800.0
1NH2	+ 1HN2	+ 0	= 1N2	+ 1NH3	+ 0	1	0.10E+14	0.00	0.000	1000.0
1NH2	+ 1NH	+ 0	= 1N2H2	+ 1H	+ 0	1	0.50E+14	0.00	0.000	1000.0
1NH2	+ 1N	+ 0	= 1N2	+ 1H	+ 1H	3	0.72E+14	0.00	0.000	1000.0
1NH	+ 1N	+ 0	= 1N2	+ 1H	+ 0	1	0.30E+14	0.00	0.000	1000.0
1NH	+ 1H	+ 0	= 1N	+ 1H2	+ 0	1	0.30E+14	0.00	0.000	1000.0
1NH	+ 1NH	+ 0	= 1N2	+ 1H2	+ 0	1	0.36E+12	-0.60	1.900	1000.0
1NH	+ 1M	+ 0	= 1N	+ 1H	+ 1M	5	0.32E+22	2.00	83.400	1000.0
1HN2	+ 1M	+ 0	= 1N2	+ 1H	+ 1M	5	0.20E+15	0.00	30.000	1000.0
1HN2	+ 1H	+ 0	= 1N2	+ 1H2	+ 0	1	0.37E+14	0.00	3.000	1000.0
1N2H2	+ 1M	+ 0	= 1HN2	+ 1H	+ 1M	5	0.50E+17	0.00	50.000	1000.0
1N2H2	+ 1H	+ 0	= 1HN2	+ 1H2	+ 0	1	0.50E+14	0.00	1.000	1000.0
1NH3	+ 1O	+ 0	= 1NH2	+ 1HO	+ 0	1	0.21E+14	0.00	9.000	1000.0
1NH3	+ 1HO	+ 0	= 1NH2	+ 1H2O	+ 0	1	0.33E+13	0.00	2.100	300.0
1NH2	+ 1O	+ 0	= 1HNO	+ 1H	+ 0	1	0.66E+15	0.50	0.000	300.0
1NH2	+ 1O	+ 0	= 1NH	+ 1HO	+ 0	1	0.17E+14	0.00	1.000	300.0
1NH2	+ 1NO	+ 0	= 1HN2	+ 1HO	+ 0	1	0.61E+20	2.46	1.870	1000.0
1NH2	+ 1NO	+ 0	= 1N2	+ 1H2O	+ 0	1	0.91E+20	2.46	1.870	300.0
1NH2	+ 1O2	+ 0	= 1HNO	+ 1HO	+ 0	1	0.51E+14	0.00	30.000	1000.0
1NH2	+ 1HO	+ 0	= 1NH	+ 1H2O	+ 0	1	0.55E+11	-0.70	1.300	1000.0
1NH2	+ 1HNO	+ 0	= 1NH3	+ 1NO	+ 0	1	0.18E+15	0.00	1.000	1000.0
1NH	+ 1O2	+ 0	= 1HNO	+ 1O	+ 0	1	0.10E+14	0.00	12.000	1000.0
1NH	+ 1O2	+ 0	= 1NO	+ 1HO	+ 0	1	0.14E+12	0.00	2.000	300.0
1NH	+ 1NO	+ 0	= 1N2O	+ 1H	+ 0	1	0.43E+15	0.50	0.000	300.0
1NH	+ 1HO	+ 0	= 1HNO	+ 1H	+ 0	1	0.20E+14	0.00	0.000	300.0
1NH	+ 1HO	+ 0	= 1N	+ 1H2O	+ 0	1	0.50E+12	-0.50	2.000	1000.0

```
1N     + 1HO    + 0      = 1NO    + 1H     + 0        1 0.38E+14 0.00    0.000  1000.0
1HN2   + 1HO    + 0      = 1N2    + 1H2O   + 0        1 0.30E+14 0.00    0.000   300.0
1HN2   + 1NO    + 0      = 1N2    + 1HNO   + 0        1 0.91E+12 0.00    0.000   914.0
1NO    + 1HO2   + 0      = 1NO2   + 1HO    + 0        1 0.34E+13 0.00   -0.300  1000.0
1NO2   + 1H     + 0      = 1NO    + 1HO    + 0        1 0.35E+15 0.00    1.500  1000.0
1N2O   + 1H     + 0      = 1N2    + 1HO    + 0        1 0.76E+14 0.00   15.200   700.0
1HNO   + 1M     + 0      = 1H     + 1NO    + 1M       5 0.19E+17 0.00   48.700  1000.0
1HNO   + 1HO    + 0      = 1NO    + 1H2O   + 0        1 0.36E+14 0.00    0.000  1000.0
1HNO   + 1H     + 0      = 1H2    + 1NO    + 0        1 0.50E+13 0.00    0.000  1000.0
1C     + 1NO    + 0      = 1CN    + 1O     + 0        1 0.66E+14 0.00    0.000  1000.0
1C     + 1N2O   + 0      = 1CN    + 1NO    + 0        1 0.10E+14 0.00    0.000  1000.0
1CN    + 1O     + 0      = 1CO    + 1N     + 0        1 0.18E+14 0.00    0.000  1000.0
1CN    + 1O2    + 0      = 1NCO   + 1O     + 0        1 0.56E+13 0.00    0.000  1000.0
1CN    + 1NO2   + 0      = 1NCO   + 1NO    + 0        1 0.30E+14 0.00    0.000  1000.0
1CN    + 1N2O   + 0      = 1NCO   + 1N2    + 0        1 0.10E+14 0.00    0.000  1000.0
1NCO   + 1O     + 0      = 1NO    + 1CO    + 0        1 0.56E+14 0.00    0.000  1000.0
1NCO   + 1N     + 0      = 1N2    + 1CO    + 0        1 0.20E+14 0.00    0.000  1000.0
1NCO   + 1M     + 0      = 1N     + 1CO    + 1M       5 0.31E+17 0.50   48.000  1000.0
1NCO   + 1NO    + 0      = 1N2O   + 1CO    + 0        1 0.10E+14 0.00   -0.400  1000.0
1N     + 1CO2   + 0      = 1NO    + 1CO    + 0        1 0.19E+12 0.00    3.400  1000.0
1CH4   + 1N     + 0      = 1NH    + 1CH3   + 0        1 0.10E+14 0.00   24.000  1000.0
1CH4   + 1CN    + 0      = 1CH3   + 1CHN   + 0        1 0.32E+12-0.70    5.000  1000.0
1CH3   + 1N     + 0      = 1CHN   + 1H     + 1H       3 0.50E+14 0.00    0.000  1000.0
1CH3   + 1CN    + 0      = 1CH2   + 1CHN   + 0        1 0.10E+12-0.70    3.000  1000.0
1CH2   + 1N2    + 0      = 1CHN   + 1NH    + 0        1 0.10E+14 0.00   74.000  1000.0
1CH2   + 1NH    + 0      = 1CHN   + 1H     + 1H       3 0.30E+14 0.00    0.000  1000.0
1CH2   + 1N     + 0      = 1CHN   + 1H     + 0        1 0.50E+14 0.00    0.000  1000.0
1CH    + 1N2    + 0      = 1CHN   + 1N     + 0        1 0.15E+13 0.00   13.600  1000.0
1CH    + 1N     + 0      = 1CN    + 1H     + 0        1 0.13E+14 0.00    0.000  1000.0
1CH    + 1NH2   + 0      = 1CHN   + 1H     + 1H       3 0.30E+14 0.00    0.000  1000.0
1CH    + 1NH    + 0      = 1CHN   + 1H     + 0        1 0.50E+14 0.00    0.000  1000.0
1CN    + 1H2    + 0      = 1CHN   + 1H     + 0        1 0.30E+06-2.50    2.200  1000.0
1CHN   + 1HO    + 0      = 1CN    + 1H2O   + 0        1 0.15E+14 0.00   10.900  1000.0
1CHN   + 1HO    + 0      = 1HNCO  + 1H     + 0        1 0.48E+12 0.00   11.000  1000.0
1CHN   + 1HO    + 0      = 1HOCN  + 1H     + 0        1 0.46E+13 0.00   15.000  1000.0
1CHN   + 1O     + 0      = 1NCO   + 1H     + 0        1 0.14E+05-2.60    5.000  1000.0
1CHN   + 1O     + 0      = 1NH    + 1CO    + 0        1 0.35E+04-2.60    5.000  1000.0
1CN    + 1HO    + 0      = 1NCO   + 1H     + 0        1 0.60E+14 0.00    0.000  1000.0
1CH2   + 1NO    + 0      = 1CHN   + 1HO    + 0        1 0.50E+13 0.00   -1.100  1000.0
1CH    + 1NO    + 0      = 1CHN   + 1O     + 0        1 0.10E+15 0.00    0.000  1000.0
 CH    + 1NO    + 0      = 1CHO   + 1N     + 0        1 0.10E+14 0.00    0.000  1000.0
  CO   + 1H     + 0      = 1NH    + 1CO    + 0        1 0.50E+14 0.00    0.000  1000.0
  CO   + 1HO    + 0      = 1NO    + 1CO    + 1H       3 0.10E+14 0.00    0.000  1000.0
  CO   + 1H2    + 0      = 1HNCO  + 1H     + 0        1 0.86E+13 0.00    9.000  1000.0
 HOCN  + 1H     + 0      = 1HNCO  + 1H     + 0        1 0.10E+14 0.00    0.000  1000.0
 HNCO  + 1H     + 0      = 1NH2   + 1CO    + 0        1 0.20E+14 0.00    3.000  1000.0
1HNCO  + 1O     + 0      = 1NH    + 1CO2   + 0        1 0.32E+13 0.00   10.380  1000.0
1HNCO  + 1HO    + 0      = 1NCO   + 1H2O   + 0        1 0.26E+13 0.00    5.540  1000.0
1C2H   + 1N2    + 0      = 1CHN   + 1CN    + 0        1 0.13E+13 0.00   25.000
1C2H2  + 1NO    + 0      = 1CHN   + 1CHO   + 0        1 0.22E+06 0.00  -14.140
1O     + 1SO3   + 0      = 1O2    + 1SO2   + 0        1 0.12E+13 0.00    7.500
1O     + 1SO2   + 1M     = 1SO3   + 1M     + 0        2 0.54E+29 3.75    5.265
1H     + 1SO3   + 0      = 1HO    + 1SO2   + 0        1 0.15E+14 0.00    0.000
1HO    + 1SO2   + 1M     = 1HSO3  + 1M     + 0        2 0.17E+25 2.90    0.000
1HSO3  + 1O2    + 0      = 1SO3   + 1HO2   + 0        1 0.21E+12 0.00    0.000
-------------------- RXR NO. 2 : RICH ZONE REACTOR -------------------
id(1):
    0    0    4
id(2):
    1   43  201 -
id(3):
    1    0.0000     0.0000
id(4):
    0    0.0000
id(5):
    0    0    0
id(6):
    0
id(7):
    0
id(8):
    0
```

```
id(9):
    0
id(10):
    0
id(11):
    3
 0.000E-01 3.308E-01 1.000E+03
 1662.0712 1627.2600 1627.2600
id(12):
    0
id(13):
    0
id(14):
    0
id(15):
    0
id(16):
 0.000E-01 3.308E-01 1.103E-03 1.000E-12 3.000E-08
id(17):
    0    0    0    0    0    0
id(18):
-1.000E-10 1.000E-20 2.000E-01 1.000E-06 3.000E-02 5.000E-02
id(19):
 6.000E+02 6.000E+02
----------------- RXR NO. 3 : OVER-FIRED-AIR REACTOR -----------------
id(1):
    0    0    4
id(2):
    1   43  201
id(3):
    1    0.0000    0.0000
id(4):
    0    0.0000
id(5):
    0    0    0
id(6):
    0
id(7):
    0
id(8):
    0
id(9):
    0
id(10):
    0
id(11):
    3
 0.000E-01 2.400E-01 1.000E+03
 1627.2600 1582.3734 1582.3734
id(12):
    0
id(13):
    4
 0.000E-01 2.400E-01 2.402E-01 1.000E+03
 7.472E-01 7.472E-01 0.000E-01 0.000E-01
  300.0000  300.0000  300.0000  300.0000
 0.0000000 0.2100000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.7900000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
 0.0000000
id(14):
    0
id(15):
    0
id(16):
 0.000E-01 2.400E-01 8.000E-04 1.000E-12 3.000E-08
id(17):
    0    0    0    0    0    0
id(18):
```

```
-1.000E-10 1.000E-20 2.000E-01 1.000E-06 2.000E-02 5.000E-02
id(19):
 6.000E+02 6.000E+02
------------------- RXR NO. 4 : QUENCHING REACTOR -------------------
id(1):
     0     0     4
id(2):
     1    43   201
id(3):
     1     0.0000     0.0000
id(4):
     0     0.0000
id(5):
     0     0     0
id(6):
     0
id(7):
     0
id(8):
     0
id(9):
     0
id(10):
     0
id(11):
     3
 0.000E-01 2.039E+00 1.000E+03
 1582.3734 1045.7800 1045.7800
id(12):
     0
id(13):
     0
id(14):
     0
id(15):
     0
id(16):
 0.000E-01 2.039E+00 6.796E-03 1.000E-12 3.000E-08
id(17):
     0     0     0     0     0     0
id(18):
-1.000E-10 1.000E-20 2.000E-01 1.000E-06 2.000E-02 5.000E-02
id(19):
 6.000E+02 6.000E+02
```

Listing 3.11. Contents of file THERMO.DAT (Case 2).

```
        43         50          5  .100E+03  .100E-03
C               12.011   171.290
C2H             25.032   134.003
C2H2            26.041    54.194
C2H3            27.051    68.410
C2H4            28.061    12.538
C2H5            29.070    28.015
C2H6            30.080   -20.041
CH              13.021   141.999
CH2             14.030    92.484
CH2O            30.030   -27.702
CH3             15.040    34.820
CH3O            31.039     3.896
CH4             16.050   -17.898
CN              26.078   104.002
CO              28.010   -26.417
CO2             44.010   -94.051
H                1.010    52.093
H2               2.019     0.001
H2O             18.019   -57.797
H2O2            34.018   -32.527
CHN             27.088    32.301
CHO             29.020    10.400
HNCO            43.087   -24.895
HNO             31.076    23.799
HO2             33.008     2.499
HOCN            43.087    -2.280
N               14.067   112.950
N2              28.134     0.000
N2H2            30.153    50.898
N2O             44.133    19.612
NCO             42.077    38.101
NH              15.077    85.200
NH2             16.086    45.501
NH3             17.096   -10.972
HN2             29.144    58.568
NO              30.066    21.580
NO2             46.066     7.910
O               15.999    59.554
O2              31.999     0.000
HO              17.009     9.317
SO2             64.064   -70.947
SO3             80.064   -94.590
HSO3            81.066   -97.998
    4.9760    4.9799    4.9792    4.9762    4.9728  CP  1   C
    4.9701    4.9689    4.9694    4.9713    4.9736  CP  2   C
    4.9688    4.9661    4.9656    4.9669    4.9702  CP  3   C
    4.9752    4.9817    4.9898    4.9993    5.0101  CP  4   C
    5.0221    5.0352    5.0492    5.0641    5.0798  CP  5   C
    5.0962    5.1131    5.1305    5.1483    5.1665  CP  6   C
    5.1848    5.2032    5.2217    5.2401    5.2584  CP  7   C
    5.2765    5.2943    5.3117    5.3286    5.3450  CP  8   C
    5.3608    5.3759    5.3902    5.4038    5.4164  CP  9   C
    5.4281    5.4387    5.4483    5.4567    5.4639  CP 10   C
   -0.9866   -0.4888    0.0092    0.5070    1.0044  H   1   C
    1.5016    1.9985    2.4954    2.9924    3.4897  H   2   C
    3.9868    4.4835    4.9801    5.4767    5.9735  H   3   C
    6.4708    6.9686    7.4672    7.9666    8.4671  H   4   C
    8.9687    9.4716    9.9758   10.4814   10.9886  H   5   C
   11.4974   12.0079   12.5200   13.0340   13.5497  H   6   C
   14.0673   14.5867   15.1079   15.6310   16.1560  H   7   C
   16.6827   17.2112   17.7415   18.2736   18.8072  H   8   C
   19.3425   19.8794   20.4177   20.9574   21.4984  H   9   C
   22.0406   22.5840   23.1284   23.6736   24.2197  H  10   C
   42.1880   38.2164   37.7610   37.9563   38.3249  F   1   C
   38.7375   39.1512   39.5505   39.9302   40.2894  F   2   C
   40.6285   40.9488   41.2517   41.5386   41.8110  F   3   C
   42.0700   42.3169   42.5526   42.7781   42.9942  F   4   C
   43.2017   43.4012   43.5933   43.7785   43.9573  F   5   C
   44.1303   44.2976   44.4598   44.6171   44.7699  F   6   C
   44.9183   45.0627   45.2033   45.3402   45.4738  F   7   C
   45.6041   45.7313   45.8556   45.9771   46.0959  F   8   C
```

46.2122	46.3261	46.4376	46.5469	46.6541	F	9	C
46.7593	46.8625	46.9638	47.0633	47.1610	F	10	C
7.1711	8.1146	8.9199	9.6107	10.2065	CP	1	C2H
10.7234	11.1733	11.5641	11.9001	12.1814	CP	2	C2H
12.4276	12.6605	12.8811	13.0900	13.2879	CP	3	C2H
13.4754	13.6533	13.8221	13.9825	14.1348	CP	4	C2H
14.2796	14.4174	14.5486	14.6736	14.7927	CP	5	C2H
14.9063	15.0146	15.1179	15.2165	15.3104	CP	6	C2H
15.3998	15.4849	15.5657	15.6422	15.7145	CP	7	C2H
15.7825	15.8462	15.9054	15.9601	16.0099	CP	8	C2H
16.0549	16.0946	16.1289	16.1573	16.1797	CP	9	C2H
16.1955	16.2044	16.2059	16.1995	16.1847	CP	10	C2H
-1.6018	-0.8363	0.0165	0.9439	1.9355	H	1	C2H
2.9826	4.0779	5.2153	6.3889	7.5935	H	2	C2H
8.8240	10.0785	11.3557	12.6544	13.9733	H	3	C2H
15.3116	16.6681	18.0419	19.4322	20.8382	H	4	C2H
22.2590	23.6939	25.1422	26.6034	28.0767	H	5	C2H
29.5617	31.0578	32.5645	34.0813	35.6076	H	6	C2H
37.1432	38.6875	40.2400	41.8004	43.3683	H	7	C2H
44.9432	46.5247	48.1123	49.7056	51.3041	H	8	C2H
52.9074	54.5149	56.1262	57.7405	59.3574	H	9	C2H
60.9762	62.5963	64.2169	65.8372	67.4565	H	10	C2H
56.9197	50.3516	49.5619	49.9203	50.6193	F	1	C2H
51.4269	52.2599	53.0845	53.8868	54.6610	F	2	C2H
55.4053	56.1197	56.8055	57.4642	58.0974	F	3	C2H
58.7068	59.2941	59.8608	60.4083	60.9378	F	4	C2H
61.4505	61.9476	62.4299	62.8984	63.3539	F	5	C2H
63.7971	64.2287	64.6494	65.0597	65.4601	F	6	C2H
65.8511	66.2332	66.6068	66.9724	67.3301	F	7	C2H
67.6805	68.0238	68.3603	68.6903	69.0140	F	8	C2H
69.3317	69.6435	69.9498	70.2507	70.5464	F	9	C2H
70.8370	71.1228	71.4038	71.6802	71.9522	F	10	C2H
6.7158	8.8912	10.6218	11.9930	13.0810	CP	1	C2H2
13.9532	14.6675	15.2730	15.8094	16.3074	CP	2	C2H2
16.7737	17.2009	17.5917	17.9486	18.2744	CP	3	C2H2
18.5713	18.8417	19.0878	19.3117	19.5155	CP	4	C2H2
19.7011	19.8703	20.0247	20.1660	20.2957	CP	5	C2H2
20.4152	20.5258	20.6287	20.7249	20.8155	CP	6	C2H2
20.9013	20.9831	21.0616	21.1374	21.2109	CP	7	C2H2
21.2825	21.3526	21.4211	21.4883	21.5540	CP	8	C2H2
21.6181	21.6804	21.7406	21.7981	21.8524	CP	9	C2H2
21.9028	21.9487	21.9891	22.0230	22.0494	CP	10	C2H2
-1.7438	-0.9594	0.0196	1.1530	2.4088	H	1	C2H2
3.7620	5.1942	6.6919	8.2465	9.8525	H	2	C2H2
11.5069	13.2060	14.9459	16.7232	18.5346	H	3	C2H2
20.3771	22.2480	24.1446	26.0648	28.0063	H	4	C2H2
29.9673	31.9460	33.9408	35.9505	37.9737	H	5	C2H2
40.0093	42.0564	44.1142	46.1819	48.2590	H	6	C2H2
50.3449	52.4391	54.5414	56.6513	58.7688	H	7	C2H2
60.8935	63.0252	65.1639	67.3094	69.4615	H	8	C2H2
71.6202	73.7851	75.9562	78.1331	80.3157	H	9	C2H2
82.5035	84.6961	86.8930	89.0937	91.2974	H	10	C2H2
56.2230	48.9323	48.0159	48.4499	49.3125	F	1	C2H2
50.3248	51.3809	52.4353	53.4678	54.4698	F	2	C2H2
55.4379	56.3719	57.2725	58.1411	58.9795	F	3	C2H2
59.7892	60.5720	61.3294	62.0629	62.7739	F	4	C2H2
63.4636	64.1333	64.7840	65.4168	66.0326	F	5	C2H2
66.6323	67.2166	67.7863	68.3422	68.8848	F	6	C2H2
69.4148	69.9327	70.4392	70.9346	71.4194	F	7	C2H2
71.8942	72.3593	72.8151	73.2620	73.7003	F	8	C2H2
74.1303	74.5525	74.9670	75.3742	75.7742	F	9	C2H2
76.1675	76.5541	76.9344	77.3085	77.6766	F	10	C2H2
6.3904	7.9589	9.5681	11.1879	12.7828	CP	1	C2H3
14.3118	15.7278	16.9785	18.0058	18.7458	CP	2	C2H3
19.3057	19.8379	20.3418	20.8173	21.2640	CP	3	C2H3
21.6820	22.0712	22.4319	22.7643	23.0687	CP	4	C2H3
23.3458	23.5959	23.8200	24.0188	24.1933	CP	5	C2H3
24.3445	24.4737	24.5820	24.6709	24.7420	CP	6	C2H3
24.7968	24.8370	24.8646	24.8815	24.8898	CP	7	C2H3
24.8917	24.8895	24.8856	24.8825	24.8830	CP	8	C2H3
24.8897	24.9055	24.9335	24.9767	25.0383	CP	9	C2H3
25.1217	25.2303	25.3677	25.5376	25.7436	CP	10	C2H3

-1.5755	-0.8585	0.0177	1.0555	2.2544	H	1	C2H3
3.6099	5.1130	6.7499	8.5013	10.3415	H	2	C2H3
12.2443	14.2017	16.2110	18.2692	20.3735	H	3	C2H3
22.5210	24.7089	26.9343	29.1943	31.4862	H	4	C2H3
33.8072	36.1545	38.5255	40.9176	43.3284	H	5	C2H3
45.7555	48.1966	50.6496	53.1124	55.5832	H	6	C2H3
58.0602	60.5420	63.0272	65.5146	68.0032	H	7	C2H3
70.4923	72.9814	75.4702	77.9586	80.4466	H	8	C2H3
82.9354	85.4251	87.9169	90.4123	92.9128	H	9	C2H3
95.4206	97.9380	100.4677	103.0126	105.5764	H	10	C2H3
62.7052	56.1504	55.3297	55.7243	56.5229	F	1	C2H3
57.4823	58.5088	59.5596	60.6128	61.6553	F	2	C2H3
62.6788	63.6780	64.6508	65.5965	66.5152	F	3	C2H3
67.4077	68.2750	69.1180	69.9380	70.7358	F	4	C2H3
71.5126	72.2693	73.0069	73.7261	74.4279	F	5	C2H3
75.1129	75.7818	76.4354	77.0741	77.6986	F	6	C2H3
78.3095	78.9071	79.4921	80.0648	80.6257	F	7	C2H3
81.1752	81.7137	82.2415	82.7591	83.2667	F	8	C2H3
83.7648	84.2536	84.7334	85.2046	85.6675	F	9	C2H3
86.1224	86.5695	87.0092	87.4417	87.8674	F	10	C2H3
3.2243	7.1186	10.2337	12.7853	14.9431	CP	1	C2H4
16.8302	18.5231	20.0521	21.4008	22.5068	CP	2	C2H4
23.4126	24.2305	24.9669	25.6281	26.2199	CP	3	C2H4
26.7483	27.2184	27.6357	28.0050	28.3311	CP	4	C2H4
28.6184	28.8711	29.0931	29.2882	29.4599	CP	5	C2H4
29.6112	29.7452	29.8645	29.9717	30.0688	CP	6	C2H4
30.1579	30.2406	30.3184	30.3925	30.4637	CP	7	C2H4
30.5328	30.6003	30.6662	30.7306	30.7931	CP	8	C2H4
30.8532	30.9100	30.9625	31.0093	31.0489	CP	9	C2H4
31.0794	31.0988	31.1047	31.0946	31.0656	CP	10	C2H4
-1.3789	-0.8543	0.0189	1.1738	2.5629	H	1	C2H4
4.1534	5.9225	7.8526	9.9269	12.1247	H	2	C2H4
14.4215	16.8043	19.2648	21.7952	24.3881	H	3	C2H4
27.0371	29.7359	32.4790	35.2614	38.0786	H	4	C2H4
40.9263	43.8011	46.6995	49.6188	52.5564	H	5	C2H4
55.5101	58.4780	61.4586	64.4505	67.4527	H	6	C2H4
70.4640	73.4840	76.5120	79.5476	82.5904	H	7	C2H4
85.6402	88.6969	91.7603	94.8301	97.9063	H	8	C2H4
100.9887	104.0769	107.1705	110.2692	113.3721	H	9	C2H4
116.4786	119.5876	122.6979	125.8080	128.9162	H	10	C2H4
59.2516	53.2151	52.3785	52.8118	53.7113	F	1	C2H4
54.8093	55.9947	57.2146	58.4421	59.6619	F	2	C2H4
60.8645	62.0442	63.1978	64.3238	65.4217	F	3	C2H4
66.4917	67.5342	68.5498	69.5393	70.5036	F	4	C2H4
71.4436	72.3600	73.2538	74.1259	74.9770	F	5	C2H4
75.8079	76.6195	77.4125	78.1876	78.9454	F	6	C2H4
79.6867	80.4121	81.1222	81.8175	82.4986	F	7	C2H4
83.1661	83.8204	84.4620	85.0914	85.7091	F	8	C2H4
86.3154	86.9108	87.4955	88.0701	88.6348	F	9	C2H4
89.1899	89.7358	90.2728	90.8010	91.3208	F	10	C2H4
7.1678	9.1651	11.3212	13.6005	15.9486	CP	1	C2H5
18.2923	20.5398	22.5803	24.2847	25.5047	CP	2	C2H5
26.4062	27.2626	28.0732	28.8376	29.5553	CP	3	C2H5
30.2264	30.8508	31.4289	31.9610	32.4478	CP	4	C2H5
32.8901	33.2889	33.6454	33.9610	34.2371	CP	5	C2H5
34.4755	34.6782	34.8473	34.9850	35.0938	CP	6	C2H5
35.1764	35.2356	35.2744	35.2962	35.3042	CP	7	C2H5
35.3020	35.2935	35.2826	35.2734	35.2703	CP	8	C2H5
35.2777	35.3003	35.3431	35.4111	35.5096	CP	9	C2H5
35.6440	35.8199	36.0431	36.3196	36.6556	CP	10	C2H5
-1.8174	-1.0022	0.0209	1.2662	2.7433	H	1	C2H5
4.4558	6.3986	8.5568	10.9035	13.3976	H	2	C2H5
15.9936	18.6774	21.4446	24.2905	27.2105	H	3	C2H5
30.2000	33.2542	36.3686	39.5385	42.7593	H	4	C2H5
46.0266	49.3359	52.6829	56.0636	59.4738	H	5	C2H5
62.9097	66.3677	69.8443	73.3361	76.8403	H	6	C2H5
80.3540	83.8748	87.4005	90.9291	94.4592	H	7	C2H5
97.9896	101.5194	105.0482	108.5760	112.1031	H	8	C2H5
115.6304	119.1592	122.6911	126.2286	129.7744	H	9	C2H5
133.3317	136.9046	140.4973	144.1150	147.7632	H	10	C2H5
68.6908	61.0991	60.1373	60.6083	61.5735	F	1	C2H5
62.7495	64.0254	65.3491	66.6921	68.0362	F	2	C2H5

69.3677	70.6775	71.9607	73.2148	74.4392	F	3	C2H5
75.6337	76.7988	77.9353	79.0441	80.1261	F	4	C2H5
81.1823	82.2138	83.2213	84.2059	85.1683	F	5	C2H5
86.1093	87.0297	87.9303	88.8117	89.6745	F	6	C2H5
90.5195	91.3470	92.1578	92.9524	93.7312	F	7	C2H5
94.4947	95.2435	95.9780	96.6986	97.4058	F	8	C2H5
98.1000	98.7817	99.4512	100.1089	100.7553	F	9	C2H5
101.3908	102.0157	102.6304	103.2354	103.8310	F	10	C2H5
6.0756	9.3377	12.5752	15.6927	18.6169	CP	1	C2H6
21.2962	23.7010	25.8235	27.6777	29.2996	CP	2	C2H6
30.5572	31.7115	32.7685	33.7341	34.6141	CP	3	C2H6
35.4139	36.1388	36.7942	37.3850	37.9160	CP	4	C2H6
38.3919	38.8172	39.1963	39.5333	39.8321	CP	5	C2H6
40.0967	40.3306	40.5373	40.7201	40.8821	CP	6	C2H6
41.0263	41.1556	41.2723	41.3792	41.4783	CP	7	C2H6
41.5718	41.6616	41.7495	41.8371	41.9257	CP	8	C2H6
42.0167	42.1110	42.2096	42.3132	42.4223	CP	9	C2H6
42.5374	42.6586	42.7860	42.9195	43.0587	CP	10	C2H6
-1.8435	-1.0731	0.0232	1.4379	3.1553	H	1	C2H6
5.1531	7.4054	9.8839	12.5611	15.4117	H	2	C2H6
18.4054	21.5197	24.7444	28.0703	31.4884	H	3	C2H6
34.9905	38.5687	42.2159	45.9254	49.6909	H	4	C2H6
53.5067	57.3676	61.2687	65.2055	69.1740	H	5	C2H6
73.1708	77.1924	81.2360	85.2990	89.3793	H	6	C2H6
93.4748	97.5841	101.7055	105.8382	109.9811	H	7	C2H6
114.1337	118.2954	122.4659	126.6452	130.8334	H	8	C2H6
135.0305	139.2368	143.4528	147.6789	151.9156	H	9	C2H6
156.1636	160.4233	164.6955	168.9807	173.2796	H	10	C2H6
63.6229	55.7639	54.7219	55.2529	56.3572	F	1	C2H6
57.7143	59.1908	60.7215	62.2707	63.8177	F	2	C2H6
65.3496	66.8577	68.3372	69.7855	71.2013	F	3	C2H6
72.5845	73.9351	75.2538	76.5413	77.7984	F	4	C2H6
79.0261	80.2254	81.3970	82.5421	83.6614	F	5	C2H6
84.7559	85.8265	86.8740	87.8991	88.9027	F	6	C2H6
89.8856	90.8483	91.7917	92.7164	93.6230	F	7	C2H6
94.5122	95.3846	96.2406	97.0809	97.9061	F	8	C2H6
98.7165	99.5128	100.2953	101.0646	101.8211	F	9	C2H6
102.5652	103.2972	104.0177	104.7270	105.4254	F	10	C2H6
6.6797	6.8594	6.9524	7.0037	7.0490	CP	1	CH
7.1147	7.2179	7.3663	7.5583	7.7831	CP	2	CH
8.0093	8.2181	8.4105	8.5872	8.7491	CP	3	CH
8.8970	9.0317	9.1539	9.2644	9.3640	CP	4	CH
9.4533	9.5331	9.6039	9.6666	9.7217	CP	5	CH
9.7698	9.8116	9.8477	9.8785	9.9047	CP	6	CH
9.9269	9.9454	9.9608	9.9736	9.9842	CP	7	CH
9.9931	10.0007	10.0074	10.0136	10.0196	CP	8	CH
10.0259	10.0326	10.0402	10.0489	10.0591	CP	9	CH
10.0708	10.0845	10.1003	10.1185	10.1391	CP	10	CH
-1.3561	-0.6783	0.0129	0.7108	1.4134	H	1	CH
2.1213	2.8376	3.5664	4.3123	5.0792	H	2	CH
5.8690	6.6805	7.5120	8.3621	9.2290	H	3	CH
10.1114	11.0080	11.9173	12.8383	13.7699	H	4	CH
14.7108	15.6602	16.6171	17.5807	18.5502	H	5	CH
19.5248	20.5039	21.4870	22.4733	23.4625	H	6	CH
24.4541	25.4478	26.4431	27.4398	28.4377	H	7	CH
29.4366	30.4363	31.4367	32.4378	33.4394	H	8	CH
34.4417	35.4446	36.4483	37.4527	38.4581	H	9	CH
39.4646	40.4723	41.4815	42.4925	43.5053	H	10	CH
49.8292	44.3506	43.7174	43.9908	44.5087	F	1	CH
45.0904	45.6762	46.2449	46.7898	47.3098	F	2	CH
47.8061	48.2805	48.7346	49.1700	49.5883	F	3	CH
49.9908	50.3786	50.7529	51.1146	51.4644	F	4	CH
51.8033	52.1318	52.4506	52.7602	53.0612	F	5	CH
53.3540	53.6390	53.9166	54.1872	54.4512	F	6	CH
54.7087	54.9602	55.2058	55.4459	55.6807	F	7	CH
55.9103	56.1350	56.3550	56.5705	56.7816	F	8	CH
56.9885	57.1914	57.3904	57.5857	57.7774	F	9	CH
57.9656	58.1504	58.3321	58.5106	58.6860	F	10	CH
7.7126	7.9679	8.2469	8.5512	8.8790	CP	1	CH2
9.2253	9.5811	9.9344	10.2693	10.5666	CP	2	CH2
10.8305	11.0798	11.3141	11.5333	11.7374	CP	3	CH2
11.9265	12.1007	12.2601	12.4052	12.5362	CP	4	CH2

12.6537	12.7583	12.8505	12.9311	13.0019	CP	5	CH2
13.0611	13.1123	13.1557	13.1925	13.2239	CP	6	CH2
13.2514	13.2762	13.3000	13.3243	13.3508	CP	7	CH2
13.3813	13.4176	13.4617	13.5157	13.5815	CP	8	CH2
13.6615	13.7579	13.8731	14.0095	14.1697	CP	9	CH2
14.3564	14.5722	14.8200	15.1026	15.4231	CP	10	CH2
-1.5791	-0.7953	0.0153	0.8549	1.7263	H	1	CH2
2.6314	3.5717	4.5475	5.5579	6.6001	H	2	CH2
7.6701	8.7657	9.8856	11.0280	12.1917	H	3	CH2
13.3750	14.5765	15.7947	17.0281	18.2752	H	4	CH2
19.5349	20.8056	22.0861	23.3753	24.6720	H	5	CH2
25.9752	27.2839	28.5973	29.9148	31.2357	H	6	CH2
32.5595	33.8858	35.2147	36.5459	37.8796	H	7	CH2
39.2162	40.5560	41.8999	43.2487	44.6035	H	8	CH2
45.9655	47.3363	48.7177	50.1116	51.5204	H	9	CH2
52.9465	54.3927	55.8620	57.3578	58.8838	H	10	CH2
53.8538	47.4621	46.7175	47.0445	47.6723	F	1	CH2
48.3884	49.1204	49.8410	50.5396	51.2127	F	2	CH2
51.8596	52.4808	53.0775	53.6512	54.2033	F	3	CH2
54.7354	55.2487	55.7445	56.2241	56.6883	F	4	CH2
57.1381	57.5745	57.9981	58.4097	58.8099	F	5	CH2
59.1994	59.5786	59.9481	60.3083	60.6596	F	6	CH2
61.0025	61.3374	61.6645	61.9842	62.2969	F	7	CH2
62.6028	62.9021	63.1953	63.4826	63.7641	F	8	CH2
64.0402	64.3111	64.5770	64.8381	65.0947	F	9	CH2
65.3470	65.5952	65.8396	66.0802	66.3174	F	10	CH2
5.4577	7.1021	8.4014	9.4996	10.5008	CP	1	CH2O
11.4688	12.4273	13.3600	14.2104	14.8818	CP	2	CH2O
15.3943	15.8552	16.2683	16.6375	16.9662	CP	3	CH2O
17.2579	17.5158	17.7432	17.9429	18.1178	CP	4	CH2O
18.2705	18.4035	18.5192	18.6198	18.7073	CP	5	CH2O
18.7837	18.8506	18.9097	18.9624	19.0099	CP	6	CH2O
19.0535	19.0940	19.1324	19.1692	19.2049	CP	7	CH2O
19.2401	19.2748	19.3091	19.3429	19.3759	CP	8	CH2O
19.4079	19.4381	19.4659	19.4905	19.5107	CP	9	CH2O
19.5255	19.5336	19.5334	19.5232	19.5015	CP	10	CH2O
-1.3934	-0.7619	0.0155	0.9118	1.9123	H	1	CH2O
3.0108	4.2057	5.4955	6.8750	8.3316	H	2	CH2O
9.8459	11.4088	13.0153	14.6610	16.3415	H	3	CH2O
18.0530	19.7919	21.5551	23.3397	25.1429	H	4	CH2O
26.9625	28.7963	30.6426	32.4997	34.3661	H	5	CH2O
36.2407	38.1225	40.0106	41.9043	43.8029	H	6	CH2O
45.7061	47.6135	49.5248	51.4399	53.3586	H	7	CH2O
55.2809	57.2066	59.1358	61.0684	63.0044	H	8	CH2O
64.9436	66.8859	68.8311	70.7790	72.7291	H	9	CH2O
74.6809	76.6340	78.5874	80.5403	82.4916	H	10	CH2O
58.7836	52.9706	52.2438	52.5869	53.2702	F	1	CH2O
54.0769	54.9268	55.7865	56.6408	57.4822	F	2	CH2O
58.3059	59.1089	59.8902	60.6492	61.3863	F	3	CH2O
62.1020	62.7970	63.4720	64.1278	64.7653	F	4	CH2O
65.3852	65.9883	66.5754	67.1471	67.7041	F	5	CH2O
68.2470	68.7765	69.2931	69.7973	70.2898	F	6	CH2O
70.7709	71.2411	71.7010	72.1508	72.5911	F	7	CH2O
73.0221	73.4443	73.8580	74.2634	74.6611	F	8	CH2O
75.0511	75.4338	75.8095	76.1784	76.5408	F	9	CH2O
76.8968	77.2467	77.5907	77.9290	78.2617	F	10	CH2O
6.7368	8.1537	9.2313	10.0931	10.8345	CP	1	CH3
11.5229	12.1981	12.8714	13.5265	14.1190	CP	2	CH3
14.6343	15.1035	15.5298	15.9162	16.2658	CP	3	CH3
16.5812	16.8652	17.1203	17.3492	17.5540	CP	4	CH3
17.7370	17.9003	18.0460	18.1760	18.2919	CP	5	CH3
18.3954	18.4881	18.5713	18.6465	18.7147	CP	6	CH3
18.7770	18.8343	18.8876	18.9374	18.9845	CP	7	CH3
19.0292	19.0719	19.1130	19.1524	19.1903	CP	8	CH3
19.2265	19.2607	19.2928	19.3221	19.3481	CP	9	CH3
19.3701	19.3874	19.3990	19.4038	19.4007	CP	10	CH3
-1.6024	-0.8545	0.0171	0.9846	2.0317	H	1	CH3
3.1498	4.3359	5.5894	6.9096	8.2926	H	2	CH3
9.7307	11.2179	12.7500	14.3226	15.9320	H	3	CH3
17.5746	19.2472	20.9467	22.6703	24.4157	H	4	CH3
26.1804	27.9624	29.7599	31.5711	33.3946	H	5	CH3
35.2291	37.0733	38.9264	40.7873	42.6554	H	6	CH3

44.5301	46.4107	48.2968	50.1881	52.0842	H	7	CH3
53.9849	55.8900	57.7992	59.7125	61.6297	H	8	CH3
63.5505	65.4749	67.4026	69.3333	71.2669	H	9	CH3
73.2028	75.1408	77.0801	79.0203	80.9606	H	10	CH3
53.8090	47.1850	46.3748	46.7477	47.4793	F	1	CH3
48.3296	49.2122	50.0924	50.9563	51.7973	F	2	CH3
52.6141	53.4057	54.1724	54.9149	55.6342	F	3	CH3
56.3314	57.0076	57.6637	58.3009	58.9200	F	4	CH3
59.5220	60.1076	60.6777	61.2330	61.7741	F	5	CH3
62.3018	62.8166	63.3191	63.8098	64.2892	F	6	CH3
64.7578	65.2161	65.6644	66.1032	66.5329	F	7	CH3
66.9537	67.3661	67.7703	68.1667	68.5556	F	8	CH3
68.9372	69.3118	69.6796	70.0409	70.3959	F	9	CH3
70.7449	71.0879	71.4252	71.7571	72.0835	F	10	CH3
5.7108	7.3665	9.0791	10.7854	12.4319	CP	1	CH3O
13.9754	15.3824	16.6290	17.7018	18.5968	CP	2	CH3O
19.2924	19.9280	20.5073	21.0335	21.5102	CP	3	CH3O
21.9405	22.3276	22.6745	22.9842	23.2594	CP	4	CH3O
23.5030	23.7175	23.9055	24.0695	24.2117	CP	5	CH3O
24.3345	24.4399	24.5300	24.6066	24.6717	CP	6	CH3O
24.7270	24.7741	24.8145	24.8497	24.8809	CP	7	CH3O
24.9094	24.9364	24.9629	24.9897	25.0177	CP	8	CH3O
25.0477	25.0802	25.1158	25.1549	25.1978	CP	9	CH3O
25.2448	25.2959	25.3512	25.4105	25.4738	CP	10	CH3O
-1.4584	-0.8053	0.0168	1.0103	2.1718	H	1	CH3O
3.4932	4.9624	6.5643	8.2824	10.0988	H	2	CH3O
11.9937	13.9552	15.9775	18.0549	20.1825	H	3	CH3O
22.3554	24.5692	26.8196	29.1028	31.4153	H	4	CH3O
33.7537	36.1149	38.4963	40.8952	43.3095	H	5	CH3O
45.7369	48.1758	50.6244	53.0813	55.5453	H	6	CH3O
58.0153	60.4905	62.9699	65.4532	67.9397	H	7	CH3O
70.4293	72.9216	75.4166	77.9142	80.4145	H	8	CH3O
82.9178	85.4242	87.9339	90.4474	92.9650	H	9	CH3O
95.4871	98.0141	100.5465	103.0845	105.6287	H	10	CH3O
61.4726	55.3762	54.6035	54.9801	55.7473	F	1	CH3O
56.6738	57.6686	58.6896	59.7147	60.7315	F	2	CH3O
61.7324	62.7128	63.6702	64.6035	65.5125	F	3	CH3O
66.3976	67.2592	68.0981	68.9150	69.7108	F	4	CH3O
70.4861	71.2418	71.9787	72.6975	73.3989	F	5	CH3O
74.0836	74.7523	75.4055	76.0439	76.6680	F	6	CH3O
77.2784	77.8756	78.4600	79.0322	79.5926	F	7	CH3O
80.1416	80.6796	81.2070	81.7243	82.2316	F	8	CH3O
82.7295	83.2183	83.6982	84.1695	84.6326	F	9	CH3O
85.0878	85.5353	85.9753	86.4081	86.8341	F	10	CH3O
4.5251	6.7262	8.4268	9.8445	11.1386	CP	1	CH4
12.4101	13.7015	14.9970	16.2225	17.2454	CP	2	CH4
18.0673	18.8112	19.4827	20.0872	20.6299	CP	3	CH4
21.1158	21.5496	21.9359	22.2789	22.5830	CP	4	CH4
22.8518	23.0892	23.2985	23.4831	23.6460	CP	5	CH4
23.7900	23.9177	24.0316	24.1337	24.2262	CP	6	CH4
24.3107	24.3887	24.4617	24.5306	24.5965	CP	7	CH4
24.6600	24.7215	24.7813	24.8395	24.8958	CP	8	CH4
24.9499	25.0011	25.0487	25.0916	25.1285	CP	9	CH4
25.1581	25.1785	25.1879	25.1842	25.1651	CP	10	CH4
-1.3131	-0.7453	0.0156	0.9307	1.9804	H	1	CH4
3.1578	4.4632	5.8983	7.4603	9.1361	H	2	CH4
10.9024	12.7469	14.6622	16.6412	18.6776	H	3	CH4
20.7653	22.8990	25.0737	27.2847	29.5281	H	4	CH4
31.8002	34.0975	36.4171	38.7563	41.1130	H	5	CH4
43.4849	45.8704	48.2680	50.6763	53.0944	H	6	CH4
55.5213	57.9563	60.3989	62.8485	65.3049	H	7	CH4
67.7677	70.2368	72.7120	75.1930	77.6798	H	8	CH4
80.1721	82.6697	85.1722	87.6793	90.1904	H	9	CH4
92.7048	95.2217	97.7401	100.2588	102.7764	H	10	CH4
50.7381	45.1817	44.4651	44.8132	45.5161	F	1	CH4
46.3571	47.2538	48.1713	49.0933	50.0111	F	2	CH4
50.9187	51.8120	52.6885	53.5469	54.3865	F	3	CH4
55.2071	56.0089	56.7919	57.5568	58.3037	F	4	CH4
59.0333	59.7461	60.4425	61.1231	61.7884	F	5	CH4
62.4389	63.0751	63.6975	64.3065	64.9028	F	6	CH4
65.4866	66.0584	66.6187	67.1678	67.7061	F	7	CH4
68.2341	68.7521	69.2603	69.7593	70.2492	F	8	CH4

70.7304	71.2031	71.6677	72.1245	72.5736	F	9	CH4
73.0153	73.4499	73.8775	74.2984	74.7127	F	10	CH4
7.0922	6.9915	6.9730	7.0292	7.1485	CP	1	CN
7.3155	7.5110	7.7116	7.8902	8.0156	CP	2	CN
8.1050	8.1976	8.2932	8.3913	8.4916	CP	3	CN
8.5937	8.6972	8.8019	8.9074	9.0133	CP	4	CN
9.1193	9.2251	9.3303	9.4347	9.5380	CP	5	CN
9.6398	9.7399	9.8380	9.9338	10.0270	CP	6	CN
10.1174	10.2046	10.2885	10.3689	10.4454	CP	7	CN
10.5178	10.5859	10.6495	10.7084	10.7623	CP	8	CN
10.8110	10.8545	10.8923	10.9245	10.9508	CP	9	CN
10.9710	10.9850	10.9926	10.9936	10.9880	CP	10	CN
-1.3881	-0.6847	0.0129	0.7124	1.4208	H	1	CN
2.1437	2.8849	3.6461	4.4265	5.2224	H	2	CN
6.0284	6.8435	7.6680	8.5022	9.3463	H	3	CN
10.2006	11.0651	11.9400	12.8255	13.7215	H	4	CN
14.6282	15.5454	16.4732	17.4114	18.3601	H	5	CN
19.3190	20.2880	21.2669	22.2555	23.2536	H	6	CN
24.2608	25.2769	26.3016	27.3345	28.3753	H	7	CN
29.4235	30.4787	31.5405	32.6084	33.6820	H	8	CN
34.7607	35.8440	36.9314	38.0223	39.1161	H	9	CN
40.2123	41.3101	42.4090	43.5084	44.6075	H	10	CN
54.6226	49.0448	48.4071	48.6810	49.2007	F	1	CN
49.7870	50.3808	50.9606	51.5188	52.0532	F	2	CN
52.5634	53.0500	53.5143	53.9580	54.3824	F	3	CN
54.7892	55.1798	55.5554	55.9172	56.2663	F	4	CN
56.6036	56.9300	57.2462	57.5530	57.8510	F	5	CN
58.1407	58.4227	58.6974	58.9654	59.2268	F	6	CN
59.4822	59.7318	59.9760	60.2150	60.4490	F	7	CN
60.6783	60.9031	61.1236	61.3400	61.5525	F	8	CN
61.7611	61.9661	62.1676	62.3656	62.5604	F	9	CN
62.7520	62.9405	63.1260	63.3087	63.4885	F	10	CN
6.7164	6.8557	6.9492	7.0340	7.1354	CP	1	CO
7.2667	7.4296	7.6140	7.7978	7.9473	CP	2	CO
8.0596	8.1609	8.2520	8.3338	8.4069	CP	3	CO
8.4722	8.5303	8.5819	8.6276	8.6681	CP	4	CO
8.7039	8.7356	8.7636	8.7884	8.8106	CP	5	CO
8.8304	8.8482	8.8645	8.8794	8.8934	CP	6	CO
8.9065	8.9191	8.9313	8.9432	8.9550	CP	7	CO
8.9668	8.9785	8.9902	9.0019	9.0135	CP	8	CO
9.0249	9.0360	9.0467	9.0568	9.0660	CP	9	CO
9.0741	9.0808	9.0858	9.0888	9.0893	CP	10	CO
-1.3568	-0.6776	0.0129	0.7120	1.4202	H	1	CO
2.1401	2.8746	3.6267	4.3974	5.1851	H	2	CO
5.9856	6.7967	7.6174	8.4468	9.2839	H	3	CO
10.1279	10.9781	11.8337	12.6943	13.5591	H	4	CO
14.4277	15.2997	16.1747	17.0524	17.9323	H	5	CO
18.8144	19.6983	20.5840	21.4712	22.3598	H	6	CO
23.2498	24.1411	25.0336	25.9274	26.8223	H	7	CO
27.7184	28.6156	29.5141	30.4137	31.3145	H	8	CO
32.2164	33.1194	34.0236	34.9288	35.8349	H	9	CO
36.7419	37.6497	38.5580	39.4668	40.3757	H	10	CO
53.3209	47.8432	47.2107	47.4842	48.0037	F	1	CO
48.5895	49.1816	49.7589	50.3138	50.8445	F	2	CO
51.3510	51.8342	52.2954	52.7362	53.1578	F	3	CO
53.5619	53.9495	54.3220	54.6803	55.0256	F	4	CO
55.3586	55.6801	55.9910	56.2919	56.5833	F	5	CO
56.8659	57.1401	57.4064	57.6653	57.9172	F	6	CO
58.1623	58.4012	58.6339	58.8610	59.0826	F	7	CO
59.2990	59.5104	59.7171	59.9193	60.1171	F	8	CO
60.3108	60.5005	60.6863	60.8685	61.0472	F	9	CO
61.2225	61.3945	61.5634	61.7293	61.8922	F	10	CO
6.2998	7.7400	8.9093	9.8642	10.6513	CP	1	CO2
11.3070	11.8577	12.3195	12.6987	12.9912	CP	2	CO2
13.2238	13.4321	13.6181	13.7838	13.9307	CP	3	CO2
14.0607	14.1754	14.2763	14.3648	14.4425	CP	4	CO2
14.5104	14.5699	14.6222	14.6682	14.7090	CP	5	CO2
14.7455	14.7785	14.8087	14.8368	14.8634	CP	6	CO2
14.8890	14.9140	14.9388	14.9636	14.9886	CP	7	CO2
15.0140	15.0398	15.0658	15.0921	15.1183	CP	8	CO2
15.1441	15.1693	15.1934	15.2158	15.2359	CP	9	CO2
15.2530	15.2665	15.2753	15.2786	15.2755	CP	10	CO2

-1.5225	-0.8180	0.0165	0.9567	1.9837	H	1	CO2
3.0826	4.2416	5.4512	6.7028	7.9880	H	2	CO2
9.2990	10.6320	11.9847	13.3549	14.7408	H	3	CO2
16.1405	17.5524	18.9751	20.4073	21.8477	H	4	CO2
23.2954	24.7495	26.2092	27.6738	29.1427	H	5	CO2
30.6154	32.0916	33.5710	35.0533	36.5383	H	6	CO2
38.0259	39.5161	41.0087	42.5039	44.0015	H	7	CO2
45.5016	47.0043	48.5096	50.0174	51.5280	H	8	CO2
53.0411	54.5568	56.0749	57.5954	59.1180	H	9	CO2
60.6425	62.1685	63.6956	65.2234	66.7511	H	10	CO2
58.1662	51.8569	51.0795	51.4409	52.1537	F	1	CO2
52.9851	53.8489	54.7088	55.5490	56.3624	F	2	CO2
57.1461	57.8995	58.6231	59.3183	59.9864	F	3	CO2
60.6291	61.2479	61.8443	62.4196	62.9753	F	4	CO2
63.5124	64.0321	64.5354	65.0233	65.4966	F	5	CO2
65.9561	66.4026	66.8368	67.2592	67.6706	F	6	CO2
68.0714	68.4621	68.8433	69.2154	69.5788	F	7	CO2
69.9339	70.2811	70.6207	70.9531	71.2785	F	8	CO2
71.5973	71.9097	72.2159	72.5163	72.8110	F	9	CO2
73.1003	73.3843	73.6632	73.9372	74.2065	F	10	CO2
4.9675	4.9675	4.9675	4.9675	4.9675	CP	1	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	2	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	3	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	4	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	5	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	6	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	7	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	8	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	9	H
4.9675	4.9675	4.9675	4.9675	4.9675	CP	10	H
-0.9843	-0.4876	0.0092	0.5059	1.0027	H	1	H
1.4994	1.9962	2.4929	2.9897	3.4864	H	2	H
3.9832	4.4799	4.9767	5.4734	5.9702	H	3	H
6.4669	6.9637	7.4604	7.9572	8.4539	H	4	H
8.9507	9.4474	9.9442	10.4409	10.9377	H	5	H
11.4344	11.9312	12.4279	12.9247	13.4214	H	6	H
13.9182	14.4149	14.9117	15.4084	15.9052	H	7	H
16.4019	16.8987	17.3954	17.8922	18.3889	H	8	H
18.8857	19.3824	19.8792	20.3759	20.8727	H	9	H
21.3694	21.8662	22.3629	22.8597	23.3564	H	10	H
31.8050	27.8429	27.3887	27.5835	27.9514	F	1	H
28.3634	28.7765	29.1754	29.5548	29.9136	F	2	H
30.2524	30.5724	30.8751	31.1618	31.4340	F	3	H
31.6929	31.9396	32.1752	32.4004	32.6163	F	4	H
32.8234	33.0224	33.2139	33.3985	33.5766	F	5	H
33.7487	33.9150	34.0761	34.2322	34.3836	F	6	H
34.5305	34.6733	34.8121	34.9472	35.0788	F	7	H
35.2070	35.3320	35.4539	35.5729	35.6892	F	8	H
35.8028	35.9139	36.0226	36.1290	36.2331	F	9	H
36.3352	36.4352	36.5332	36.6293	36.7236	F	10	H
6.7010	6.8163	6.9011	6.9591	6.9963	CP	1	H2
7.0202	7.0406	7.0693	7.1198	7.2078	CP	2	H2
7.3188	7.4268	7.5318	7.6337	7.7326	CP	3	H2
7.8285	7.9213	8.0111	8.0980	8.1818	CP	4	H2
8.2627	8.3408	8.4160	8.4884	8.5581	CP	5	H2
8.6252	8.6897	8.7518	8.8116	8.8690	CP	6	H2
8.9243	8.9776	9.0290	9.0787	9.1267	CP	7	H2
9.1733	9.2185	9.2626	9.3058	9.3481	CP	8	H2
9.3898	9.4312	9.4723	9.5134	9.5548	CP	9	H2
9.5966	9.6391	9.6826	9.7272	9.7732	CP	10	H2
-1.3495	-0.6733	0.0128	0.7060	1.4039	H	1	H2
2.1048	2.8078	3.5132	4.2224	4.9384	H	2	H2
5.6648	6.4021	7.1500	7.9083	8.6767	H	3	H2
9.4548	10.2423	11.0389	11.8444	12.6584	H	4	H2
13.4807	14.3109	15.1487	15.9940	16.8463	H	5	H2
17.7055	18.5713	19.4434	20.3216	21.2056	H	6	H2
22.0953	22.9904	23.8908	24.7962	25.7064	H	7	H2
26.6214	27.5410	28.4651	29.3935	30.3262	H	8	H2
31.2631	32.2042	33.1494	34.0987	35.0521	H	9	H2
36.0096	36.9714	37.9375	38.9080	39.8830	H	10	H2
37.2846	31.8385	31.2100	31.4815	31.9958	F	1	H2
32.5734	33.1539	33.7155	34.2507	34.7581	F	2	H2

35.2390	35.6952	36.1288	36.5420	36.9364	F	3	H2
37.3137	37.6755	38.0229	38.3573	38.6795	F	4	H2
38.9905	39.2911	39.5821	39.8640	40.1376	F	5	H2
40.4033	40.6616	40.9129	41.1577	41.3963	F	6	H2
41.6291	41.8562	42.0782	42.2951	42.5072	F	7	H2
42.7149	42.9181	43.1173	43.3125	43.5038	F	8	H2
43.6916	43.8758	44.0568	44.2344	44.4091	F	9	H2
44.5807	44.7494	44.9154	45.0788	45.2396	F	10	H2
7.3072	7.7083	7.9982	8.2300	8.4449	CP	1	H2O
8.6723	8.9294	9.2217	9.5427	9.8736	CP	2	H2O
10.1897	10.4850	10.7606	11.0176	11.2569	CP	3	H2O
11.4795	11.6865	11.8787	12.0570	12.2224	CP	4	H2O
12.3755	12.5174	12.6486	12.7701	12.8824	CP	5	H2O
12.9863	13.0825	13.1714	13.2539	13.3303	CP	6	H2O
13.4013	13.4673	13.5289	13.5864	13.6402	CP	7	H2O
13.6908	13.7386	13.7837	13.8265	13.8673	CP	8	H2O
13.9063	13.9437	13.9796	14.0143	14.0477	CP	9	H2O
14.0800	14.1112	14.1414	14.1705	14.1984	CP	10	H2O
-1.5232	-0.7712	0.0148	0.8265	1.6602	H	1	H2O
2.5159	3.3957	4.3030	5.2410	6.2119	H	2	H2O
7.2152	8.2491	9.3116	10.4006	11.5145	H	3	H2O
12.6514	13.8099	14.9882	16.1851	17.3992	H	4	H2O
18.6292	19.8739	21.1323	22.4033	23.6860	H	5	H2O
24.9795	26.2830	27.5958	28.9171	30.2464	H	6	H2O
31.5830	32.9265	34.2763	35.6321	36.9935	H	7	H2O
38.3600	39.7315	41.1077	42.4882	43.8729	H	8	H2O
45.2616	46.6541	48.0503	49.4500	50.8531	H	9	H2O
52.2595	53.6691	55.0817	56.4973	57.9158	H	10	H2O
52.0016	45.8221	45.0997	45.4163	46.0217	F	1	H2O
46.7084	47.4063	48.0896	48.7495	49.3835	F	2	H2O
49.9922	50.5766	51.1384	51.6791	52.2002	F	3	H2O
52.7030	53.1890	53.6591	54.1145	54.5561	F	4	H2O
54.9847	55.4012	55.8062	56.2003	56.5843	F	5	H2O
56.9585	57.3235	57.6797	58.0276	58.3675	F	6	H2O
58.6998	59.0249	59.3430	59.6545	59.9596	F	7	H2O
60.2585	60.5516	60.8391	61.1211	61.3978	F	8	H2O
61.6695	61.9364	62.1986	62.4562	62.7094	F	9	H2O
62.9585	63.2034	63.4444	63.6816	63.9151	F	10	H2O
8.0271	9.2666	10.4144	11.4449	12.3442	CP	1	H2O2
13.1102	13.7524	14.2925	14.7636	15.2109	CP	2	H2O2
15.5984	15.9540	16.2797	16.5774	16.8490	CP	3	H2O2
17.0963	17.3211	17.5250	17.7096	17.8765	CP	4	H2O2
18.0272	18.1630	18.2853	18.3953	18.4943	CP	5	H2O2
18.5833	18.6634	18.7357	18.8010	18.8602	CP	6	H2O2
18.9140	18.9633	19.0086	19.0505	19.0896	CP	7	H2O2
19.1263	19.1609	19.1938	19.2252	19.2553	CP	8	H2O2
19.2842	19.3119	19.3384	19.3635	19.3872	CP	9	H2O2
19.4092	19.4292	19.4467	19.4614	19.4728	CP	10	H2O2
-1.8310	-0.9657	0.0192	1.1133	2.3038	H	1	H2O2
3.5777	4.9217	6.3247	7.7779	9.2766	H	2	H2O2
10.8174	12.3953	14.0072	15.6503	17.3218	H	3	H2O2
19.0192	20.7403	22.4828	24.2446	26.0241	H	4	H2O2
27.8194	29.6290	31.4515	33.2857	35.1302	H	5	H2O2
36.9842	38.8466	40.7166	42.5935	44.4766	H	6	H2O2
46.3654	48.2593	50.1579	52.0609	53.9679	H	7	H2O2
55.8787	57.7931	59.7108	61.6318	63.5558	H	8	H2O2
65.4828	67.4126	69.3451	71.2803	73.2178	H	9	H2O2
75.1576	77.0996	79.0434	80.9888	82.9356	H	10	H2O2
64.1021	56.5691	55.6544	56.0756	56.9040	F	1	H2O2
57.8692	58.8716	59.8694	60.8442	61.7883	F	2	H2O2
62.6992	63.5765	64.4212	65.2347	66.0187	F	3	H2O2
66.7750	67.5051	68.2108	68.8934	69.5544	F	4	H2O2
70.1951	70.8165	71.4197	72.0059	72.5758	F	5	H2O2
73.1303	73.6702	74.1963	74.7091	75.2094	F	6	H2O2
75.6977	76.1745	76.6404	77.0959	77.5413	F	7	H2O2
77.9771	78.4037	78.8215	79.2309	79.6321	F	8	H2O2
80.0254	80.4112	80.7898	81.1614	81.5263	F	9	H2O2
81.8846	82.2367	82.5827	82.9229	83.2574	F	10	H2O2
6.4692	7.6630	8.6034	9.3529	9.9636	CP	1	CHN
10.4767	10.9230	11.3226	11.6850	12.0090	CP	2	CHN
12.2972	12.5596	12.7980	13.0142	13.2098	CP	3	CHN
13.3865	13.5459	13.6894	13.8184	13.9343	CP	4	CHN

14.0383	14.1317	14.2156	14.2909	14.3588	CP	5	CHN
14.4202	14.4758	14.5265	14.5730	14.6158	CP	6	CHN
14.6556	14.6929	14.7281	14.7616	14.7935	CP	7	CHN
14.8243	14.8539	14.8824	14.9099	14.9363	CP	8	CHN
14.9615	14.9852	15.0072	15.0271	15.0445	CP	9	CHN
15.0589	15.0697	15.0764	15.0781	15.0743	CP	10	CHN
-1.5083	-0.7993	0.0159	0.9151	1.8819	H	1	CHN
2.9046	3.9750	5.0876	6.2383	7.4234	H	2	CHN
8.6389	9.8819	11.1500	12.4408	13.7522	H	3	CHN
15.0821	16.4289	17.7908	19.1563	20.5540	H	4	CHN
21.9528	23.3613	24.7788	26.2042	27.6367	H	5	CHN
29.0757	30.5206	31.9707	33.4257	34.8852	H	6	CHN
36.3488	37.8162	39.2873	40.7618	42.2396	H	7	CHN
43.7205	45.2044	46.6912	48.1808	49.6732	H	8	CHN
51.1681	52.6654	54.1651	55.6668	57.1704	H	9	CHN
58.6756	60.1820	61.6894	63.1972	64.7048	H	10	CHN
55.1923	48.9727	48.2157	48.5627	49.2414	F	1	CHN
50.0274	50.8390	51.6431	52.4261	53.1824	F	2	CHN
53.9106	54.6106	55.2835	55.9306	56.5534	F	3	CHN
57.1535	57.7322	58.2909	58.8308	59.3531	F	4	CHN
59.8588	60.3490	60.8245	61.2861	61.7346	F	5	CHN
62.1707	62.5950	63.0082	63.4108	63.8033	F	6	CHN
64.1861	64.5599	64.9249	65.2815	65.6302	F	7	CHN
65.9713	66.3050	66.6318	66.9518	67.2654	F	8	CHN
67.5728	67.8743	68.1700	68.4602	68.7451	F	9	CHN
69.0249	69.2998	69.5699	69.8353	70.0963	F	10	CHN
6.8203	7.6164	8.2444	8.7799	9.2763	CP	1	CHO
9.7654	10.2571	10.7395	11.1791	11.5201	CP	2	CHO
11.7745	12.0033	12.2085	12.3920	12.5557	CP	3	CHO
12.7013	12.8305	12.9449	13.0461	13.1353	CP	4	CHO
13.2141	13.2837	13.3452	13.3998	13.4484	CP	5	CHO
13.4921	13.5318	13.5680	13.6017	13.6333	CP	6	CHO
13.6635	13.6926	13.7211	13.7493	13.7772	CP	7	CHO
13.8052	13.8331	13.8611	13.8889	13.9163	CP	8	CHO
13.9431	13.9689	13.9933	14.0157	14.0356	CP	9	CHO
14.0522	14.0647	14.0723	14.0741	14.0691	CP	10	CHO
-1.5025	-0.7789	0.0152	0.8670	1.7699	H	1	CHO
2.7220	3.7231	4.7731	5.8696	7.0057	H	2	CHO
8.1707	9.3598	10.5705	11.8007	13.0483	H	3	CHO
14.3113	15.5880	16.8769	18.1765	19.4857	H	4	CHO
20.8032	22.1282	23.4597	24.7970	26.1395	H	5	CHO
27.4865	28.8378	30.1928	31.5513	32.9130	H	6	CHO
34.2779	35.6457	37.0164	38.3899	39.7663	H	7	CHO
41.1454	42.5273	43.9120	45.2995	46.6898	H	8	CHO
48.0827	49.4783	50.8765	52.2769	53.6795	H	9	CHO
55.0840	56.4898	57.8967	59.3041	60.7113	H	10	CHO
60.5392	54.3928	53.6590	53.9889	54.6293	F	1	CHO
55.3670	56.1272	56.8809	57.6165	58.3292	F	2	CHO
59.0172	59.6798	60.3174	60.9311	61.5220	F	3	CHO
62.0914	62.6405	63.1705	63.6826	64.1779	F	4	CHO
64.6572	65.1216	65.5719	66.0088	66.4331	F	5	CHO
66.8455	67.2465	67.6368	68.0169	68.3873	F	6	CHO
68.7485	69.1008	69.4448	69.7808	70.1091	F	7	CHO
70.4301	70.7442	71.0515	71.3525	71.6473	F	8	CHO
71.9362	72.2194	72.4972	72.7698	73.0373	F	9	CHO
73.3000	73.5580	73.8115	74.0607	74.3056	F	10	CHO
8.6553	9.9308	11.1350	12.2427	13.2352	CP	1	HNCO
14.1003	14.8323	15.4318	15.9063	16.2694	CP	2	HNCO
16.5739	16.8602	17.1280	17.3772	17.6079	CP	3	HNCO
17.8201	18.0140	18.1901	18.3486	18.4903	CP	4	HNCO
18.6157	18.7256	18.8209	18.9025	18.9716	CP	5	HNCO
19.0293	19.0769	19.1160	19.1479	19.1743	CP	6	HNCO
19.1970	19.2178	19.2387	19.2617	19.2890	CP	7	HNCO
19.3229	19.3658	19.4201	19.4885	19.5737	CP	8	HNCO
19.6785	19.8059	19.9589	20.1406	20.3543	CP	9	HNCO
20.6034	20.8913	21.2216	21.5980	22.0243	CP	10	HNCO
-1.9632	-1.0334	0.0206	1.1904	2.4653	H	1	HNCO
3.8331	5.2809	6.7952	8.3631	9.9727	H	2	HNCO
11.6150	13.2869	14.9865	16.7119	18.4613	H	3	HNCO
20.2328	22.0247	23.8350	25.6621	27.5042	H	4	HNCO
29.3596	31.2268	33.1043	34.9906	36.8844	H	5	HNCO
38.7845	40.6899	42.5996	44.5128	46.4290	H	6	HNCO

48.3476	50.2683	52.1912	54.1161	56.0436	H	7	HNCO
57.9742	59.9085	61.8477	63.7930	65.7460	H	8	HNCO
67.7084	69.6824	71.6704	73.6752	75.6996	H	9	HNCO
77.7472	79.8216	81.9269	84.0674	86.2481	H	10	HNCO
66.1056	58.0347	57.0561	57.5065	58.3926	F	1	HNCO
59.4261	60.5008	61.5721	62.6199	63.6351	F	2	HNCO
64.6138	65.5550	66.4596	67.3291	68.1656	F	3	HNCO
68.9708	69.7469	70.4956	71.2187	71.9178	F	4	HNCO
72.5944	73.2498	73.8852	74.5017	75.1005	F	5	HNCO
75.6823	76.2482	76.7989	77.3352	77.8577	F	6	HNCO
78.3671	78.8641	79.3491	79.8228	80.2855	F	7	HNCO
80.7379	81.1804	81.6133	82.0371	82.4522	F	8	HNCO
82.8591	83.2579	83.6492	84.0333	84.4104	F	9	HNCO
84.7810	85.1454	85.5038	85.8567	86.2042	F	10	HNCO
6.6792	7.5582	8.2554	8.8385	9.3575	CP	1	HNO
9.8442	10.3128	10.7595	11.1625	11.4822	CP	2	HNO
11.7296	11.9522	12.1518	12.3303	12.4894	CP	3	HNO
12.6307	12.7558	12.8661	12.9632	13.0482	CP	4	HNO
13.1227	13.1876	13.2441	13.2934	13.3364	CP	5	HNO
13.3739	13.4069	13.4360	13.4621	13.4856	CP	6	HNO
13.5072	13.5272	13.5462	13.5644	13.5820	CP	7	HNO
13.5993	13.6164	13.6332	13.6497	13.6659	CP	8	HNO
13.6814	13.6962	13.7097	13.7217	13.7316	CP	9	HNO
13.7389	13.7429	13.7429	13.7383	13.7280	CP	10	HNO
-1.4903	-0.7766	0.0153	0.8707	1.7808	H	1	HNO
2.7411	3.7491	4.8030	5.8996	7.0327	H	2	HNO
8.1935	9.3778	10.5832	11.8074	13.0486	H	3	HNO
14.3047	15.5742	16.8554	18.1470	19.4476	H	4	HNO
20.7563	22.0718	23.3935	24.7204	26.0520	H	5	HNO
27.3875	28.7266	30.0688	31.4137	32.7611	H	6	HNO
34.1108	35.4625	36.8162	38.1717	39.5290	H	7	HNO
40.8881	42.2489	43.6114	44.9755	46.3413	H	8	HNO
47.7087	49.0776	50.4479	51.8194	53.1921	H	9	HNO
54.5657	55.9398	57.3141	58.6882	60.0616	H	10	HNO
59.5628	53.4545	52.7218	53.0529	53.6967	F	1	HNO
54.4393	55.2048	55.9636	56.7034	57.4193	F	2	HNO
58.1096	58.7737	59.4123	60.0265	60.6176	F	3	HNO
61.1869	61.7356	62.2651	62.7764	63.2708	F	4	HNO
63.7491	64.2124	64.6615	65.0971	65.5200	F	5	HNO
65.9310	66.3305	66.7193	67.0978	67.4665	F	6	HNO
67.8259	68.1765	68.5187	68.8528	69.1792	F	7	HNO
69.4983	69.8103	70.1156	70.4144	70.7071	F	8	HNO
70.9938	71.2748	71.5503	71.8205	72.0857	F	9	HNO
72.3459	72.6015	72.8525	73.0991	73.3414	F	10	HNO
6.8432	7.6404	8.3351	8.9456	9.4865	CP	1	HO2
9.9686	10.3986	10.7797	11.1108	11.3874	CP	2	HO2
11.6270	11.8527	12.0650	12.2646	12.4520	CP	3	HO2
12.6276	12.7921	12.9460	13.0896	13.2236	CP	4	HO2
13.3483	13.4643	13.5719	13.6716	13.7638	CP	5	HO2
13.8488	13.9272	13.9991	14.0651	14.1254	CP	6	HO2
14.1804	14.2304	14.2757	14.3165	14.3532	CP	7	HO2
14.3860	14.4151	14.4408	14.4634	14.4830	CP	8	HO2
14.4997	14.5139	14.5257	14.5351	14.5424	CP	9	HO2
14.5477	14.5511	14.5526	14.5525	14.5506	CP	10	HO2
-1.5093	-0.7841	0.0154	0.8801	1.8022	H	1	HO2
2.7754	3.7942	4.8535	5.9485	7.0739	H	2	HO2
8.2247	9.3988	10.5948	11.8114	13.0473	H	3	HO2
14.3014	15.5725	16.8594	18.1613	19.4770	H	4	HO2
20.8057	22.1464	23.4983	24.8605	26.2324	H	5	HO2
27.6130	29.0019	30.3983	31.8015	33.2111	H	6	HO2
34.6264	36.0470	37.4724	38.9020	40.3355	H	7	HO2
41.7725	43.2126	44.6554	46.1006	47.5480	H	8	HO2
48.9971	50.4478	51.8998	53.3529	54.8068	H	9	HO2
56.2613	57.7163	59.1715	60.6267	62.0819	H	10	HO2
61.6429	55.4654	54.7258	55.0602	55.7114	F	1	HO2
56.4632	57.2382	58.0055	58.7523	59.4733	F	2	HO2
60.1669	60.8330	61.4727	62.0873	62.6784	F	3	HO2
63.2476	63.7962	64.3257	64.8373	65.3322	F	4	HO2
65.8115	66.2761	66.7269	67.1648	67.5904	F	5	HO2
68.0044	68.4075	68.8003	69.1832	69.5567	F	6	HO2
69.9213	70.2775	70.6255	70.9658	71.2986	F	7	HO2
71.6244	71.9434	72.2558	72.5620	72.8621	F	8	HO2

73.1564	73.4451	73.7284	74.0065	74.2796	F	9	HO2
74.5479	74.8115	75.0705	75.3252	75.5756	F	10	HO2
8.3281	9.4163	10.4518	11.4162	12.2949	CP	1	HOCN
13.0770	13.7555	14.3275	14.7934	15.1577	CP	2	HOCN
15.4649	15.7540	16.0248	16.2773	16.5113	CP	3	HOCN
16.7270	16.9247	17.1045	17.2670	17.4127	CP	4	HOCN
17.5422	17.6562	17.7556	17.8413	17.9144	CP	5	HOCN
17.9761	18.0277	18.0705	18.1059	18.1357	CP	6	HOCN
18.1615	18.1851	18.2085	18.2336	18.2625	CP	7	HOCN
18.2976	18.3411	18.3956	18.4635	18.5475	CP	8	HOCN
18.6504	18.7750	18.9244	19.1017	19.3100	CP	9	HOCN
19.5526	19.8329	20.1545	20.5210	20.9361	CP	10	HOCN
-1.8622	-0.9746	0.0193	1.1134	2.2997	H	1	HOCN
3.5691	4.9116	6.3167	7.7736	9.2720	H	2	HOCN
10.8032	12.3643	13.9534	15.5687	17.2083	H	3	HOCN
18.8703	20.5531	22.2547	23.9734	25.7075	H	4	HOCN
27.4554	29.2154	30.9862	32.7661	34.5540	H	5	HOCN
36.3486	38.1489	39.9539	41.7627	43.5749	H	6	HOCN
45.3897	47.2071	49.0268	50.8488	52.6736	H	7	HOCN
54.5015	56.3334	58.1701	60.0130	61.8634	H	8	HOCN
63.7231	65.5942	67.4789	69.3800	71.3003	H	9	HOCN
73.2431	75.2121	77.2111	79.2445	81.3169	H	10	HOCN
67.8016	60.1618	59.2402	59.6619	60.4895	F	1	HOCN
61.4526	62.4527	63.4488	64.4228	65.3665	F	2	HOCN
66.2766	67.1522	67.9942	68.8041	69.5835	F	3	HOCN
70.3343	71.0583	71.7572	72.4326	73.0858	F	4	HOCN
73.7184	74.3314	74.9260	75.5032	76.0640	F	5	HOCN
76.6092	77.1396	77.6560	78.1591	78.6494	F	6	HOCN
79.1276	79.5942	80.0498	80.4948	80.9297	F	7	HOCN
81.3549	81.7709	82.1780	82.5767	82.9673	F	8	HOCN
83.3501	83.7255	84.0939	84.4555	84.8108	F	9	HOCN
85.1599	85.5031	85.8409	86.1735	86.5011	F	10	HOCN
4.9702	4.9684	4.9676	4.9674	4.9675	CP	1	N
4.9676	4.9676	4.9675	4.9674	4.9675	CP	2	N
4.9689	4.9696	4.9696	4.9692	4.9684	CP	3	N
4.9675	4.9666	4.9658	4.9653	4.9652	CP	4	N
4.9656	4.9667	4.9686	4.9714	4.9751	CP	5	N
4.9800	4.9861	4.9935	5.0022	5.0125	CP	6	N
5.0243	5.0377	5.0528	5.0697	5.0884	CP	7	N
5.1090	5.1315	5.1560	5.1825	5.2111	CP	8	N
5.2417	5.2745	5.3094	5.3464	5.3856	CP	9	N
5.4270	5.4705	5.5161	5.5640	5.6139	CP	10	N
-0.9845	-0.4876	0.0092	0.5059	1.0027	H	1	N
1.4994	1.9962	2.4929	2.9897	3.4864	H	2	N
3.9833	4.4802	4.9772	5.4741	5.9710	H	3	N
6.4678	6.9645	7.4611	7.9577	8.4542	H	4	N
8.9507	9.4473	9.9441	10.4411	10.9384	H	5	N
11.4361	11.9344	12.4334	12.9332	13.4339	H	6	N
13.9357	14.4388	14.9433	15.4494	15.9573	H	7	N
16.4672	16.9792	17.4935	18.0105	18.5301	H	8	N
19.0527	19.5785	20.1077	20.6405	21.1771	H	9	N
21.7177	22.2625	22.8118	23.3658	23.9247	H	10	N
41.0267	37.0639	36.6096	36.8044	37.1724	F	1	N
37.5844	37.9975	38.3963	38.7757	39.1345	F	2	N
39.4733	39.7934	40.0961	40.3829	40.6551	F	3	N
40.9140	41.1607	41.3963	41.6216	41.8374	F	4	N
42.0445	42.2436	42.4351	42.6197	42.7978	F	5	N
42.9699	43.1363	43.2974	43.4536	43.6051	F	6	N
43.7522	43.8952	44.0343	44.1697	44.3016	F	7	N
44.4303	44.5558	44.6784	44.7981	44.9152	F	8	N
45.0298	45.1420	45.2518	45.3595	45.4651	F	9	N
45.5687	45.6704	45.7703	45.8684	45.9649	F	10	N
6.7663	6.8810	6.9485	7.0068	7.0824	CP	1	N2
7.1901	7.3330	7.5026	7.6787	7.8295	CP	2	N2
7.9481	8.0555	8.1523	8.2395	8.3178	CP	3	N2
8.3880	8.4506	8.5065	8.5563	8.6005	CP	4	N2
8.6398	8.6746	8.7056	8.7331	8.7576	CP	5	N2
8.7796	8.7994	8.8174	8.8338	8.8490	CP	6	N2
8.8633	8.8768	8.8897	8.9022	8.9145	CP	7	N2
8.9266	8.9385	8.9503	8.9620	8.9736	CP	8	N2
8.9850	8.9961	9.0067	9.0168	9.0260	CP	9	N2
9.0342	9.0411	9.0464	9.0498	9.0509	CP	10	N2

-1.3618	-0.6788	0.0129	0.7106	1.4148	H	1	N2
2.1281	2.8540	3.5956	4.3548	5.1306	H	2	N2
5.9195	6.7198	7.5303	8.3499	9.1779	H	3	N2
10.0132	10.8552	11.7031	12.5563	13.4142	H	4	N2
14.2763	15.1420	16.0111	16.8830	17.7576	H	5	N2
18.6345	19.5134	20.3943	21.2769	22.1610	H	6	N2
23.0466	23.9336	24.8220	25.7116	26.6024	H	7	N2
27.4945	28.3877	29.2822	30.1778	31.0746	H	8	N2
31.9725	32.8716	33.7717	34.6729	35.5750	H	9	N2
36.4780	37.3818	38.2862	39.1910	40.0961	H	10	N2
51.8958	46.4013	45.7680	46.0412	46.5591	F	1	N2
47.1421	47.7305	48.3032	48.8530	49.3783	F	2	N2
49.8794	50.3572	50.8132	51.2488	51.6657	F	3	N2
52.0651	52.4484	52.8167	53.1711	53.5127	F	4	N2
53.8421	54.1604	54.4681	54.7659	55.0545	F	5	N2
55.3343	55.6059	55.8698	56.1263	56.3759	F	6	N2
56.6189	56.8557	57.0865	57.3116	57.5314	F	7	N2
57.7460	57.9558	58.1608	58.3614	58.5577	F	8	N2
58.7499	58.9382	59.1226	59.3035	59.4809	F	9	N2
59.6549	59.8257	59.9934	60.1581	60.3199	F	10	N2
5.5004	7.2785	8.6970	9.8748	10.9016	CP	1	N2H2
11.8379	12.7155	13.5368	14.2754	14.8756	CP	2	N2H2
15.3566	15.7915	16.1836	16.5362	16.8524	CP	3	N2H2
17.1351	17.3871	17.6113	17.8101	17.9860	CP	4	N2H2
18.1413	18.2783	18.3990	18.5052	18.5989	CP	5	N2H2
18.6817	18.7551	18.8206	18.8794	18.9327	CP	6	N2H2
18.9815	19.0268	19.0692	19.1095	19.1481	CP	7	N2H2
19.1854	19.2216	19.2570	19.2914	19.3248	CP	8	N2H2
19.3568	19.3871	19.4152	19.4404	19.4618	CP	9	N2H2
19.4787	19.4899	19.4943	19.4906	19.4774	CP	10	N2H2
-1.4277	-0.7852	0.0161	0.9462	1.9860	H	1	N2H2
3.1236	4.3517	5.6648	7.0563	8.5153	H	2	N2H2
10.0273	11.5851	13.1842	14.8205	16.4902	H	3	N2H2
18.1899	19.9162	21.6664	23.4376	25.2276	H	4	N2H2
27.0341	28.8553	30.6893	32.5346	34.3899	H	5	N2H2
36.2540	38.1259	40.0048	41.8898	43.7805	H	6	N2H2
45.6762	47.5767	49.4815	51.3904	53.3033	H	7	N2H2
55.2200	57.1404	59.0643	60.9917	62.9225	H	8	N2H2
64.8566	66.7938	68.7340	70.6768	72.6219	H	9	N2H2
74.5690	76.5175	78.4668	80.4161	82.3646	H	10	N2H2
58.9277	52.9594	52.2093	52.5651	53.2746	F	1	N2H2
54.1121	54.9928	55.8807	56.7595	57.6211	F	2	N2H2
58.4615	59.2781	60.0704	60.8385	61.5830	F	3	N2H2
62.3046	63.0044	63.6832	64.3421	64.9820	F	4	N2H2
65.6038	66.2083	66.7964	67.3689	67.9263	F	5	N2H2
68.4696	68.9991	69.5157	70.0199	70.5121	F	6	N2H2
70.9929	71.4628	71.9223	72.3717	72.8115	F	7	N2H2
73.2421	73.6638	74.0770	74.4820	74.8791	F	8	N2H2
75.2686	75.6508	76.0260	76.3944	76.7562	F	9	N2H2
77.1117	77.4611	77.8046	78.1423	78.4745	F	10	N2H2
6.7566	8.1404	9.2655	10.1840	10.9386	CP	1	N2O
11.5633	12.0830	12.5132	12.8607	13.1231	CP	2	N2O
13.3280	13.5101	13.6715	13.8139	13.9388	CP	3	N2O
14.0479	14.1428	14.2248	14.2953	14.3557	CP	4	N2O
14.4071	14.4507	14.4876	14.5186	14.5449	CP	5	N2O
14.5672	14.5862	14.6027	14.6173	14.6305	CP	6	N2O
14.6428	14.6546	14.6662	14.6779	14.6897	CP	7	N2O
14.7018	14.7143	14.7270	14.7399	14.7526	CP	8	N2O
14.7650	14.7767	14.7871	14.7960	14.8025	CP	9	N2O
14.8062	14.8062	14.8017	14.7918	14.7757	CP	10	N2O
-1.6024	-0.8551	0.0171	0.9911	2.0485	H	1	N2O
3.1745	4.3576	5.5881	6.8575	8.1575	H	2	N2O
9.4802	10.8223	12.1816	13.5560	14.9437	H	3	N2O
16.3432	17.7529	19.1713	20.5974	22.0301	H	4	N2O
23.4683	24.9112	26.3582	27.8085	29.2618	H	5	N2O
30.7174	32.1751	33.6345	35.0956	36.5580	H	6	N2O
38.0216	39.4865	40.9526	42.4198	43.8881	H	7	N2O
45.3577	46.8285	48.3006	49.7739	51.2485	H	8	N2O
52.7244	54.2015	55.6797	57.1589	58.6388	H	9	N2O
60.1193	61.6000	63.0804	64.5601	66.0385	H	10	N2O
59.9854	53.3617	52.5503	52.9252	53.6624	F	1	N2O
54.5198	55.4082	56.2907	57.1511	57.9825	F	2	N2O

58.7821	59.5496	60.2856	60.9917	61.6695	F	3	N2O
62.3206	62.9468	63.5497	64.1307	64.6913	F	4	N2O
65.2326	65.7560	66.2624	66.7528	67.2282	F	5	N2O
67.6895	68.1373	68.5724	68.9955	69.4072	F	6	N2O
69.8081	70.1987	70.5795	70.9509	71.3135	F	7	N2O
71.6676	72.0136	72.3519	72.6827	73.0065	F	8	N2O
73.3234	73.6338	73.9380	74.2362	74.5286	F	9	N2O
74.8154	75.0969	75.3732	75.6445	75.9110	F	10	N2O
7.2202	8.5257	9.5970	10.4812	11.2167	CP	1	NCO
11.8325	12.3487	12.7762	13.1168	13.3633	CP	2	NCO
13.5470	13.7100	13.8538	13.9802	14.0906	CP	3	NCO
14.1866	14.2696	14.3409	14.4018	14.4535	CP	4	NCO
14.4972	14.5339	14.5646	14.5903	14.6117	CP	5	NCO
14.6298	14.6452	14.6585	14.6704	14.6814	CP	6	NCO
14.6918	14.7022	14.7127	14.7236	14.7351	CP	7	NCO
14.7473	14.7602	14.7737	14.7877	14.8021	CP	8	NCO
14.8166	14.8308	14.8444	14.8569	14.8679	CP	9	NCO
14.8765	14.8823	14.8845	14.8822	14.8745	CP	10	NCO
-1.6796	-0.8901	0.0177	1.0230	2.1090	H	1	NCO
3.2624	4.4722	5.7292	7.0246	8.3494	H	2	NCO
9.6951	11.0581	12.4365	13.8283	15.2320	H	3	NCO
16.6460	18.0689	19.4995	20.9367	22.3795	H	4	NCO
23.8271	25.2788	26.7337	28.1915	29.6516	H	5	NCO
31.1137	32.5775	34.0427	35.5092	36.9768	H	6	NCO
38.4454	39.9151	41.3859	42.8577	44.3306	H	7	NCO
45.8047	47.2801	48.7568	50.2348	51.7143	H	8	NCO
53.1953	54.6776	56.1614	57.6465	59.1327	H	9	NCO
60.6200	62.1080	63.5963	65.0847	66.5726	H	10	NCO
63.2467	56.3215	55.4781	55.8656	56.6254	F	1	NCO
57.5073	58.4196	59.3248	60.2066	61.0579	F	2	NCO
61.8760	62.6605	63.4123	64.1329	64.8240	F	3	NCO
65.4874	66.1250	66.7384	67.3292	67.8988	F	4	NCO
68.4486	68.9798	69.4935	69.9908	70.4727	F	5	NCO
70.9400	71.3935	71.8340	72.2621	72.6786	F	6	NCO
73.0840	73.4789	73.8638	74.2391	74.6054	F	7	NCO
74.9631	75.3124	75.6539	75.9878	76.3145	F	8	NCO
76.6344	76.9475	77.2544	77.5551	77.8500	F	9	NCO
78.1392	78.4230	78.7016	78.9751	79.2438	F	10	NCO
6.8238	6.9186	6.9599	6.9792	7.0009	CP	1	NH
7.0419	7.1115	7.2119	7.3376	7.4757	CP	2	NH
7.6092	7.7336	7.8497	7.9579	8.0589	CP	3	NH
8.1533	8.2416	8.3244	8.4021	8.4752	CP	4	NH
8.5442	8.6094	8.6714	8.7304	8.7868	CP	5	NH
8.8411	8.8933	8.9439	8.9932	9.0412	CP	6	NH
9.0884	9.1347	9.1805	9.2258	9.2707	CP	7	NH
9.3155	9.3600	9.4044	9.4487	9.4928	CP	8	NH
9.5368	9.5806	9.6241	9.6673	9.7099	CP	9	NH
9.7519	9.7930	9.8332	9.8721	9.9095	CP	10	NH
-1.3691	-0.6814	0.0129	0.7099	1.4088	H	1	NH
2.1107	2.8181	3.5341	4.2614	5.0020	H	2	NH
5.7563	6.5235	7.3028	8.0932	8.8941	H	3	NH
9.7048	10.5246	11.3529	12.1893	13.0332	H	4	NH
13.8842	14.7419	15.6060	16.4761	17.3520	H	5	NH
18.2334	19.1201	20.0120	20.9088	21.8106	H	6	NH
22.7171	23.6282	24.5440	25.4643	26.3891	H	7	NH
27.3184	28.2522	29.1904	30.1331	31.0802	H	8	NH
32.0316	32.9875	33.9477	34.9123	35.8812	H	9	NH
36.8543	37.8315	38.8128	39.7981	40.7872	H	10	NH
49.4499	43.9290	43.2936	43.5669	44.0835	F	1	NH
44.6628	45.2452	45.8093	46.3485	46.8616	F	2	NH
47.3494	47.8136	48.2561	48.6785	49.0824	F	3	NH
49.4695	49.8410	50.1982	50.5422	50.8739	F	4	NH
51.1941	51.5038	51.8035	52.0940	52.3758	F	5	NH
52.6494	52.9154	53.1741	53.4260	53.6715	F	6	NH
53.9108	54.1444	54.3724	54.5952	54.8130	F	7	NH
55.0261	55.2347	55.4389	55.6391	55.8352	F	8	NH
56.0276	56.2164	56.4017	56.5836	56.7624	F	9	NH
56.9380	57.1107	57.2806	57.4477	57.6121	F	10	NH
7.3609	7.7312	8.0079	8.2510	8.5033	CP	1	NH2
8.7905	9.1214	9.4877	9.8640	10.2079	CP	2	NH2
10.5077	10.7892	11.0537	11.3023	11.5363	CP	3	NH2
11.7568	11.9647	12.1611	12.3469	12.5229	CP	4	NH2

12.6899	12.8488	13.0002	13.1447	13.2829	CP	5	NH2
13.4153	13.5424	13.6647	13.7824	13.8958	CP	6	NH2
14.0052	14.1108	14.2126	14.3108	14.4053	CP	7	NH2
14.4961	14.5831	14.6661	14.7449	14.8191	CP	8	NH2
14.8886	14.9527	15.0112	15.0635	15.1091	CP	9	NH2
15.1472	15.1772	15.1984	15.2099	15.2110	CP	10	NH2
-1.5283	-0.7726	0.0148	0.8278	1.6653	H	1	NH2
2.5297	3.4249	4.3552	5.3228	6.3269	H	2	NH2
7.3628	8.4278	9.5201	10.6380	11.7801	H	3	NH2
12.9448	14.1310	15.3374	16.5629	17.8064	H	4	NH2
19.0672	20.3442	21.6367	22.9440	24.2654	H	5	NH2
25.6003	26.9483	28.3087	29.6811	31.0650	H	6	NH2
32.4601	33.8659	35.2821	36.7083	38.1442	H	7	NH2
39.5893	41.0433	42.5057	43.9763	45.4546	H	8	NH2
46.9400	48.4321	49.9304	51.4341	52.9428	H	9	NH2
54.4557	55.9720	57.4909	59.0114	60.5325	H	10	NH2
53.4277	47.2308	46.5073	46.8243	47.4310	F	1	NH2
48.1207	48.8234	49.5138	50.1829	50.8278	F	2	NH2
51.4483	52.0451	52.6193	53.1722	53.7053	F	3	NH2
54.2198	54.7170	55.1981	55.6641	56.1160	F	4	NH2
56.5547	56.9810	57.3956	57.7992	58.1924	F	5	NH2
58.5759	58.9500	59.3153	59.6723	60.0213	F	6	NH2
60.3628	60.6970	61.0243	61.3451	61.6595	F	7	NH2
61.9679	62.2705	62.5676	62.8593	63.1459	F	8	NH2
63.4276	63.7044	63.9767	64.2446	64.5081	F	9	NH2
64.7675	65.0229	65.2743	65.5220	65.7659	F	10	NH2
6.1264	7.4482	8.4798	9.3303	10.0832	CP	1	NH3
10.7968	11.5038	12.2116	12.9022	13.5321	CP	2	NH3
14.0878	14.5994	15.0695	15.5007	15.8955	CP	3	NH3
16.2563	16.5854	16.8850	17.1572	17.4041	CP	4	NH3
17.6277	17.8296	18.0118	18.1758	18.3233	CP	5	NH3
18.4556	18.5742	18.6804	18.7754	18.8602	CP	6	NH3
18.9359	19.0034	19.0635	19.1170	19.1645	CP	7	NH3
19.2066	19.2436	19.2761	19.3042	19.3281	CP	8	NH3
19.3479	19.3637	19.3752	19.3824	19.3850	CP	9	NH3
19.3825	19.3745	19.3604	19.3396	19.3114	CP	10	NH3
-1.4643	-0.7827	0.0157	0.9073	1.8785	H	1	NH3
2.9227	4.0377	5.2235	6.4794	7.8019	H	2	NH3
9.1833	10.6180	12.1018	13.6306	15.2007	H	3	NH3
16.8086	18.4509	20.1246	21.8270	23.5552	H	4	NH3
25.3070	27.0801	28.8723	30.6818	32.5069	H	5	NH3
34.3460	36.1976	38.0604	39.9333	41.8151	H	6	NH3
43.7050	45.6020	47.5054	49.4145	51.3286	H	7	NH3
53.2472	55.1698	57.0958	59.0248	60.9565	H	8	NH3
62.8903	64.8259	66.7629	68.7008	70.6393	H	9	NH3
72.5777	74.5156	76.4524	78.3874	80.3200	H	10	NH3
52.8362	46.7785	46.0358	46.3790	47.0543	F	1	NH3
47.8420	48.6624	49.4835	50.2920	51.0822	F	2	NH3
51.8519	52.6000	53.3267	54.0324	54.7178	F	3	NH3
55.3838	56.0313	56.6610	57.2738	57.8705	F	4	NH3
58.4518	59.0184	59.5710	60.1102	60.6366	F	5	NH3
61.1506	61.6529	62.1438	62.6240	63.0936	F	6	NH3
63.5533	64.0033	64.4441	64.8759	65.2991	F	7	NH3
65.7140	66.1209	66.5201	66.9118	67.2963	F	8	NH3
67.6739	68.0446	68.4089	68.7669	69.1187	F	9	NH3
69.4646	69.8047	70.1393	70.4684	70.7923	F	10	NH3
7.3803	7.8350	8.3204	8.8307	9.3557	CP	1	HN2
9.8805	10.3857	10.8470	11.2357	11.5186	CP	2	HN2
11.7299	11.9280	12.1130	12.2848	12.4433	CP	3	HN2
12.5888	12.7212	12.8410	12.9483	13.0437	CP	4	HN2
13.1277	13.2006	13.2633	13.3164	13.3607	CP	5	HN2
13.3971	13.4264	13.4498	13.4684	13.4832	CP	6	HN2
13.4956	13.5069	13.5185	13.5318	13.5485	CP	7	HN2
13.5701	13.5984	13.6352	13.6823	13.7417	CP	8	HN2
13.8154	13.9056	14.0142	14.1437	14.2964	CP	9	HN2
14.4746	14.6809	14.9178	15.1879	15.4940	CP	10	HN2
-1.5526	-0.7921	0.0154	0.8728	1.7820	H	1	HN2
2.7439	3.7575	4.8196	5.9245	7.0632	H	2	HN2
8.2257	9.4087	10.6109	11.8309	13.0674	H	3	HN2
14.3191	15.5847	16.8630	18.1525	19.4522	H	4	HN2
20.7609	22.0774	23.4007	24.7297	26.0637	H	5	HN2
27.4016	28.7428	30.0867	31.4326	32.7803	H	6	HN2

34.1292	35.4793	36.8306	38.1831	39.5371	H	7	HN2
40.8930	42.2513	43.6129	44.9787	46.3498	H	8	HN2
47.7275	49.1134	50.5093	51.9170	53.3388	H	9	HN2
54.7771	56.2347	57.7143	59.2193	60.7531	H	10	HN2
60.6814	54.3690	53.6247	53.9570	54.6017	F	1	HN2
55.3448	56.1116	56.8725	57.6152	58.3342	F	2	HN2
59.0273	59.6939	60.3344	60.9500	61.5421	F	3	HN2
62.1120	62.6612	63.1910	63.7026	64.1970	F	4	HN2
64.6755	65.1389	65.5881	66.0239	66.4470	F	5	HN2
66.8581	67.2579	67.6468	68.0256	68.3945	F	6	HN2
68.7542	69.1049	69.4472	69.7815	70.1080	F	7	HN2
70.4271	70.7391	71.0444	71.3433	71.6360	F	8	HN2
71.9228	72.2039	72.4797	72.7503	73.0161	F	9	HN2
73.2772	73.5339	73.7864	74.0350	74.2798	F	10	HN2
6.9024	7.0198	7.1061	7.1942	7.3056	CP	1	NO
7.4501	7.6255	7.8184	8.0034	8.1435	CP	2	NO
8.2409	8.3286	8.4073	8.4778	8.5406	CP	3	NO
8.5966	8.6463	8.6904	8.7293	8.7636	CP	4	NO
8.7939	8.8207	8.8443	8.8651	8.8837	CP	5	NO
8.9003	8.9153	8.9289	8.9415	8.9533	CP	6	NO
8.9645	8.9752	8.9857	8.9960	9.0062	CP	7	NO
9.0165	9.0267	9.0370	9.0473	9.0575	CP	8	NO
9.0676	9.0774	9.0868	9.0956	9.1036	CP	9	NO
9.1105	9.1162	9.1202	9.1223	9.1221	CP	10	NO
-1.3898	-0.6933	0.0131	0.7280	1.4528	H	1	NO
2.1903	2.9438	3.7160	4.5073	5.3152	H	2	NO
6.1345	6.9630	7.7999	8.6442	9.4952	H	3	NO
10.3521	11.2143	12.0812	12.9522	13.8269	H	4	NO
14.7048	15.5856	16.4688	17.3543	18.2418	H	5	NO
19.1310	20.0218	20.9140	21.8075	22.7023	H	6	NO
23.5982	24.4952	25.3932	26.2923	27.1924	H	7	NO
28.0936	28.9957	29.8989	30.8031	31.7084	H	8	NO
32.6146	33.5219	34.4301	35.3392	36.2492	H	9	NO
37.1599	38.0713	38.9831	39.8952	40.8075	H	10	NO
56.5978	50.9895	50.3424	50.6222	51.1535	F	1	NO
51.7528	52.3590	52.9503	53.5190	54.0630	F	2	NO
54.5822	55.0773	55.5497	56.0009	56.4323	F	3	NO
56.8454	57.2415	57.6218	57.9876	58.3397	F	4	NO
58.6792	59.0069	59.3235	59.6297	59.9263	F	5	NO
60.2137	60.4924	60.7631	61.0261	61.2819	F	6	NO
61.5307	61.7731	62.0093	62.2395	62.4642	F	7	NO
62.6836	62.8978	63.1073	63.3120	63.5124	F	8	NO
63.7084	63.9005	64.0886	64.2729	64.4537	F	9	NO
64.6310	64.8050	64.9757	65.1434	65.3081	F	10	NO
6.7155	7.8712	8.8302	9.6384	10.3306	CP	1	NO2
10.9304	11.4504	11.8922	12.2462	12.4919	CP	2	NO2
12.6634	12.8155	12.9496	13.0674	13.1702	CP	3	NO2
13.2594	13.3365	13.4026	13.4590	13.5067	CP	4	NO2
13.5469	13.5805	13.6084	13.6316	13.6509	CP	5	NO2
13.6668	13.6802	13.6917	13.7016	13.7106	CP	6	NO2
13.7190	13.7272	13.7354	13.7437	13.7525	CP	7	NO2
13.7616	13.7712	13.7811	13.7912	13.8013	CP	8	NO2
13.8112	13.8206	13.8289	13.8358	13.8408	CP	9	NO2
13.8432	13.8423	13.8375	13.8280	13.8128	CP	10	NO2
-1.5514	-0.8202	0.0163	0.9408	1.9401	H	1	NO2
3.0039	4.1236	5.2914	6.4991	7.7370	H	2	NO2
8.9950	10.2691	11.5575	12.8584	14.1704	H	3	NO2
15.4920	16.8219	18.1590	19.5021	20.8505	H	4	NO2
22.2032	23.5596	24.9191	26.2811	27.6453	H	5	NO2
29.0112	30.3786	31.7472	33.1169	34.4875	H	6	NO2
35.8590	37.2313	38.6044	39.9784	41.3532	H	7	NO2
42.7289	44.1055	45.4831	46.8617	48.2414	H	8	NO2
49.6220	51.0036	52.3861	53.7693	55.1532	H	9	NO2
56.5374	57.9217	59.3057	60.6890	62.0711	H	10	NO2
64.5055	58.1149	57.3382	57.6946	58.3934	F	1	NO2
59.2050	60.0456	60.8809	61.6960	62.4843	F	2	NO2
63.2429	63.9711	64.6695	65.3393	65.9821	F	3	NO2
66.5994	67.1929	67.7641	68.3143	68.8449	F	4	NO2
69.3572	69.8522	70.3311	70.7947	71.2439	F	5	NO2
71.6796	72.1025	72.5132	72.9125	73.3010	F	6	NO2
73.6791	74.0474	74.4064	74.7566	75.0982	F	7	NO2
75.4319	75.7578	76.0763	76.3878	76.6926	F	8	NO2

76.9909	77.2831	77.5693	77.8498	78.1248	F	9	NO2
78.3946	78.6593	78.9191	79.1741	79.4245	F	10	NO2
5.5740	5.3717	5.2313	5.1382	5.0799	CP	1	O
5.0456	5.0264	5.0153	5.0071	4.9983	CP	2	O
4.9942	4.9903	4.9869	4.9838	4.9812	CP	3	O
4.9791	4.9774	4.9762	4.9755	4.9754	CP	4	O
4.9758	4.9768	4.9783	4.9804	4.9831	CP	5	O
4.9863	4.9902	4.9946	4.9996	5.0052	CP	6	O
5.0114	5.0181	5.0253	5.0331	5.0414	CP	7	O
5.0502	5.0595	5.0693	5.0794	5.0900	CP	8	O
5.1010	5.1123	5.1239	5.1359	5.1480	CP	9	O
5.1604	5.1729	5.1856	5.1984	5.2111	CP	10	O
-1.0667	-0.5200	0.0097	0.5278	1.0385	H	1	O
1.5446	2.0481	2.5501	3.0513	3.5515	H	2	O
4.0512	4.5504	5.0492	5.5478	6.0460	H	3	O
6.5440	7.0418	7.5395	8.0371	8.5346	H	4	O
9.0322	9.5298	10.0276	10.5255	11.0237	H	5	O
11.5221	12.0209	12.5202	13.0199	13.5201	H	6	O
14.0210	14.5224	15.0246	15.5275	16.0312	H	7	O
16.5358	17.0413	17.5477	18.0552	18.5636	H	8	O
19.0732	19.5838	20.0956	20.6086	21.1228	H	9	O
21.6382	22.1549	22.6728	23.1920	23.7125	H	10	O
43.2154	38.9459	38.4632	38.6671	39.0494	F	1	O
39.4749	39.8996	40.3082	40.6958	41.0617	F	2	O
41.4065	41.7318	42.0390	42.3298	42.6056	F	3	O
42.8677	43.1172	43.3553	43.5829	43.8009	F	4	O
44.0099	44.2107	44.4039	44.5900	44.7695	F	5	O
44.9429	45.1105	45.2728	45.4300	45.5825	F	6	O
45.7306	45.8744	46.0143	46.1504	46.2830	F	7	O
46.4122	46.5382	46.6612	46.7813	46.8987	F	8	O
47.0134	47.1256	47.2355	47.3430	47.4484	F	9	O
47.5517	47.6530	47.7523	47.8498	47.9455	F	10	O
6.5991	6.8045	7.0096	7.2197	7.4358	CP	1	O2
7.6546	7.8690	8.0674	8.2340	8.3490	CP	2	O2
8.4290	8.5060	8.5802	8.6516	8.7205	CP	3	O2
8.7869	8.8511	8.9130	8.9729	9.0308	CP	4	O2
9.0868	9.1411	9.1937	9.2448	9.2944	CP	5	O2
9.3426	9.3894	9.4350	9.4794	9.5226	CP	6	O2
9.5648	9.6058	9.6459	9.6851	9.7232	CP	7	O2
9.7605	9.7969	9.8324	9.8670	9.9007	CP	8	O2
9.9336	9.9656	9.9967	10.0269	10.0562	CP	9	O2
10.0844	10.1117	10.1380	10.1631	10.1872	CP	10	O2
-1.3479	-0.6777	0.0130	0.7244	1.4571	H	1	O2
2.2116	2.9879	3.7849	4.6003	5.4300	H	2	O2
6.2689	7.1157	7.9700	8.8317	9.7003	H	3	O2
10.5757	11.4576	12.3458	13.2401	14.1403	H	4	O2
15.0462	15.9576	16.8744	17.7963	18.7233	H	5	O2
19.6551	20.5918	21.5330	22.4787	23.4288	H	6	O2
24.3832	25.3417	26.3043	27.2709	28.2413	H	7	O2
29.2155	30.1934	31.1749	32.1598	33.1482	H	8	O2
34.1400	35.1349	36.1330	37.1342	38.1384	H	9	O2
39.1454	40.1553	41.1677	42.1828	43.2003	H	10	O2
55.0894	49.6361	49.0019	49.2794	49.8103	F	1	O2
50.4135	51.0273	51.6285	52.2084	52.7640	F	2	O2
53.2945	53.8005	54.2832	54.7442	55.1849	F	3	O2
55.6069	56.0116	56.4002	56.7741	57.1341	F	4	O2
57.4814	57.8168	58.1410	58.4550	58.7592	F	5	O2
59.0543	59.3409	59.6194	59.8903	60.1541	F	6	O2
60.4111	60.6617	60.9062	61.1449	61.3781	F	7	O2
61.6060	61.8290	62.0472	62.2608	62.4701	F	8	O2
62.6753	62.8764	63.0737	63.2673	63.4573	F	9	O2
63.6440	63.8274	64.0076	64.1848	64.3590	F	10	O2
7.2353	7.2028	7.1523	7.1022	7.0667	CP	1	HO
7.0564	7.0775	7.1323	7.2192	7.3325	CP	2	HO
7.4528	7.5668	7.6746	7.7766	7.8729	CP	3	HO
7.9637	8.0494	8.1301	8.2059	8.2772	CP	4	HO
8.3442	8.4070	8.4659	8.5211	8.5727	CP	5	HO
8.6210	8.6661	8.7084	8.7478	8.7847	CP	6	HO
8.8193	8.8516	8.8820	8.9105	8.9374	CP	7	HO
8.9628	8.9869	9.0099	9.0319	9.0531	CP	8	HO
9.0737	9.0939	9.1137	9.1333	9.1529	CP	9	HO
9.1727	9.1928	9.2133	9.2344	9.2562	CP	10	HO

-1.4267	-0.7046	0.0132	0.7259	1.4342	H	1	HO
2.1401	2.8465	3.5567	4.2740	5.0014	H	2	HO
5.7407	6.4918	7.2539	8.0265	8.8090	H	3	HO
9.6009	10.4016	11.2106	12.0275	12.8517	H	4	HO
13.6828	14.5204	15.3640	16.2134	17.0681	H	5	HO
17.9278	18.7922	19.6610	20.5338	21.4104	H	6	HO
22.2907	23.1742	24.0609	24.9506	25.8430	H	7	HO
26.7380	27.6355	28.5353	29.4374	30.3417	H	8	HO
31.2481	32.1564	33.0668	33.9792	34.8935	H	9	HO
35.8098	36.7280	37.6483	38.5707	39.4952	H	10	HO
50.2718	44.5342	43.8783	44.1583	44.6853	F	1	HO
45.2739	45.8632	46.4320	46.9737	47.4875	F	2	HO
47.9746	48.4371	48.8769	49.2961	49.6965	F	3	HO
50.0797	50.4470	50.7999	51.1394	51.4666	F	4	HO
51.7823	52.0874	52.3825	52.6684	52.9457	F	5	HO
53.2148	53.4762	53.7305	53.9779	54.2189	F	6	HO
54.4538	54.6829	54.9065	55.1249	55.3383	F	7	HO
55.5469	55.7510	55.9507	56.1463	56.3378	F	8	HO
56.5256	56.7097	56.8902	57.0674	57.2413	F	9	HO
57.4120	57.5798	57.7446	57.9066	58.0659	F	10	HO
7.5530	8.5860	9.5456	10.3995	11.1273	CP	1	SO2
11.7211	12.1850	12.5354	12.8008	13.0220	CP	2	SO2
13.1681	13.2990	13.4160	13.5204	13.6131	CP	3	SO2
13.6953	13.7680	13.8322	13.8888	13.9387	CP	4	SO2
13.9827	14.0215	14.0560	14.0868	14.1144	CP	5	SO2
14.1396	14.1627	14.1843	14.2048	14.2246	CP	6	SO2
14.2439	14.2631	14.2823	14.3018	14.3217	CP	7	SO2
14.3420	14.3628	14.3839	14.4054	14.4272	CP	8	SO2
14.4489	14.4704	14.4915	14.5117	14.5307	CP	9	SO2
14.5480	14.5632	14.5758	14.5851	14.5905	CP	10	SO2
-1.6968	-.8894	.0179	1.0161	2.0936	H	1	SO2
3.2371	4.4335	5.6703	6.9377	8.2290	H	2	SO2
9.5386	10.8621	12.1980	13.5449	14.9017	H	3	SO2
16.2672	17.6404	19.0205	20.4066	21.7980	H	4	SO2
23.1941	24.5944	25.9983	27.4054	28.8155	H	5	SO2
30.2283	31.6434	33.0607	34.4802	35.9017	H	6	SO2
37.3251	38.7505	40.1777	41.6069	43.0381	H	7	SO2
44.4713	45.9065	47.3439	48.7833	50.2249	H	8	SO2
51.6688	53.1147	54.5628	56.0130	57.4651	H	9	SO2
58.9191	60.3746	61.8316	63.2897	64.7485	H	10	SO2
67.1038	60.1379	59.2969	59.6821	60.4365	F	1	SO2
61.3117	62.2166	63.1133	63.9851	64.8250	F	2	SO2
65.6306	66.4018	67.1397	67.8460	68.5225	F	3	SO2
69.1712	69.7940	70.3926	70.9686	71.5236	F	4	SO2
72.0590	72.5759	73.0756	73.5592	74.0275	F	5	SO2
74.4816	74.9221	75.3499	75.7657	76.1701	F	6	SO2
76.5637	76.9471	77.3207	77.6851	78.0407	F	7	SO2
78.3879	78.7271	79.0587	79.3830	79.7003	F	8	SO2
80.0109	80.3151	80.6132	80.9054	81.1919	F	9	SO2
81.4730	81.7488	82.0197	82.2856	82.5469	F	10	SO2
7.8324	10.1729	12.1494	13.7759	15.0759	CP	1	SO3
16.0823	16.8372	17.3925	17.8090	18.1573	CP	2	SO3
18.3757	18.5688	18.7385	18.8869	19.0160	CP	3	SO3
19.1274	19.2230	19.3044	19.3731	19.4306	CP	4	SO3
19.4784	19.5177	19.5496	19.5755	19.5962	CP	5	SO3
19.6129	19.6262	19.6371	19.6462	19.6542	CP	6	SO3
19.6615	19.6687	19.6761	19.6839	19.6924	CP	7	SO3
19.7017	19.7117	19.7225	19.7338	19.7455	CP	8	SO3
19.7571	19.7684	19.7787	19.7876	19.7943	CP	9	SO3
19.7982	19.7983	19.7937	19.7835	19.7666	CP	10	SO3
-1.9993	-1.0959	.0232	1.3223	2.7675	H	1	SO3
4.3277	5.9755	7.6884	9.4494	11.2480	H	2	SO3
13.0748	14.9223	16.7878	18.6692	20.5645	H	3	SO3
22.4719	24.3895	26.3160	28.2500	30.1902	H	4	SO3
32.1358	34.0856	36.0390	37.9954	39.9540	H	5	SO3
41.9145	43.8764	45.8396	47.8038	49.7688	H	6	SO3
51.7346	53.7011	55.6684	57.6364	59.6052	H	7	SO3
61.5749	63.5455	65.5173	67.4901	69.4640	H	8	SO3
71.4392	73.4154	75.3928	77.3711	79.3503	H	9	SO3
81.3299	83.3098	85.2894	87.2683	89.2459	H	10	SO3
70.7348	62.3899	61.3435	61.8411	62.8313	F	1	SO3
63.9953	65.2103	66.4227	67.6075	68.7535	F	2	SO3

69.8563	70.9146	71.9293	72.9021	73.8351	F	3	SO3
74.7308	75.5915	76.4194	77.2166	77.9851	F	4	SO3
78.7267	79.4430	80.1357	80.8060	81.4554	F	5	SO3
82.0849	82.6958	83.2890	83.8655	84.4261	F	6	SO3
84.9717	85.5030	86.0208	86.5256	87.0182	F	7	SO3
87.4990	87.9686	88.4275	88.8762	89.3151	F	8	SO3
89.7446	90.1652	90.5771	90.9808	91.3765	F	9	SO3
91.7646	92.1453	92.5189	92.8857	93.2459	F	10	SO3
8.5923	11.7750	14.4094	16.5521	18.2598	CP	1	HSO3
19.5891	20.5968	21.3395	21.8738	22.2564	CP	2	HSO3
22.5440	22.7932	23.0608	23.4033	23.8775	CP	3	HSO3
24.5400	25.4475	26.6566	28.2240	30.2322	CP	4	HSO3
32.4318	34.6314	36.8310	39.0306	41.2302	CP	5	HSO3
43.4299	45.6295	47.8291	50.0287	52.2283	CP	6	HSO3
54.4279	56.6275	58.8271	61.0267	63.2263	CP	7	HSO3
65.4259	67.6256	69.8252	72.0248	74.2244	CP	8	HSO3
76.4240	78.6236	80.8232	83.0228	85.2224	CP	9	HSO3
87.4220	89.6216	91.8213	94.0209	96.2205	CP	10	HSO3
-2.3101	-1.2869	0.0266	1.5786	3.3225	H	1	HSO3
5.2179	7.2296	9.3284	11.4906	13.6981	H	2	HSO3
15.9387	18.2056	20.4980	22.8203	25.1830	H	3	HSO3
27.6021	30.0992	32.7016	35.4424	19.5939	H	4	HSO3
22.7271	26.0803	29.6534	33.4465	37.4595	H	5	HSO3
41.6925	46.1455	50.8184	55.7113	60.8241	H	6	HSO3
66.1569	71.7097	77.4824	83.4751	89.6878	H	7	HSO3
96.1204	102.7730	109.6455	116.7380	124.0505	H	8	HSO3
131.5829	139.3353	147.3076	155.4999	163.9122	H	9	HSO3
172.5444	181.3966	190.4687	199.7608	209.2729	H	10	HSO3
77.9455	68.2443	67.0108	67.6030	68.7888	F	1	HSO3
70.1894	71.6569	73.1259	74.5651	75.9599	F	2	HSO3
77.3035	78.5942	79.8326	81.0210	82.1624	F	3	HSO3
83.2608	84.3203	85.3453	86.3404	68.4387	F	4	HSO3
68.9415	69.4687	70.0186	70.5893	71.1794	F	5	HSO3
71.7876	72.4126	73.0532	73.7086	74.3778	F	6	HSO3
75.0600	75.7544	76.4604	77.1772	77.9044	F	7	HSO3
78.6413	79.3876	80.1426	80.9061	81.6775	F	8	HSO3
82.4566	83.2429	84.0362	84.8362	85.6426	F	9	HSO3
86.4550	87.2733	88.0973	88.9266	89.7612	F	10	HSO3

Listing 3.12. Screen output from the RBNOX code (Case 2).

RBNOX

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-------------------- RXR NO. 1 : REBURNING REACTOR -------------------
                     restart at: x= 6.141E-05  dx= 1.536E-05
                     restart at: x= 6.141E-05  dx= 7.680E-06
                     restart at: x= 1.206E-03  dx= 1.536E-05

-------------------- RXR NO. 2 : RICH ZONE REACTOR -------------------

----------------- RXR NO. 3 : OVER-FIRED-AIR REACTOR -----------------
                     restart at: x= 1.890E-06  dx= 9.600E-07
                     restart at: x= 1.890E-06  dx= 4.800E-07
                     restart at: x= 1.582E-03  dx= 6.144E-05
                     restart at: x= 1.006E-02  dx= 2.458E-04

-------------------- RXR NO. 4 : QUENCHING REACTOR -------------------
```

Listing 3.13. Contents of file RBOT0201.075 (Case 2).

BOILER REBURNING NOx MODEL (RBNOX) OUTPUTS
OUTPUT FILE NAME: RBOT0201.075

```
**********
*        *
* USER'S COMMENTS *
*        *
**********
```

c.OIL FIRING WITH GAS REBURN AT 75% LOAD
c.SR1=1.1 SR2=0.9 SR3=1.06
c.0.24 SECONDS MIXING TIME FOR OFA AND RBN FUEL
c.
c.
c.
c.
c.
c.
c.

---------- RXR NO. 1 : REBURNING REACTOR ---------- -------

irxr= 1
iprt= 0
x= 0.000000E+00 cm
dx= 0.300000E-07 cm
p= 0.100000E+01 atm
dpdx= 0.000000E+00 atm/cm
tausr= 0.000000E+00 sec

TEMPERATURE(K) = 1656.06 ENTHALPY(CAL/G)=-2.444E+02 VELOCITY(CM/SEC)= 1.000E+00 CP(CAL/G-K) = 3.291E-01
DENSITY(G/CC) = 2.131E-04 MOLE/GM-TOTAL = 3.454E-02 AREA(CM2) = 1.000E+00 H.T.(CAL/CC-S) = 0.000E-01

MASS INFLUX(XMDOTE,GM/SEC)= 1.000E-01 ENERGY INFLU X(QDOTE,CAL/SEC)= 0.000E-01 TE(K)= 3.000E+02 RHOE(G/CC)= 0.000E-01
OFRE= 1.000E-16 FEXTNAL= 2.131E-04

I	SPECIES	MASS FRXN (OVERALL)	MASS FRXN (GAS/SOLID)	MOLE FRXN (OVERALL)	MOLE FRXN (GAS/SOLID)	NET RATE (MOLE/CC-S)	DADT(I) (FRXN/S)	ALPHAE(I)	ALPHAA(I)	ALPHAF(I)	#N
1	H2	6.9628E-18	6.9628E-18	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E 18	0
2	O2	1.9356E-02	1.9356E-02	1.7513E-02	1.7513E-02	0.0000E-01	0.0000E-01	0.0000E-01	7.2784E-03	6.0486E 04	0
3	HO	5.8742E-17	5.8742E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E 18	0
4	O	5.5261E-17	5.5261E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
5	H	3.4814E-18	3.4814E-18	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E 18	0
6	H2O	7.3200E-02	7.3200E-02	1.1764E-01	1.1764E-01	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	4.0630E 03	0
7	CO2	1.9227E-01	1.9227E-01	1.2649E-01	1.2649E-01	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	4.3688E-03	0
8	HO2	1.1400E-16	1.1400E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
9	H2O2	1.1748E-16	1.1748E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E 18	0
10	CO	9.6744E-17	9.6744E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
11	CH4	5.5409E-17	5.5409E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
12	CH3	5.1928E-17	5.1928E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
13	CH2	4.8446E-17	4.8446E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E 18	0
14	CH	4.4965E-17	4.4965E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E 18	0

15	C2H4	9.6893E-17	9.6893E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
16	C2H6	1.0386E-16	1.0386E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
17	C2H5	1.0037E-16	1.0037E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
18	C2H3	9.3411E-17	9.3411E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
19	C	4.1484E-17	4.1484E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
20	C2H2	8.9930E-17	8.9930E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
21	C2H	8.6448E-17	8.6448E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
22	CH2O	1.0371E-16	1.0371E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
23	CH3O	1.0719E-16	1.0719E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
24	CHO	1.0023E-16	1.0023E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
25	N	4.8381E-17	4.8381E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
26	NO	6.2185E-04	6.2185E-04	6.0000E-04	6.0000E-04	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	2.0723E-05	1
27	N2	7.1333E-01	7.1333E-01	7.3720E-01	7.3720E-01	0.0000E-01	0.0000E-01	0.0000E-01	2.7381E-02	2.5462E-02	0
28	NO2	1.5890E-16	1.5890E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
29	N2O	1.5202E-16	1.5202E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	2
30	NH3	5.8825E-17	5.8825E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
31	NH2	5.5344E-17	5.5344E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
32	NH	5.1862E-17	5.1862E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
33	HN2	1.0024E-16	1.0024E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	2
34	N2H2	1.0372E-16	1.0372E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	2
35	HNO	1.0712E-16	1.0712E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
36	CN	8.9864E-17	8.9864E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
37	NCO	1.4512E-16	1.4512E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
38	CHN	9.3346E-17	9.3346E-17	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
39	HNCO	1.4861E-16	1.4861E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
40	HOCN	1.4861E-16	1.4861E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	1
41	SO2	1.2187E-03	1.2187E-03	5.5080E-04	5.5080E-04	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	1.9023E-05	0
42	SO3	2.7652E-16	2.7652E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0
43	HSO3	2.7999E-16	2.7999E-16	1.0000E-16	1.0000E-16	0.0000E-01	0.0000E-01	0.0000E-01	3.4659E-18	3.4538E-18	0

MOLE FRACTION OF FIXED NITROGEN IN GAS PHASE = 6.000E-04

```
 Step size increased at: x= 0.300E-07 dx= 0.600E-07
 Step size increased at: x= 0.900E-07 dx= 0.120E-06
 Step size increased at: x= 0.210E-06 dx= 0.240E-06
 Step size increased at: x= 0.450E-06 dx= 0.480E-06
 Step size increased at: x= 0.930E-06 dx= 0.960E-06
 Step size increased at: x= 0.189E-05 dx= 0.192E-05
 Step size increased at: x= 0.381E-05 dx= 0.384E-05
 Step size increased at: x= 0.765E-05 dx= 0.768E-05
 Step size increased at: x= 0.153E-04 dx= 0.154E-04
 Step size increased at: x= 0.307E-04 dx= 0.307E-04
 Step size reduced at: x= 0.921E-04  dx= 0.307E-04 ideqn=  3 delmax= 0.119E+00  qm= 0.251E-07 savea= 0.158E-07
          restart at: x= 6.141E-05  dx= 1.536E-05
 Step size reduced at: x= 0.768E-04  dx= 0.154E-04 ideqn=  3 delmax= 0.584E-01  qm= 0.204E-07 savea= 0.158E-07
          restart at: x= 6.141E-05  dx= 7.680E-06
 Step size increased at: x= 0.998E-04 dx= 0.154E-04
 Step size increased at: x= 0.192E-03 dx= 0.307E-04
 Step size reduced at: x= 0.124E-02  dx= 0.307E-04 ideqn=  5 delmax= 0.520E-01  qm= 0.252E-07 savea= 0.200E 07
          restart at: x= 1.206E-03  dx= 1.536E-05
 Step size increased at: x= 0.176E-02 dx= 0.307E-04
 Step size increased at: x= 0.191E-02 dx= 0.614E-04
 Step size increased at: x= 0.216E-02 dx= 0.123E-03
 Step size increased at: x= 0.253E-02 dx= 0.246E-03
 Step size increased at: x= 0.302E-02 dx= 0.492E-03
 Step size increased at: x= 0.400E-02 dx= 0.800E-03
```

REACH MAX. at X= 2.400E-01

---------- RXR NO. 1 : REBURNING REACTOR ----------

irxr= 1
iprt= 402
x= 0.240001E+00 cm
dx= 0.800000E-03 cm
p= 0.100000E+01 atm
dpdx= 0.000000E+00 atm/cm
tausr= 0.000000E+00 sec

TEMPERATURE(K) = 1662.07 ENTHALPY(CAL/G)=-2.741E+02 VELOCITY(CM/SEC)= 1.000E+00 CP(CAL/G-K) = 3.385E-01
DENSITY(G/CC) = 2.070E-04 MOLE/GM-TOTAL = 3.542E-02 AREA(CM2) = 1.042E+00 H.T.(CAL/CC-S) = 0.000E-01

MASS INFLUX(XMDOTE,GM/SEC)= 1.051E-05 ENERGY INFLU X(QDOTE,CAL/SEC)= 0.000E-01 TE(K)= 5.450E+02 RHOE(G/CC)= 3.775E-04
OFRE= 1.000E-16 FEXTNAL= 2.131E-04

I	SPECIES	MASS FRXN (OVERALL)	MASS FRXN (GAS/SOLID)	MOLE FRXN (OVERALL)	MOLE FRXN (GAS/SOLID)	NET RATE (MOLE/CC-S)	DADT(I) (FRXN/S)	ALPHAE(I)	ALPHAA(I)	ALPHAF(I)	#N
1	H2	7.6342E-04	7.6342E-04	1.0690E-02	1.0690E-02	5.6107E-07	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
2	O2	2.9771E-07	2.9771E-07	2.6264E-07	2.6264E-07	-1.1748E-10	0.0000E-01	5.9232E-18	7.2784E-03	6.0486E-04	0
3	HO	3.1794E-06	3.1794E-06	5.2771E-06	5.2771E-06	1.8387E-09	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
4	O	1.8674E-09	1.8674E-09	3.2947E-09	3.2947E-09	-5.3595E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
5	H	3.2747E-07	3.2747E-07	9.1712E-06	9.1712E-06	-1.0104E-09	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
6	H2O	8.7154E-02	8.7154E-02	1.3656E-01	1.3656E-01	3.8361E-07	0.0000E-01	5.9232E-18	3.4659E-18	4.0630E-03	0
7	CO2	1.8152E-01	1.8152E-01	1.1643E-01	1.1643E-01	-7.4206E-07	0.0000E-01	2.9616E-04	3.4659E 18	4.3688E-03	0
8	HO2	1.0314E-11	1.0314E-11	8.8211E-12	8.8211E-12	-5.4569E-15	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	0
9	H2O2	1.0180E-11	1.0180E-11	8.4486E-12	8.4486E-12	-4.2941E-15	0.0000E-01	5.9232E-18	3.4659E 18	3.4538E-18	0
10	CO	2.1595E-02	2.1595E-02	2.1764E-02	2.1764E-02	1.1047E-06	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
11	CH4	1.0701E-03	1.0701E-03	1.8830E-03	1.8830E-03	-4.9026E-07	0.0000E-01	5.5678E-02	3.4659E-18	3.4538E-18	0
12	CH3	2.0640E-05	2.0640E-05	3.8754E-05	3.8754E-05	4.8869E-10	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
13	CH2	1.5048E-08	1.5048E-08	3.0284E-08	3.0284E-08	3.8147E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
14	CH	5.2964E-12	5.2964E-12	1.1485E-11	1.1485E-11	-3.5590E-15	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
15	C2H4	1.6476E-05	1.6476E-05	1.6579E-05	1.6579E-05	-5.5269E-09	0.0000E-01	5.9232E-04	3.4659E-18	3.4538E 18	0
16	C2H6	1.5740E-06	1.5740E-06	1.4777E-06	1.4777E-06	-1.1992E-08	0.0000E-01	1.1846E-03	3.4659E-18	3.4538E-18	0
17	C2H5	1.1879E-09	1.1879E-09	1.1539E-09	1.1539E-09	-3.7519E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
18	C2H3	6.1427E-09	6.1427E-09	6.4115E-09	6.4115E-09	-1.2793E-11	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
19	C	7.4581E-14	7.4581E-14	1.7529E-13	1.7529E-13	1.4337E-17	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
20	C2H2	6.3635E-04	6.3635E-04	6.8991E-04	6.8991E-04	7.9144E-08	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
21	C2H	3.0270E-09	3.0270E-09	3.4139E-09	3.4139E-09	2.3509E-11	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
22	CH2O	3.4766E-05	3.4766E-05	3.2685E-05	3.2685E-05	-4.3430E-11	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
23	CH3O	1.3320E-07	1.3320E-07	1.2116E-07	1.2116E-07	-7.4185E-11	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
24	CHO	4.2009E-09	4.2009E-09	4.0866E-09	4.0866E-09	-1.4795E-11	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
25	N	1.2172E-10	1.2172E-10	2.4531E-10	2.4531E-10	3.7263E-14	0.0000E-01	5.9232E-18	3.4659E 18	2.0723E-05	1
26	NO	4.2407E-04	4.2407E-04	3.9894E-04	3.9894E-04	-5.6465E-09	0.0000E-01	5.9232E-18	3.4659E-18	2.7381E-02	0
27	N2	7.0547E-01	7.0547E-01	7.1086E-01	7.1086E-01	5.6438E-10	0.0000E-01	1.4808E-03	3.4659E-18	2.5462E-02	0
28	NO2	7.7869E-10	7.7869E-10	4.7779E-10	4.7779E-10	-2.4480E-14	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
29	N2O	1.2534E-07	1.2534E-07	8.0385E-08	8.0385E-08	2.5593E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	2
30	NH3	4.5792E-06	4.5792E-06	7.5899E-06	7.5899E-06	5.0106E-10	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
31	NH2	9.2441E-09	9.2441E-09	1.6285E-08	1.6285E-08	1.2009E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
32	NH	3.3119E-10	3.3119E-10	6.2263E-10	6.2263E-10	3.9587E-14	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
33	HN2	1.3592E-10	1.3592E-10	1.3220E-10	1.3220E-10	-3.8296E-14	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	2
34	N2H2	4.3182E-14	4.3182E-14	4.0591E-14	4.0591E-14	-3.6807E-18	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	2
35	HNO	1.4941E-08	1.4941E-08	1.3598E-08	1.3598E-08	-3.8878E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
36	CN	7.9850E-10	7.9850E-10	8.6635E-10	8.6635E-10	7.0705E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
37	NCO	6.6287E-11	6.6287E-11	4.4534E-11	4.4534E-11	-4.3715E-16	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
38	CHN	7.2920E-05	7.2920E-05	7.6166E-05	7.6166E-05	4.0066E-09	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1

39	HNCO	4.9508E-07	4.9508E-07	3.2482E-07	3.2482E-07	6.3504E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
40	HOCN	1.8616E-07	1.8616E-07	1.2214E-07	1.2214E-07	6.4632E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
41	SO2	1.2044E-03	1.2044E-03	5.3071E-04	5.3071E-04	2.7845E-13	0.0000E-01	5.9232E-18	3.4659E-18	1.9023E-05	0
42	SO3	3.8638E-09	3.8638E-09	1.3623E-09	1.3623E-09	-6.4001E-14	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
43	HSO3	7.1295E-12	7.1295E-12	2.4827E-12	2.4827E-12	-2.1445E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0

MOLE FRACTION OF FIXED NITROGEN IN GAS PHASE = 4.833E-04

PLUG FLOW REACTOR (CONTINUED WITH SAME CHEMISTRY)

Step size increased at: x= 0.300E-07 dx= 0.600E-07
Step size increased at: x= 0.900E-07 dx= 0.120E-06
Step size increased at: x= 0.210E-06 dx= 0.240E-06
Step size increased at: x= 0.450E-06 dx= 0.480E-06
Step size increased at: x= 0.930E-06 dx= 0.960E-06
Step size increased at: x= 0.189E-05 dx= 0.192E-05
Step size increased at: x= 0.381E-05 dx= 0.384E-05
Step size increased at: x= 0.765E-05 dx= 0.768E-05
Step size increased at: x= 0.153E-04 dx= 0.154E-04
Step size increased at: x= 0.307E-04 dx= 0.307E-04
Step size increased at: x= 0.614E-04 dx= 0.614E-04
Step size increased at: x= 0.123E-03 dx= 0.123E-03
Step size increased at: x= 0.246E-03 dx= 0.246E-03
Step size increased at: x= 0.491E-03 dx= 0.492E-03
Step size increased at: x= 0.983E-03 dx= 0.983E-03
Step size increased at: x= 0.197E-02 dx= 0.110E-02

REACH MAX. at X= 3.318E-01

---------- RXR NO. 2 : RICH ZONE REACTOR ----------

irxr= 2
iprt= 315
x= 0.331764E+00 cm
dx= 0.110300E-02 cm
p= 0.100000E+01 atm
dpdx= 0.000000E+00 atm/cm
tausr= 0.000000E+00 sec

TEMPERATURE(K) = 1627.26 ENTHALPY(CAL/G)=-2.812E+02 VELOCITY(CM/SEC)= 1.000E+00 CP(CAL/G-K) = 3.371E-01
DENSITY(G/CC) = 2.106E-04 MOLE/GM-TOTAL = 3.556E-02 AREA(CM2) = 1.024E+00 H.T.(CAL/CC-S) = 0.000E-01

MASS INFLUX(XMDOTE,GM/SEC)= 0.000E-01 ENERGY INFLU X(QDOTE,CAL/SEC)= 0.000E-01 TE(K)= 5.450E+02 RHOE(G/CC)= 3.775E-04
OFRE= 1.000E-16 FEXTNAL= 2.131E-04

I	SPECIES	MASS FRXN (OVERALL)	MASS FRXN (GAS/SOLID)	MOLE FRXN (OVERALL)	MOLE FRXN (GAS/SOLID)	NET RATE (MOLE/CC-S)	DADT(I) (FRXN/S)	ALPHAE(I)	ALPHAA(I)	ALPHAF(I)	#N
1	H2	8.1878E-04	8.1878E-04	1.1422E-02	1.1422E-02	8.9132E-09	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
2	O2	1.3138E-08	1.3138E-08	1.1547E-08	1.1547E-08	-1.7615E-13	0.0000E-01	5.9232E-18	7.2784E-03	6.0486E-04	0
3	HO	2.4462E-06	2.4462E-06	4.0450E-06	4.0450E-06	-7.8174E-10	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
4	O	1.2309E-09	1.2309E-09	2.1637E-09	2.1637E-09	3.4686E-13	0.0000E-01	5.9232E-18	3.4659E 18	3.4538E-18	0
5	H	2.8957E-07	2.8957E-07	8.0794E-06	8.0794E-06	7.1564E-10	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
6	H2O	8.9099E-02	8.9099E-02	1.3909E-01	1.3909E-01	-6.9356E-09	0.0000E-01	5.9232E-18	3.4659E-18	4.0630E-03	0
7	CO2	1.7402E-01	1.7402E-01	1.1120E-01	1.1120E-01	5.2596E-09	0.0000E-01	2.9616E-04	3.4659E-18	4.3688E-03	0
8	HO2	1.2989E-12	1.2989E-12	1.1067E-12	1.1067E-12	7.4088E-17	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0

9	H2O2	8.2790E-12	8.2790E-12	6.8451E-12	6.8451E-12	1.7390E-15	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
10	CO	2.8257E-02	2.8257E-02	2.8371E-02	2.8371E-02	-1.4785E-09	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
11	CH4	4.4183E-06	4.4183E-06	7.7456E-06	7.7456E-06	-5.0353E-11	0.0000E-01	5.5678E-02	3.4659E-18	3.4538E-18	0
12	CH3	7.2404E-08	7.2404E-08	1.3544E-07	1.3544E-07	-4.3665E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
13	CH2	4.4364E-10	4.4364E-10	8.8951E-10	8.8951E-10	2.2898E-16	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
14	CH	1.8367E-13	1.8367E-13	3.9677E-13	3.9677E-13	1.0359E-16	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
15	C2H4	1.1387E-07	1.1387E-07	1.1416E-07	1.1416E-07	2.3565E-13	0.0000E-01	5.9232E-04	3.4659E-18	3.4538E-18	0
16	C2H6	2.7235E-11	2.7235E-11	2.5473E-11	2.5473E-11	-8.1884E-17	0.0000E-01	1.1846E-03	3.4659E-18	3.4538E-18	0
17	C2H5	8.8055E-14	8.8055E-14	8.5214E-14	8.5214E-14	2.0181E-16	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
18	C2H3	8.8181E-10	8.8181E-10	9.1696E-10	9.1696E-10	1.4398E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
19	C	3.2192E-15	3.2192E-15	7.5378E-15	7.5378E-15	-1.3191E-19	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
20	C2H2	6.7482E-04	6.7482E-04	7.2889E-04	7.2889E-04	-1.7024E-09	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
21	C2H	2.2954E-09	2.2954E-09	2.5791E-09	2.5791E-09	-1.8382E-11	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
22	CH2O	1.7660E-07	1.7660E-07	1.6541E-07	1.6541E-07	-1.7018E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
23	CH3O	4.1467E-10	4.1467E-10	3.7578E-10	3.7578E-10	6.0569E-14	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
24	CHO	3.7013E-10	3.7013E-10	3.5872E-10	3.5872E-10	3.5608E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	0
25	N	1.2724E-10	1.2724E-10	2.5546E-10	2.5546E-10	-1.9237E-14	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
26	NO	3.1890E-04	3.1890E-04	2.9888E-04	2.9888E-04	-1.3233E-09	0.0000E-01	5.9232E-18	3.4659E-18	2.0723E-05	1
27	N2	7.0552E-01	7.0552E-01	7.0824E-01	7.0824E-01	8.0486E-10	0.0000E-01	1.4808E-03	2.7381E-02	2.5462E-02	0
28	NO2	4.1376E-10	4.1376E-10	2.5293E-10	2.5293E-10	-5.2499E-15	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
29	N2O	2.2083E-07	2.2083E-07	1.4110E-07	1.4110E-07	-7.5483E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	2
30	NH3	1.0597E-05	1.0597E-05	1.7498E-05	1.7498E-05	8.1976E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
31	NH2	1.7130E-08	1.7130E-08	3.0066E-08	3.0066E-08	-9.0289E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	1
32	NH	5.7293E-10	5.7293E-10	1.0731E-09	1.0731E-09	-6.7167E-15	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	1
33	HN2	2.2347E-10	2.2347E-10	2.1654E-10	2.1654E-10	2.0723E-14	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	2
34	N2H2	1.8161E-13	1.8161E-13	1.7007E-13	1.7007E-13	1.1739E-17	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	2
35	HNO	1.3829E-08	1.3829E-08	1.2540E-08	1.2540E-08	1.8633E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
36	CN	5.8744E-10	5.8744E-10	6.3498E-10	6.3498E-10	-3.6227E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	1
37	NCO	5.8887E-11	5.8887E-11	3.9414E-11	3.9414E-11	1.6740E-16	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	1
38	CHN	7.2557E-05	7.2557E-05	7.5503E-05	7.5503E-05	-2.9057E-10	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	1
39	HNCO	6.1498E-07	6.1498E-07	4.0198E-07	4.0198E-07	-2.2861E-12	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E-18	1
40	HOCN	1.4924E-07	1.4924E-07	9.7547E-08	9.7547E-08	-8.9193E-13	0.0000E-01	5.9232E-18	3.4659E-18	1.9023E-05	0
41	SO2	1.2044E-03	1.2044E-03	5.2873E-04	5.2873E-04	-1.0982E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	0
42	SO3	3.4057E-09	3.4057E-09	1.1963E-09	1.1963E-09	-4.7699E-15	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	0
43	HSO3	6.8400E-12	6.8400E-12	2.3730E-12	2.3730E-12	1.1459E-13	0.0000E-01	5.9232E-18	3.4659E-18	3.4538E 18	0

MOLE FRACTION OF FIXED NITROGEN IN GAS PHASE = 3.927E-04

PLUG FLOW REACTOR (CONTINUED WITH SAME CHEMISTRY)

```
Step size increased at: x= 0.300E-07 dx= 0.600E-07
Step size increased at: x= 0.900E-07 dx= 0.120E-06
Step size increased at: x= 0.210E-06 dx= 0.240E-06
Step size increased at: x= 0.450E-06 dx= 0.480E-06
Step size increased at: x= 0.930E-06 dx= 0.960E-06
Step size increased at: x= 0.189E-05 dx= 0.192E-05
Step size reduced at: x= 0.381E-05  dx= 0.192E-05 ideqn=  2 delmax= 0.197E+00  qm= 0.208E-07 savea= 0.105E-07
          restart at: x= 1.890E-06  dx= 9.600E-07
Step size reduced at: x= 0.285E-05  dx= 0.960E-06 ideqn=  2 delmax= 0.984E-01  qm= 0.156E-07 savea= 0.105E 07
          restart at: x= 1.890E-06  dx= 4.800E-07
Step size increased at: x= 0.525E-05 dx= 0.960E-06
Step size increased at: x= 0.110E-04 dx= 0.192E-05
Step size increased at: x= 0.225E-04 dx= 0.384E-05
Step size increased at: x= 0.456E-04 dx= 0.768E-05
Step size increased at: x= 0.916E-04 dx= 0.154E-04
Step size increased at: x= 0.168E-03 dx= 0.307E-04
```

```
          Step size increased at: x- 0.353E-03 dx= 0.614E-04
          Step size increased at: x= 0.721E-03 dx= 0.123E-03
          Step size reduced at: x= 0.170E-02  dx= 0.123E-03 ideqn= 12 delmax= 0.534E-01  qm= 0.292E-07 savea= 0.231E-07
                    restart at: x= 1.582E-03  dx= 6.144E-05
          Step size increased at: x= 0.281E-02 dx= 0.123E-03
          Step size increased at: x= 0.392E-02 dx= 0.246E-03
          Step size increased at: x= 0.465E-02 dx= 0.492E-03
          Step size reduced at: x= 0.106E-01  dx= 0.492E-03 ideqn= 11 delmax= 0.506E-01  qm= 0.545E-07 savea= 0.729E-07
                    restart at: x= 1.006E-02  dx= 2.458E-04
          Step size increased at: x= 0.174E-01 dx= 0.492E-03
          Step size increased at: x= 0.179E-01 dx= 0.800E-03
                    |

REACH MAX. at X= 2.403E-01
```


---------- RXR NO. 3 : OVER-FIRED-AIR REACTOR ----------

```
 irxr=    3
 iprt=  413
    x= 0.240324E+00 cm
   dx= 0.800000E-03 cm
    p= 0.100000E+01 atm
 dpdx= 0.000000E+00 atm/cm
tausr= 0.000000E+00 sec

   TEMPERATURE(K)  =   1582.37   ENTHALPY(CAL/G)=-2.847E+02   VELOCITY(CM/SEC)= 1.000E+00   CP(CAL/G-K)     = 3.300E-01
   DENSITY(G/CC)   = 2.212E-04   MOLE/GM-TOTAL  = 3.481E-02   AREA(CM2)        = 1.147E+00   H.T.(CAL/CC-S) = 0.000E-01

   MASS INFLUX(XMDOTE,GM/SEC)= 0.000E-01   ENERGY INFLU X(QDOTE,CAL/SEC)= 0.000E-01   TE(K)= 3.000E+02   RHOE(G/CC)= 1.172E-03
   OFRE= 1.000E-16   FEXTNAL= 2.131E-04
```

I	SPECIES	MASS FRXN (OVERALL)	MASS FRXN (GAS/SOLID)	MOLE FRXN (OVERALL)	MOLE FRXN (GAS/SOLID)	NET RATE (MOLE/CC-S)	DADT(I) (FRXN/S)	ALPHAE(I)	ALPHAA(I)	ALPHAF(I)	#N
1	H2	7.6378E-07	7.6378E-07	1.0883E-05	1.0883E-05	-2.2157E-09	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
2	O2	1.3980E-02	1.3980E-02	1.2550E-02	1.2550E-02	-2.7364E-09	0.0000E-01	7.2784E-03	7.2784E-03	6.0486E-04	0
3	HO	6.4511E-05	6.4511E-05	1.0896E-04	1.0896E-04	-9.9232E-09	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
4	O	1.2000E-06	1.2000E-06	2.1545E-06	2.1545E-06	1.7798E-09	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
5	H	8.7575E-09	8.7575E-09	2.4958E-07	2.4958E-07	1.7846E-10	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
6	H2O	8.2308E-02	8.2308E-02	1.3124E-01	1.3124E-01	7.0724E-09	0.0000E-01	3.4659E-18	3.4659E-18	4.0630E-03	0
7	CO2	1.8754E-01	1.8754E-01	1.2241E-01	1.2241E-01	6.6143E-09	0.0000E-01	3.4659E-18	3.4659E-18	4.3688E-03	0
8	HO2	4.5511E-08	4.5511E-08	3.9608E-08	3.9608E-08	4.1318E-12	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
9	H2O2	9.1762E-09	9.1762E-09	7.7494E-09	7.7494E-09	6.7735E-12	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
10	CO	3.1868E-05	3.1868E-05	3.2682E-05	3.2682E-05	-6.6143E-09	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
11	CH4	1.6043E-19	1.6043E-19	2.8727E-19	2.8727E-19	2.1815E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
12	CH3	1.5035E-19	1.5035E-19	2.8727E-19	2.8727E-19	8.2708E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
13	CH2	1.4027E-19	1.4027E-19	2.8727E-19	2.8727E-19	-1.8102E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
14	CH	1.3019E-19	1.3019E-19	2.8727E-19	2.8727E-19	-1.0935E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
15	C2H4	2.8054E-19	2.8054E-19	2.8727E-19	2.8727E-19	6.4037E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
16	C2H6	3.0070E-19	3.0070E-19	2.8727E-19	2.8727E-19	-2.5264E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
17	C2H5	2.9062E-19	2.9062E-19	2.8727E-19	2.8727E-19	-6.3746E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
18	C2H3	2.7046E-19	2.7046E-19	2.8727E-19	2.8727E-19	-2.9618E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
19	C	1.2011E-19	1.2011E-19	2.8727E-19	2.8727E-19	-2.8365E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
20	C2H2	2.8737E-18	2.8737E-18	3.1705E-18	3.1705E-18	1.6262E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
21	C2H	2.5030E-19	2.5030E-19	2.8727E-19	2.8727E-19	-1.3839E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
22	CH2O	1.5364E-16	1.5364E-16	1.4698E-16	1.4698E-16	7.6209E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
23	CH3O	3.1035E-19	3.1035E-19	2.8727E-19	2.8727E-19	-5.4237E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
24	CHO	1.3526E-14	1.3526E-14	1.3390E-14	1.3390E-14	1.1153E-15	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
25	N	2.2277E-13	2.2277E-13	4.5685E-13	4.5685E-13	-9.0862E-16	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1

26	NO	1.7696E-04	1.7696E-04	1.6940E-04	1.6940E-04	-5.2994E-12	0.0000E-01	3.4659E-18	3.4659E-18	2.0723E-05	1
27	N2	7.1487E-01	7.1487E-01	7.3301E-01	7.3301E-01	4.0738E-12	0.0000E-01	2.7381E-02	2.7381E-02	2.5462E-02	0
28	NO2	2.7026E-07	2.7026E-07	1.6875E-07	1.6875E-07	6.2526E-12	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
29	N2O	6.8198E-08	6.8198E-08	4.4509E-08	4.4509E-08	-4.5728E-12	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	2
30	NH3	9.0927E-13	9.0927E-13	1.5336E-12	1.5336E-12	-3.5628E-16	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
31	NH2	4.5557E-14	4.5557E-14	8.1673E-14	8.1673E-14	-1.9933E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
32	NH	9.2304E-14	9.2304E-14	1.7659E-13	1.7659E-13	-7.2510E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
33	HN2	3.8499E-13	3.8499E-13	3.8105E-13	3.8105E-13	-2.0152E-16	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	2
34	N2H2	5.3791E-19	5.3791E-19	5.1454E-19	5.1454E-19	-4.1355E-22	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	2
35	HNO	2.9807E-10	2.9807E-10	2.7607E-10	2.7607E-10	4.6532E-14	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
36	CN	2.6019E-19	2.6019E-19	2.8727E-19	2.8727E-19	-4.5742E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
37	NCO	1.8647E-16	1.8647E-16	1.2748E-16	1.2748E-16	1.2105E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
38	CHN	6.2668E-17	6.2668E-17	6.6609E-17	6.6609E-17	4.0656E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
39	HNCO	7.5775E-14	7.5775E-14	5.0591E-14	5.0591E-14	-1.1158E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
40	HOCN	3.4898E-16	3.4898E-16	2.3299E-16	2.3299E-16	-2.8738E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
41	SO2	1.0185E-03	1.0185E-03	4.5672E-04	4.5672E-04	9.4936E-11	0.0000E-01	3.4659E-18	3.4659E-18	1.9023E-05	0
42	SO3	5.7366E-06	5.7366E-06	2.0583E-06	2.0583E-06	-1.0861E-10	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
43	HSO3	2.1154E-10	2.1154E-10	7.4962E-11	7.4962E-11	1.3678E-11	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0

MOLE FRACTION OF FIXED NITROGEN IN GAS PHASE = 1.697E-04

PLUG FLOW REACTOR (CONTINUED WITH SAME CHEMISTRY)

Step size increased at: x= 0.300E-07 dx= 0.600E-07
Step size increased at: x= 0.900E-07 dx= 0.120E-06
Step size increased at: x= 0.210E-06 dx= 0.240E-06
Step size increased at: x= 0.450E-06 dx= 0.480E-06
Step size increased at: x= 0.930E-06 dx= 0.960E-06
Step size increased at: x= 0.189E-05 dx= 0.192E-05
Step size increased at: x= 0.381E-05 dx= 0.384E-05
Step size increased at: x= 0.765E-05 dx= 0.768E-05
Step size increased at: x= 0.153E-04 dx= 0.154E-04
Step size increased at: x= 0.307E-04 dx= 0.307E-04
Step size increased at: x= 0.614E-04 dx= 0.614E-04
Step size increased at: x= 0.123E-03 dx= 0.123E-03
Step size increased at: x= 0.246E-03 dx= 0.246E-03
Step size increased at: x= 0.491E-03 dx= 0.492E-03
Step size increased at: x= 0.983E-03 dx= 0.983E-03
Step size increased at: x= 0.197E-02 dx= 0.197E-02
Step size increased at: x= 0.393E-02 dx= 0.393E-02
Step size increased at: x= 0.786E-02 dx= 0.680E-02

REACH MAX. at X= 2.040E+00

---------- RXR NO. 4 : QUENCHING REACTOR ---------- ------

irxr= 4
iprt= 317
x= 0.203987E+01 cm
dx= 0.679600E-02 cm
p= 0.100000E+01 atm
dpdx= 0.000000E+00 atm/cm
tausr= 0.000000E+00 sec

TEMPERATURE(K) = 1045.78 ENTHALPY(CAL/G)=-4.562E+02 VELOCITY(CM/SEC)= 1.000E+00 CP(CAL/G-K) = 3.067E-01

DENSITY(G/CC) = 3.348E-04 MOLE/GM-TOTAL = 3.481E-02 AREA(CM2) = 7.581E-01 H.T.(CAL/CC-S) = 0.000E-01

MASS INFLUX(XMDOTE,GM/SEC)= 0.000E-01 ENERGY INFLU X(QDOTE,CAL/SEC)= 0.000E-01 TE(K)= 3.000E+02 RHOE(G/CC)= 1.172E-03
OFRE= 1.000E-16 FEXTNAL= 2.131E-04

I	SPECIES	MASS FRXN (OVERALL)	MASS FRXN (GAS/SOLID)	MOLE FRXN (OVERALL)	MOLE FRXN (GAS/SOLID)	NET RATE (MOLE/CC-S)	DADT(I) (FRXN/S)	ALPHAE(I)	ALPHAA(I)	ALPHAF(I)	#N
1	H2	2.8199E-10	2.8199E-10	4.0185E-09	4.0185E-09	-1.2934E-13	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
2	O2	1.3983E-02	1.3983E-02	1.2553E-02	1.2553E-02	-1.9403E-11	0.0000E-01	7.2784E-03	7.2784E-03	6.0486E-04	0
3	HO	2.1818E-07	2.1818E-07	3.6853E-07	3.6853E-07	-3.5867E-11	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
4	O	2.1867E-10	2.1867E-10	3.9264E-10	3.9264E-10	1.0976E-12	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
5	H	8.7632E-14	8.7632E-14	2.4976E-12	2.4976E-12	8.2298E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
6	H2O	8.2349E-02	8.2349E-02	1.3131E-01	1.3131E-01	8.1066E-12	0.0000E-01	3.4659E-18	3.4659E-18	4.0630E-03	0
7	CO2	1.8759E-01	1.8759E-01	1.2245E-01	1.2245E-01	3.0888E-13	0.0000E-01	3.4659E-18	3.4659E-18	4.3688E-03	0
8	HO2	4.7575E-10	4.7575E-10	4.1407E-10	4.1407E-10	-1.6343E-13	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
9	H2O2	3.7570E-10	3.7570E-10	3.1730E-10	3.1730E-10	2.6569E-14	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
10	CO	3.4278E-08	3.4278E-08	3.5156E-08	3.5156E-08	-3.0885E-13	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
11	CH4	2.7081E-18	2.7081E-18	4.8495E-18	4.8495E-18	1.4338E-21	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
12	CH3	1.5035E-19	1.5035E-19	2.8729E-19	2.8729E-19	3.0708E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
13	CH2	1.4027E-19	1.4027E-19	2.8729E-19	2.8729E-19	-3.6165E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
14	CH	1.3019E-19	1.3019E-19	2.8729E-19	2.8729E-19	-2.2136E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
15	C2H4	2.2021E-18	2.2021E-18	2.2551E-18	2.2551E-18	4.9830E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
16	C2H6	3.0070E-19	3.0070E-19	2.8729E-19	2.8729E-19	2.5900E-23	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
17	C2H5	2.9062E-19	2.9062E-19	2.8729E-19	2.8729E-19	-4.9527E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
18	C2H3	2.7046E-19	2.7046E-19	2.8729E-19	2.8729E-19	-6.8713E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
19	C	1.2011E-19	1.2011E-19	2.8729E-19	2.8729E-19	-4.3297E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
20	C2H2	4.2154E-17	4.2154E-17	4.6510E-17	4.6510E-17	3.4629E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
21	C2H	2.5030E-19	2.5030E-19	2.8729E-19	2.8729E-19	-3.5736E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
22	CH2O	1.1276E-18	1.1276E-18	1.0789E-18	1.0789E-18	3.5572E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
23	CH3O	3.1035E-19	3.1035E-19	2.8729E-19	2.8729E-19	-3.1585E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
24	CHO	2.9019E-19	2.9019E-19	2.8729E-19	2.8729E-19	-3.0718E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
25	N	8.1342E-19	8.1342E-19	1.6682E-18	1.6682E-18	7.3533E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
26	NO	1.7588E-04	1.7588E-04	1.6838E-04	1.6838E-04	-1.9739E-11	0.0000E-01	3.4659E-18	3.4659E-18	2.0723E-05	1
27	N2	7.1487E-01	7.1487E-01	7.3305E-01	7.3305E-01	1.2383E-15	0.0000E-01	2.7381E-02	2.7381E-02	2.5462E-02	0
28	NO2	1.9422E-06	1.9422E-06	1.2127E-06	1.2127E-06	1.9739E-11	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
29	N2O	1.3481E-08	1.3481E-08	8.7987E-09	8.7987E-09	-1.2370E-15	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	2
30	NH3	2.6356E-17	2.6356E-17	4.4456E-17	4.4456E-17	1.2002E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
31	NH2	1.6024E-19	1.6024E-19	2.8729E-19	2.8729E-19	-2.7057E-20	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
32	NH	1.5016E-19	1.5016E-19	2.8729E-19	2.8729E-19	-1.1808E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
33	HN2	1.0742E-18	1.0742E-18	1.0632E-18	1.0632E-18	4.5271E-21	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	2
34	N2H2	3.0032E-19	3.0032E-19	2.8729E-19	2.8729E-19	-6.8170E-23	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	2
35	HNO	3.7031E-12	3.7031E-12	3.4300E-12	3.4300E-12	-2.4477E-17	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
36	CN	2.6019E-19	2.6019E-19	2.8729E-19	2.8729E-19	-4.6461E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
37	NCO	4.2019E-19	4.2019E-19	2.8729E-19	2.8729E-19	2.5388E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
38	CHN	3.7718E-17	3.7718E-17	4.0093E-17	4.0093E-17	3.1145E-18	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
39	HNCO	1.1774E-16	1.1774E-16	7.8616E-17	7.8616E-17	1.1796E-19	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
40	HOCN	4.6043E-17	4.6043E-17	3.0743E-17	3.0743E-17	6.6709E-24	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	1
41	SO2	1.0018E-03	1.0018E-03	4.4923E-04	4.4923E-04	-4.5696E-11	0.0000E-01	3.4659E-18	3.4659E-18	1.9023E-05	0
42	SO3	2.6675E-05	2.6675E-05	9.5715E-06	9.5715E-06	2.5674E-11	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0
43	HSO3	2.2646E-10	2.2646E-10	8.0253E-11	8.0253E-11	2.0022E-11	0.0000E-01	3.4659E-18	3.4659E-18	3.4538E-18	0

MOLE FRACTION OF FIXED NITROGEN IN GAS PHASE = 1.696E-04

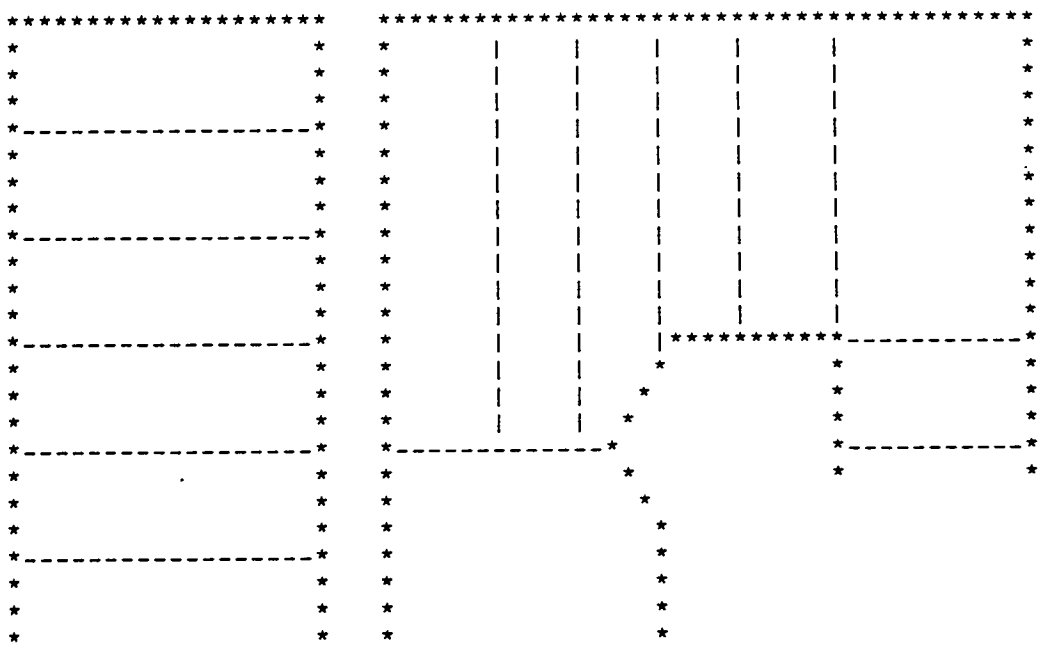
Listing 3.14. Record of BPINPT interactive session (Case 2).

BPINPT

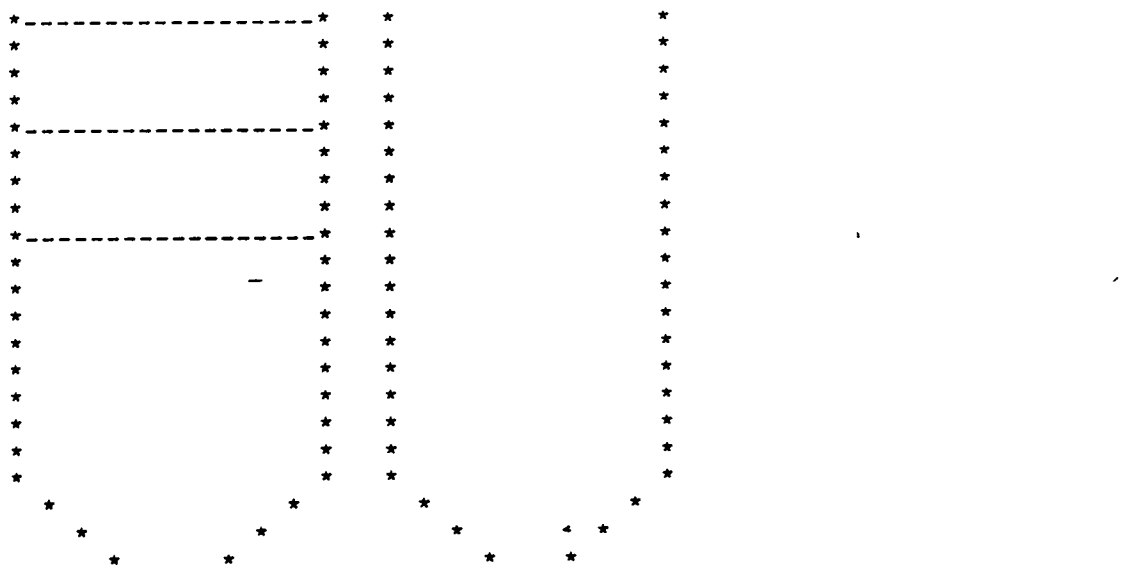
```
-- This is an interactive program (BPINPT) to create
   or update a data file which is required to run the
   EER Boiler Performance Model (BPM).
-- Version 2.70, May, 1992.

Note:
-- This program may set default values for some sections
   which don't exist in your specific boiler.
-- The above values may be ignored (you can NOT change them).


Press Return to continue
```



```
Press Return to continue
```



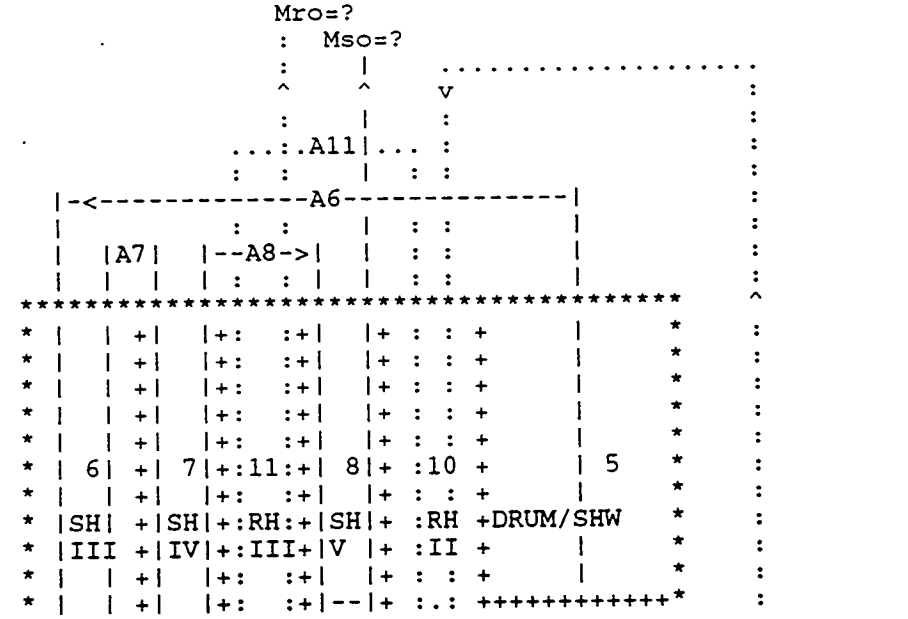
```
         1                    2
Press Return to continue


Enter boiler type (1 or 2)
1: TOWER     2: TWO PASSES
Current boiler type =   2

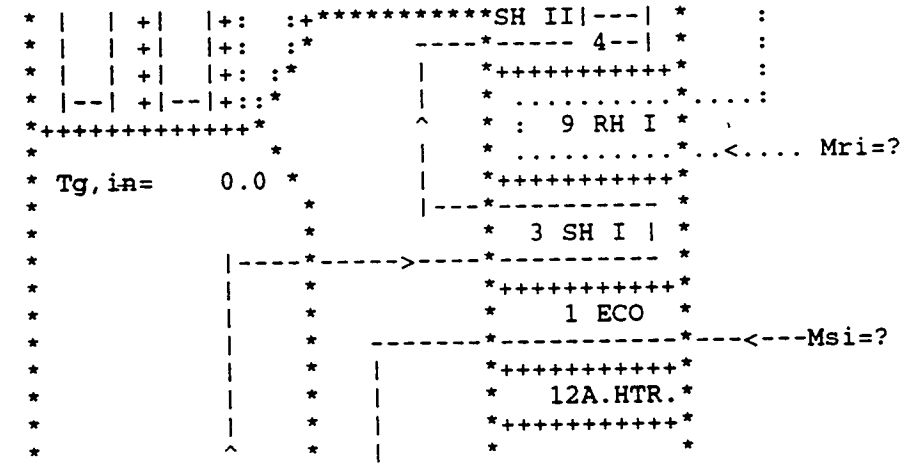
         Press: C to change
                Return to Continue

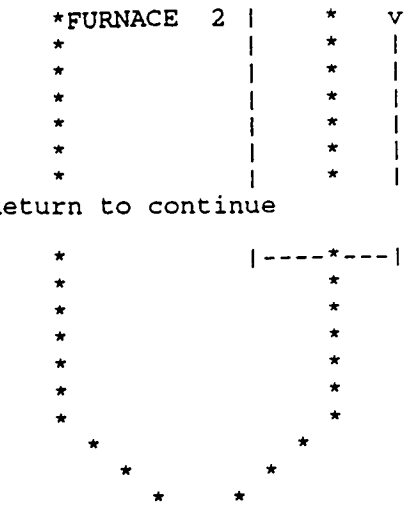

Status of Input file
--------------------
To Create a boiler data file, Press: C key
To Update a boiler data file,        Return
C


         CURRENTLY THIS IS BOILER TYPE   2  CONFIGURATION.
```




```
Push Return to continue
```





Push Return to continue

2

NOTE : ARABIC NUMBERS IN THE ABOVE CONFIGURATION
REFER TO WATER/STEAM SEQUENCE INDEX.

Press Return to continue

Boiler DRUM/SHW section

If DRUM/SHW section exists, set IDRUM = 1
Otherwise, set IDRUM = 0
-- Currently, IDRUM = 0

Press: C to change
Return to Continue

On/Off Switches for Various Boiler Sections

SECTION INDEX	SECTION NAME	S/W SEQUENCE INDEX	S/W SWITCH
1.	Furnace	2	2(ON)
2.	S.Heater III	6	6(ON)
3.	S.Heater IV	7	7(ON)
4.	R.Heater III	11	11(ON)
5.	S.Heater V	8	8(ON)
6.	R.Heater II	10	10(ON)
7.	Drum/S.Wall	5	5(ON)
8.	S.Heater II	4	4(ON)
9.	R.Heater I	9	9(ON)
10.	S.Heater I	3	3(ON)
11.	Economiser	1	1(ON)
12.	Air Preheater	12	12(ON)

Modify the on/off switches shown above ?

Press: C to modify
Return to continue

C

You chose to modify the on/off switches
Press Return to continue

SECTION INDEX: 2 (S.Heater III) S/W SEQUENCE INDEX: 6(ON)

```
          Press: Y to turn on
                 N to turn off
                 Return to continue

SECTION INDEX:   3   (S.Heater IV  )   S/W SEQUENCE INDEX:   7( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue
N
SECTION INDEX:   4   (R.Heater III )   S/W SEQUENCE INDEX:  11( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue

SECTION INDEX:   5   (S.Heater V   )   S/W SEQUENCE INDEX:   8( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue
N
SECTION INDEX:   6   (R.Heater II  )   S/W SEQUENCE INDEX:  10( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue
N
SECTION INDEX:   7   (Drum/S.Wall  )   S/W SEQUENCE INDEX:   5( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue
N
SECTION INDEX:   8   (S.Heater II  )   S/W SEQUENCE INDEX:   4( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue

SECTION INDEX:   9   (R.Heater I   )   S/W SEQUENCE INDEX:   9( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue
N
SECTION INDEX:  10   (S.Heater I   )   S/W SEQUENCE INDEX:   3( ON)

          Press: Y to turn on
                 N to turn off
                 Return to continue
N
SECTION INDEX:  11   (Economiser   )   S/W SEQUENCE INDEX:   1( ON)

          Press: Y to turn on
```

```
                N to turn off
                Return to continue


SECTION INDEX:  12   (Air Preheater)   S/W SEQUENCE INDEX:  12( ON)

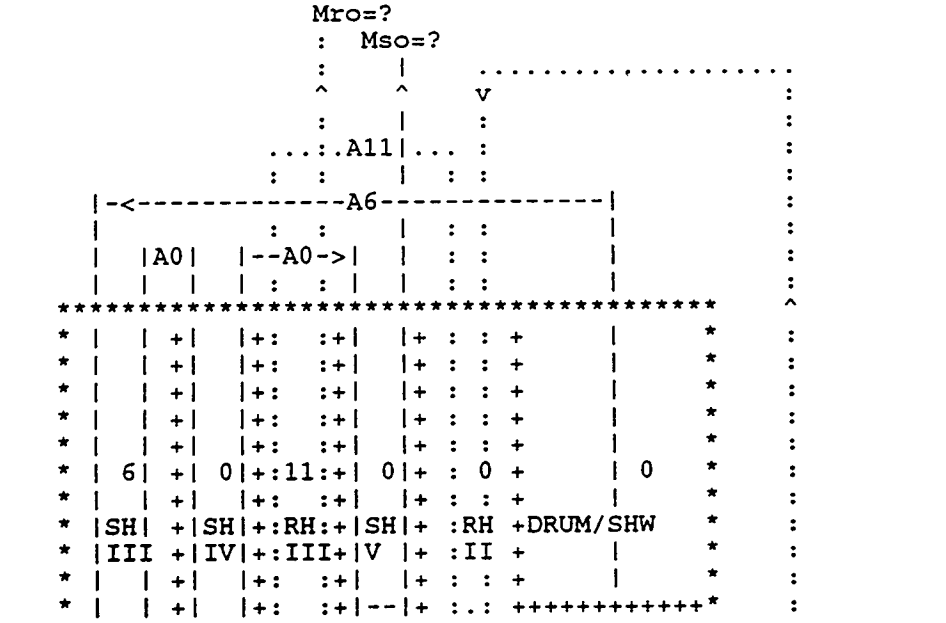
          Press: Y to turn on
                 N to turn off
                 Return to continue

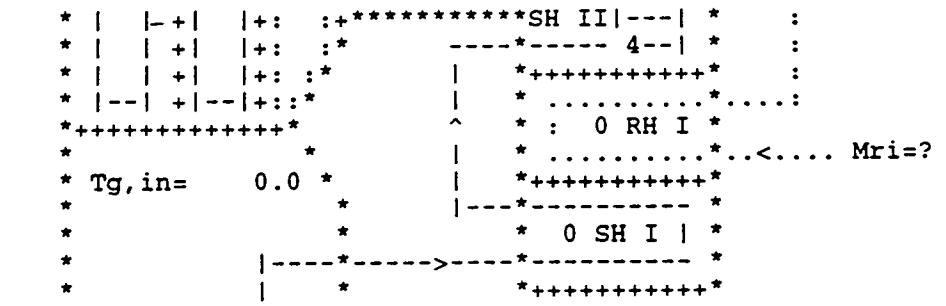

Attemperator Sequence Indices and On/Off Swithes
ATTEMPERATOR INDEX IA( 1) :  8  , ON/OFF INDEX IAC( 1) :  0(OFF)
ATTEMPERATOR INDEX IA( 2) :  7  , ON/OFF INDEX IAC( 2) :  0(OFF)
ATTEMPERATOR INDEX IA( 3) :  6  , ON/OFF INDEX IAC( 3) :  6( ON)
ATTEMPERATOR INDEX IA( 4) : 11  , ON/OFF INDEX IAC( 4) : 11( ON)

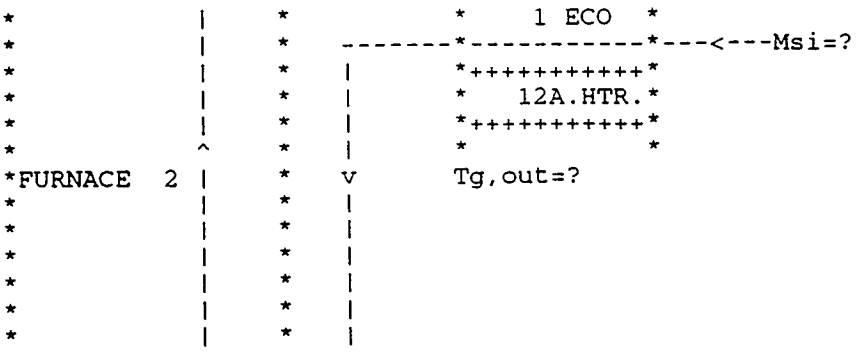
          Press: C to change
                 Return to Continue


          Press: Y to check on/off switches one more time
                 Return to continue
Y

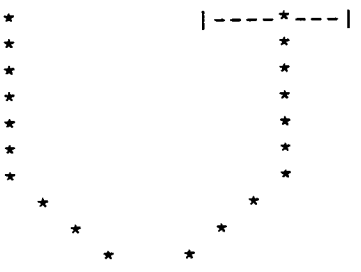

          CURRENTLY THIS IS BOILER TYPE   2  CONFIGURATION.
```







Push Return to continue



2

NOTE : ARABIC NUMBERS IN THE ABOVE CONFIGURATION
REFER TO WATER/STEAM SEQUENCE INDEX.

Press Return to continue

Boiler DRUM/SHW section

If DRUM/SHW section exists, set IDRUM = 1
Otherwise, set IDRUM = 0
-- Currently, IDRUM = 0

Press: C to change
Return to Continue

On/Off Switches for Various Boiler Sections

SECTION INDEX		SECTION NAME	S/W SEQUENCE INDEX	S/W SWITCH
1.		Furnace	2	2(ON)
2.		S.Heater III	6	6(ON)
3.		S.Heater IV	7	0(OFF)
4.		R.Heater III	11	11(ON)
5.		S.Heater V	8	0(OFF)
6.		R.Heater II	10	0(OFF)
7.	-	Drum/S.Wall	5	0(OFF)
8.		S.Heater II	4	4(ON)
9.		R.Heater I	9	0(OFF)
10.		S.Heater I	3	0(OFF)
11.		Economiser	1	1(ON)
12.		Air Preheater	12	12(ON)

Modify the on/off switches shown above ?

Press: C to modify
Return to continue

```
Attemperator Sequence Indices and On/Off Swithes
ATTEMPERATOR INDEX IA( 1) :  8  , ON/OFF INDEX IAC( 1) :  0(OFF)
ATTEMPERATOR INDEX IA( 2) :  7  , ON/OFF INDEX IAC( 2) :  0(OFF)
ATTEMPERATOR INDEX IA( 3) :  6  , ON/OFF INDEX IAC( 3) :  6( ON)
ATTEMPERATOR INDEX IA( 4) : 11  , ON/OFF INDEX IAC( 4) : 11( ON)

         Press: C to change
                Return to Continue


         Press: Y to check on/off switches one more time
                Return to continue


  Specification of Steam/Water Flow Pattern (IBCP(i))
  Non-existing or
  Furnace Section -- IBCP(i)= 0
  Air Preheater   -- IBCP(i)= 2
  Parallel Flow   -- IBCP(i)= 1
  Counter Flow    -- IBCP(i)= 2

  SECTION INDEX    SECTION NAME        FLOW INDEX
        1.         Furnace                  0
        2.         S.Heater III             0
        3.         S.Heater IV              0
        4.         R.Heater III             0
        5.         S.Heater V               0
        6.         R.Heater II              0
        7.         Drum/S.Wall              0
        8.         S.Heater II              0
        9.         R.Heater I               0
       10.         S.Heater I               0
       11.         Economiser               0
       12.         Air Preheater            0

         Press: C to change
                Return to Continue
C

SECTION INDEX:   2   (S.Heater III )   FLOW INDEX:   0

         Press: C to change flow pattern
                Return to continue
C
1

SECTION INDEX:   4   (R.Heater III )   FLOW INDEX:   0

         Press: C to change flow pattern
                Return to continue
C
2

SECTION INDEX:   8   (S.Heater II  )   FLOW INDEX:   0

         Press: C to change flow pattern
                Return to continue
C
2

SECTION INDEX:  11   (Economiser   )   FLOW INDEX:   0

         Press: C to change flow pattern
                Return to continue
```

```
C
2

  Specification of Steam/Water Flow Pattern (IBCP(i))
  Non-existing or
  Furnace Section -- IBCP(i)= 0
  Air Preheater   -- IBCP(i)= 2
  Parallel Flow   -- IBCP(i)= 1
  Counter Flow    -- IBCP(i)= 2

  SECTION INDEX    SECTION NAME         FLOW INDEX
        1.         Furnace                  0
        2.         S.Heater III             1
        3.         S.Heater IV              0
        4.         R.Heater III             2
        5.         S.Heater V               0
        6.         R.Heater II              0
        7.         Drum/S.Wall              0
        8.         S.Heater II              2
        9.         R.Heater I               0
       10.         S.Heater I               0
       11.         Economiser               2
       12.         Air Preheater            2

          Press: C to change
                 Return to Continue


Attemperator Control Temperatures (K)
ATTEMPERATOR SWITCH IAC( 1)=  0(OFF),  TMAX( 1) =      0.0000
ATTEMPERATOR SWITCH IAC( 2)=  0(OFF),  TMAX( 2) =      0.0000
ATTEMPERATOR SWITCH IAC( 3)=  6( ON),  TMAX( 3) =      0.0000
ATTEMPERATOR SWITCH IAC( 4)= 11( ON),  TMAX( 4) =      0.0000

          Press: C to change
                 Return to Continue
C

ATTEMPERATOR SWITCH IAC( 3)=   6( ON)  TMAX( 3) =      0.0000

          Press: C to change TMAX(i)
                 Return to continue
C
813.15

ATTEMPERATOR SWITCH IAC( 4)=  11( ON)  TMAX( 4) =      0.0000

          Press: C to change TMAX(i)
                 Return to continue
C
793.15

          Press: Y to check inputs one more time
                 Return to continue  Y

Attemperator Control Temperatures (K)
ATTEMPERATOR SWITCH IAC( 1)=  0(OFF),  TMAX( 1) =      0.0000
ATTEMPERATOR SWITCH IAC( 2)=  0(OFF),  TMAX( 2) =      0.0000
ATTEMPERATOR SWITCH IAC( 3)=  6( ON),  TMAX( 3) =    813.1500
ATTEMPERATOR SWITCH IAC( 4)= 11( ON),  TMAX( 4) =    793.1500

          Press: C to change
                 Return to Continue
```

```
         Press: Y to check inputs one more time
                Return to continue

Temperature (K) of Attemperator Spray-Water
Spray temperature of Superheater Attemperators, TA0 :     0.0000

         Press: C to change
                Return to Continue
C
489.15

Spray Temperature of Reheater Attemperators, TA0R :     0.0000

         Press: C to change
                Return to Continue
C
489.15

Pressure Into Economiser (or 1st S.Heater in operation)    :     0.0000 MPA
Pressure Out of S.Heater V (or last S.Heater in operation):     0.0000 MPA
-- If you do not know the outlet pressure, guess one
   (must be smaller than the inlet pressure)
-- Zero is not allowed for any of the above inputs !

         Press: C to change
                Return to Continue
C
13.5776
12.6656

Pressure Into Reheater I (or 1st Reheater in operation)     :     0.0000 MPA
Pressure Out of Reheater III (or last Reheater in operation):     0.0000 MPA
-- If you do not know the outlet pressure, guess one
   (must be smaller than the inlet pressure)
-- Zero is not allowed for any of the above inputs !

         Press: C to change
                Return to Continue
C
2.0238
1.8239

S/W SEQUENCE INDEX    SECTION NAME     OUTLET PRESSURE (MPA)
          1           Economiser            0.0000
          2           Furnace               0.0000
          3           S.Heater I            0.0000
          4           S.Heater II           0.0000
          5           Drum/S.Wall           0.0000
          6           S.Heater III         12.6656
          7           S.Heater IV          12.6656
          8           S.Heater V           12.6656
          9           R.Heater I            0.0000
         10           R.Heater II           0.0000
         11           R.Heater III          1.8239

This program doesn't allow 0.0 for S/W pressures,
neither for conditions that PSO(I+1) > PSO(I)
-- Default outlet pressures will be assigned by linear
   interpolation
-- The S/W inlet pressures will be assigned according to
   PSI(I+1)=PSO(I)
Press Return to continue
```

```
S/W SEQUENCE INDEX    SECTION NAME     OUTLET PRESSURE (MPA)
          1           Economiser           13.3496
          2           Furnace              13.1216
          3           S.Heater I           13.1216
          4           S.Heater II          12.8936
          5           Drum/S.Wall          12.8936
          6           S.Heater III         12.6656
          7           S.Heater IV          12.6656
          8           S.Heater V           12.6656
          9           R.Heater I            2.0238
         10           R.Heater II           2.0238
         11           R.Heater III          1.8239
-- Default outlet pressures are assigned by linear
   interpolation
-- Inlet pressures are assigned by PSI(i+1)=PSO(i)

          Press: C to change
                 D for default values
                 Return to continue

For information only :
-- S/W inlet pressures will be displayed next
-- To change S/W inlet pressures, Press C
   The program will then ask outlet pressures and
   assign inlet pressures based on PSI(i+1)=PSO(i)
Press Return to continue

S/W SEQUENCE INDEX    SECTION NAME     INLET PRESSURE (MPA)
          1           Economiser           13.5776
          2           Furnace              13.3496
          3           S.Heater I           13.1216
          4           S.Heater II          13.1216
          5           Drum/S.Wall          12.8936
          6           S.Heater III         12.8936
          7           S.Heater IV          12.6656
          8           S.Heater V           12.6656
          9           R.Heater I            2.0238
         10           R.Heater II           2.0238
         11           R.Heater III          2.0238

          Press: C to change
                 Return to continue

S/W Mass Flow Rate (kg/s) into Economiser (or 1st SH in oper.):    0.0000
Fraction  of Final Superheater (last SH in operation) S/W Mass
Flow Rate into Reheater I (or 1st Reheater in operation)      :    0.0000
-- Zero is NOT allowed !

          Press: C to change
                 Return to continue
C
47.0
0.8326

Steam/Water Mass Flow Rate (KG/S)
S/W SEQUENCE INDEX    SECTION NAME     S/W MASS FLOW (KG/S)
          1           Economiser           47.0000
          2           Furnace              47.0000
          3           S.Heater I           47.0000
          4           S.Heater II          47.0000
          5           Drum/S.Wall          47.0000
          6           S.Heater III         47.0000
          7           S.Heater IV          47.0000
```

```
         8          S.Heater V          47.0000
         9          R.Heater I          39.1322
        10          R.Heater II         39.1322
        11          R.Heater III        39.1322

Note:
-- Default flow rates are assigned assuming that attemperators
   are not in operation
-- Flow rates of S.Heaters and R.Heaters are kept constant

         Press: C to change
                D for default values
                Return to continue


Temperature Into Economiser (or 1st S.Heater in operation)     :     0.0000 K
Temperature Out of S.Heater V (or Last S.Heater in operation) :     0.0000 K
-- If you do not know the outlet temperature, guess one
   (must be larger than the inlet temperature)
-- Zero is not allowed for any of the above inputs !

         Press: C to change
                Return to Continue
C
489.15
813.15

Temperature Into Reheater I (or 1st Reheater in operation)      :     0.0000 K
Temperature Out of Reheater III (or Last Reheater in operation) :     0.0000 K
-- If you do not know the outlet temperature, guess one
   (must be larger than the inlet temperature)
-- Zero is not allowed for any of the above inputs !

         Press: C to change
                Return to Continue
C
613.15
793.15

Initial Steam/Water Temperatures
S/W SEQUENCE INDEX   SECTION NAME    OUTLET TEMPERATURE (K)
         1           Economiser           0.0000
         2           Furnace              0.0000
         3           S.Heater I           0.0000
         4           S.Heater II          0.0000
         5           Drum/S.Wall          0.0000
         6           S.Heater III       813.1500
         7           S.Heater IV        813.1500
         8           S.Heater V         813.1500
         9           R.Heater I           0.0000
        10           R.Heater II          0.0000
        11           R.Heater III       793.1500
The program does not allow :
-- Zero as S/W temperatures, or
-- TSO(I+1) < TSO(I)
Default values will be assigned by linear interpolation on
the inlet and outlet temperatures
Press Return to continue


S/W SEQUENCE INDEX   SECTION NAME    OUTLET TEMPERATURE (K)
         1           Economiser         570.1500
         2           Furnace            651.1500
         3           S.Heater I         651.1500
```

```
         4            S.Heater II        732.1500
         5            Drum/S.Wall        732.1500
         6            S.Heater III       813.1500
         7            S.Heater IV        813.1500
         8            S.Heater V         813.1500
         9            R.Heater I         613.1500
        10            R.Heater II        613.1500
        11            R.Heater III       793.1500

Note:
Default temperatures were calculated by linear interpolation
between inlet temp. of the 1st section and outlet temp. of
the last section

For information only :
-- S/W inlet temperatures will be displayed next
-- To change S/W inlet temperatures, Press C
   The program will then ask outlet temperatures and
   assign inlet temperatures based on TSI(i+1)=TSO(i)
Press Return to continue

S/W SEQUENCE INDEX   SECTION NAME     INLET TEMPERATURE (K)
         1           Economiser            489.1500
         2           Furnace               570.1500
         3           S.Heater I            651.1500
         4           S.Heater II           651.1500
         5           Drum/S.Wall           732.1500
         6           S.Heater III          732.1500
         7           S.Heater IV           813.1500
         8           S.Heater V            813.1500
         9           R.Heater I            613.1500
        10           R.Heater II           613.1500
        11           R.Heater III          613.1500

         Press: C to change
                Return to continue


Projected Wall Surface Area (M**2)
  SECTION INDEX    SECTION NAME          AREA(M**2)
        1.         Furnace                  0.0000
        2.         S.Heater III             0.0000
        3.         S.Heater IV              0.0000
        4.         R.Heater III             0.0000
        5.         S.Heater V               0.0000
        6.         R.Heater II              0.0000
        7.         Drum/S.Wall              0.0000
        8.         S.Heater II              0.0000
        9.         R.Heater I               0.0000
       10.         S.Heater I               0.0000
       11.         Economiser               0.0000
       12.         Air Preheater            0.0000

         Press: C to change
                Return to Continue
C

SECTION INDEX = 2.  (S.Heater III )  AREA=  0.0000

         Press: C to change
                Return to Continue


SECTION INDEX = 4.  (R.Heater III )  AREA=  0.0000
```

```
         Press: C to change
                Return to Continue
C
167.23

SECTION INDEX = 8.  (S.Heater II   )  AREA=  0.0000

         Press: C to change
                Return to Continue
C
131.74

SECTION INDEX =11.  (Economiser    )  AREA=  0.0000

         Press: C to change
                Return to Continue
C
61.6868

Projected Wall Surface Area (M**2)
  SECTION INDEX     SECTION NAME          AREA(M**2)
        1.          Furnace                  0.0000
        2.          S.Heater III             0.0000
        3.          S.Heater IV              0.0000
        4.          R.Heater III           167.2300
        5.          S.Heater V               0.0000
        6.          R.Heater II              0.0000
        7.          Drum/S.Wall              0.0000
        8.          S.Heater II            131.7400
        9.          R.Heater I               0.0000
       10.          S.Heater I               0.0000
       11.          Economiser              61.6868
       12.          Air Preheater            0.0000

          Press: C to change
                 Return to Continue


Projected Wall Heat Transfer Coefficient (KW/M**2/K)
  SECTION INDEX     SECTION NAME        COEFFICIENT(KW/M**2/K)
        1.          Furnace                  0.0000
        2.          S.Heater III             0.0000
        3.          S.Heater IV              0.0000
        4.          R.Heater III             0.0000
        5.          S.Heater V               0.0000
        6.          R.Heater II              0.0000
        7.          Drum/S.Wall              0.0000
        8.          S.Heater II              0.0000
        9.          R.Heater I               0.0000
       10.          S.Heater I               0.0000
       11.          Economiser               0.0000
       12.          Air Preheater            0.0000

          Press: D for default values (=0.0350)
                 C to change
                 Return to continue
D

Projected Wall Heat Transfer Coefficient (KW/M**2/K)
  SECTION INDEX     SECTION NAME        COEFFICIENT(KW/M**2/K)
        1.          Furnace                  0.0000
        2.          S.Heater III             0.0350
        3.          S.Heater IV              0.0000
        4.          R.Heater III             0.0350
```

```
        5.          S.Heater V              0.0000
        6.          R.Heater II             0.0000
        7.          Drum/S.Wall             0.0000
        8.          S.Heater II             0.0350
        9.          R.Heater I              0.0000
       10.          S.Heater I              0.0000
       11.          Economiser              0.0350
       12.          Air Preheater           0.0000

         Press: D for default values (=0.0350)
                C to change
                Return to continue


Total Heat Loss through Furnace Walls (XLOSS0)
-- As fractions of total heat transferred to furnace walls
Currently, XLOSS0= 0.0000

         Press: C to change
                Return to Continue
C
0.005


Heat Exchanger Surface Area (M**2)
S/W SEQUENCE INDEX   SECTION NAME    H.E. SURFACE AREA(M**2)
         1           Economiser                0.0000
         2           Furnace                   0.0000
         3           S.Heater I                0.0000
         4           S.Heater II               0.0000
         5           Drum/S.Wall               0.0000
         6           S.Heater III              0.0000
         7           S.Heater IV               0.0000
         8           S.Heater V                0.0000
         9           R.Heater I                0.0000
        10           R.Heater II               0.0000
        11           R.Heater III              0.0000
        12           Air Preheater             0.0000

         Press: C to change
                Return to Continue
C

S/W SEQUENCE INDEX=  1  (Economiser    )   H.E. SURFACE AREA(M**2)=       0.

         Press: C to change
                Return to Continue
C
1500.38

S/W SEQUENCE INDEX=  4  (S.Heater II   )   H.E. SURFACE AREA(M**2)=       0.

         Press: C to change
                Return to Continue
C
2807.1599

S/W SEQUENCE INDEX=  6  (S.Heater III  )   H.E. SURFACE AREA(M**2)=       0.

         Press: C to change
                Return to Continue
C
752.05
```

```
S/W SEQUENCE INDEX= 11  (R.Heater III )   H.E. SURFACE AREA(M**2)=       0.

         Press: C to change
                Return to Continue
C
1090

S/W SEQUENCE INDEX= 12  (Air Preheater)   H.E. SURFACE AREA(M**2)=       0.

         Press: C to change
                Return to Continue
C
1


Heat Exchanger Surface Area (M**2)
S/W SEQUENCE INDEX    SECTION NAME     H.E. SURFACE AREA(M**2)
          1           Economiser          1500.3800
          2           Furnace                0.0000
          3           S.Heater I             0.0000
          4           S.Heater II         2807.1599
          5           Drum/S.Wall            0.0000
          6           S.Heater III         752.0500
          7           S.Heater IV            0.0000
          8           S.Heater V             0.0000
          9           R.Heater I             0.0000
         10           R.Heater II            0.0000
         11           R.Heater III        1090.0000
         12           Air Preheater          1.0000

         Press: C to change
                Return to Continue


Deposit Thickness (m) on Heat Exchanger Tubes
S/W SEQUENCE INDEX    SECTION NAME     DEPOSIT THICKNESS (m)
          1           Economiser             0.0000
          2           Furnace                0.0000
          3           S.Heater I             0.0000
          4           S.Heater II            0.0000
          5           Drum/S.Wall            0.0000
          6           S.Heater III           0.0000
          7           S.Heater IV            0.0000
          8           S.Heater V             0.0000
          9           R.Heater I             0.0000
         10           R.Heater II            0.0000
         11           R.Heater III           0.0000
         12           Air Preheater          0.0000

         Press: D for default values (=0.0005)
                C to change
                Return to continue
C

S/W SEQUENCE INDEX=  1  (Economiser    )    DEPOSIT THICKNESS (m)=  0.0000

         Press: D for default values (=0.0005)
                C to change
                Return to continue
C
0.0035

S/W SEQUENCE INDEX=  4  (S.Heater II   )    DEPOSIT THICKNESS (m)=  0.0000
```

```
         Press: D for default values (=0.0005)
                C to change
                Return to continue
C
0.0048

S/W SEQUENCE INDEX=  6  (S.Heater III )    DEPOSIT THICKNESS (m)=  0.0000

         Press: D for default values (=0.0005)
                C to change
                Return to continue
C
0.0035

S/W SEQUENCE INDEX= 11  (R.Heater III )    DEPOSIT THICKNESS (m)=  0.0000

         Press: D for default values (=0.0005)
                C to change
                Return to continue
C
0.0029

Deposit Thickness (m) on Heat Exchanger Tubes
S/W SEQUENCE INDEX   SECTION NAME    DEPOSIT THICKNESS (m)
          1          Economiser           0.0035
          2          Furnace              0.0000
          3          S.Heater I           0.0000
          4          S.Heater II          0.0048
          5          Drum/S.Wall          0.0000
          6          S.Heater III         0.0035
          7          S.Heater IV          0.0000
          8          S.Heater V           0.0000
          9          R.Heater I           0.0000
         10          R.Heater II          0.0000
         11          R.Heater III         0.0029
         12          Air Preheater        0.0000

         Press: D for default values (=0.0005)
                C to change
                Return to continue


Switch for Deposit Thermal Conductivity (kW/mK) Distributions (ITC)
Set ITC= 1 for default distribution
Set ITC= 0 to prescribe
-- Currently, ITC=  0

         Press: C to change
                Return to Continue
C
1

Tube Outer Diameter (M)
SECTION INDEX -      SECTION NAME    TUBE OUTER DIAMETER (M)
          1          Furnace              0.0000
          2          S.Heater III         0.0000
          3          S.Heater IV          0.0000
          4          R.Heater III         0.0000
          5          S.Heater V           0.0000
          6          R.Heater II          0.0000
          7          Drum/S.Wall          0.0000
          8          S.Heater II          0.0000
          9          R.Heater I           0.0000
         10          S.Heater I           0.0000
```

```
        11          Economiser          0.0000
        12          Air Preheater       0.0000

         Press: D for default values (=0.0550 m)
                C to change
                Return to continue
C

SECTION INDEX=  2  (S.Heater III )    TUBE OUTER DIAMETER (M)=    0.0000

         Press: D for default values (=0.0550 m)
                C to change
                Return to continue
C
0.0508

SECTION INDEX=  4  (R.Heater III )    TUBE OUTER DIAMETER (M)=    0.0000

         Press: D for default values (=0.0550 m)
                C to change
                Return to continue
C
0.0508

SECTION INDEX=  8  (S.Heater II  )    TUBE OUTER DIAMETER (M)=    0.0000

         Press: D for default values (=0.0550 m)
                C to change
                Return to continue
C
0.0571

SECTION INDEX= 11  (Economiser   )    TUBE OUTER DIAMETER (M)=    0.0000

         Press: D for default values (=0.0550 m)
                C to change
                Return to continue
C
0.0381

Tube Outer Diameter (M)
SECTION INDEX        SECTION NAME    TUBE OUTER DIAMETER (M)
         1           Furnace              0.0000
         2           S.Heater III         0.0508
         3           S.Heater IV          0.0000
         4           R.Heater III         0.0508
         5           S.Heater V           0.0000
         6           R.Heater II          0.0000
         7           Drum/S.Wall          0.0000
         8           S.Heater II          0.0571
         9           R.Heater I           0.0000
        10           S.Heater I           0.0000
        11           Economiser           0.0381
        12           Air Preheater        0.0000

         Press: D for default values (=0.0550 m)
                C to change
                Return to continue


Switch for Automatic Calculation of Gas-Side Overall
Heat Transfer Coefficients (ICALUS)
Set ICALUS = 1 if coefficients are automatically calculated
Set ICALUS = 0 if coefficients will be prescribed point-wise
```

```
-- Currently, ICALUS=  0

         Press: C to change
                Return to Continue
C
1

Specify Overall H. T. Coeff. (kW/m**2K)
of the Air Preheater, CUS :    0.0000

         Press: C to change
                Return to Continue
C
5.4446

Gas-Side Cross Sectional Area, (M**2)
SECTION INDEX        SECTION NAME    CROSS SECTION AREA (M**2)
          1          Furnace              0.0000
          2          S.Heater III         0.0000
          3          S.Heater IV          0.0000
          4          R.Heater III         0.0000
          5          S.Heater V           0.0000
          6          R.Heater II          0.0000
          7          Drum/S.Wall          0.0000
          8          S.Heater II          0.0000
          9          R.Heater I           0.0000
         10          S.Heater I           0.0000
         11          Economiser           0.0000
         12          Air Preheater        0.0000

         Press: C to change
                Return to Continue
C

SECTION INDEX=  2  (S.Heater III )    CROSS SECTION AREA (M**2)=     0.0000

         Press: C to change
                Return to Continue
C
53.155

SECTION INDEX=  4  (R.Heater III )    CROSS SECTION AREA (M**2)=     0.0000

         Press: C to change
                Return to Continue
C
40.48

SECTION INDEX=  8  (S.Heater II  )    CROSS SECTION AREA (M**2)=     0.0000

         Press: C to change
                Return to Continue
C
30.7

SECTION INDEX= 11  (Economiser   )    CROSS SECTION AREA (M**2)=     0.0000

         Press: C to change
                Return to Continue
C
30.7

Gas-Side Cross Sectional Area, (M**2)
SECTION INDEX        SECTION NAME    CROSS SECTION AREA (M**2)
```

```
          1           Furnace              0.0000
          2           S.Heater III        53.1550
          3           S.Heater IV          0.0000
          4           R.Heater III        40.4800
          5           S.Heater V           0.0000
          6           R.Heater II          0.0000
          7           Drum/S.Wall          0.0000
          8           S.Heater II         30.7000
          9           R.Heater I           0.0000
         10           S.Heater I           0.0000
         11           Economiser          30.7000
         12           Air Preheater        0.0000

          Press: C to change
                 Return to Continue


Longitudinal Pitch (Spacing in Flow Direction/
Tube Diameter) : ELL(i)
SECTION INDEX        SECTION NAME         ELL(I)
          1           Furnace              0.0000
          2           S.Heater III         0.0000
          3           S.Heater IV          0.0000
          4           R.Heater III         0.0000
          5           S.Heater V           0.0000
          6           R.Heater II          0.0000
          7           Drum/S.Wall          0.0000
          8           S.Heater II          0.0000
          9           R.Heater I           0.0000
         10           S.Heater I           0.0000
         11           Economiser           0.0000
         12           Air Preheater        0.0000

          Press: C to change
                 Return to Continue
C

SECTION INDEX=  2  (S.Heater III )    ELL(I) =    0.0000

          Press: C to change
                 Return to Continue
C
1.35

SECTION INDEX=  4  (R.Heater III )    ELL(I) =    0.0000

          Press: C to change
                 Return to Continue
C
1.50

SECTION INDEX=  8  (S.Heater II  )    ELL(I) =    0.0000

          Press: C to change
                 Return to Continue
C
1.6

SECTION INDEX= 11  (Economiser   )    ELL(I) =    0.0000

          Press: C to change
                 Return to Continue
C
1.667
```

```
Longitudinal Pitch (Spacing in Flow Direction/
Tube Diameter) : ELL(i)
SECTION INDEX        SECTION NAME          ELL(I)
         1           Furnace               0.0000
         2           S.Heater III          1.3500
         3           S.Heater IV           0.0000
         4           R.Heater III          1.5000
         5           S.Heater V            0.0000
         6           R.Heater II           0.0000
         7           Drum/S.Wall           0.0000
         8           S.Heater II           1.6000
         9           R.Heater I            0.0000
        10           S.Heater I            0.0000
        11           Economiser            1.6670
        12           Air Preheater         0.0000

         Press: C to change
                Return to Continue


Lateral Pitch (Spacing Perpendicular to Flow
Direction/Tube Diameter) : EBB(i)
SECTION INDEX        SECTION NAME          EBB(I)
         1           Furnace               0.0000
         2           S.Heater III          0.0000
         3           S.Heater IV           0.0000
         4           R.Heater III          0.0000
         5           S.Heater V            0.0000
         6           R.Heater II           0.0000
         7           Drum/S.Wall           0.0000
         8           S.Heater II           0.0000
         9           R.Heater I            0.0000
        10           S.Heater I            0.0000
        11           Economiser            0.0000
        12           Air Preheater         0.0000

         Press: C to change
                Return to Continue
C

SECTION INDEX=  2  (S.Heater III )    EBB(I)=     0.0000

         Press: C to change
                Return to Continue
C
7.65

SECTION INDEX=  4  (R.Heater III )    EBB(I)=     0.0000

         Press: C to change
                Return to Continue
C
2.9

SECTION INDEX=  8  (S.Heater II  )    EBB(I)=     0.0000

         Press: C to change
                Return to Continue
C
1.69

SECTION INDEX= 11  (Economiser   )    EBB(I)=     0.0000

         Press: C to change
```

```
                Return to Continue
C
1.867

Lateral Pitch (Spacing Perpendicular to Flow
Direction/Tube Diameter) : EBB(i)
SECTION INDEX        SECTION NAME          EBB(I)
         1           Furnace               0.0000
         2           S.Heater III          7.6500
         3           S.Heater IV           0.0000
         4           R.Heater III          2.9000
         5           S.Heater V            0.0000
         6           R.Heater II           0.0000
         7           Drum/S.Wall           0.0000
         8           S.Heater II           1.6900
         9           R.Heater I            0.0000
        10           S.Heater I            0.0000
        11           Economiser            1.8670
        12           Air Preheater         0.0000

         Press: C to change
                Return to Continue


Air Temperature (K) into Preheater,  TAPHI:    0.0000

         Press: C to change
                Return to Continue
C
338.


COUPLING OF FURNACE OPERATIONAL DATA
------------------------------------
Press Return to continue

Status of furnace data file (BOILER.DAT)
-- To read data from an existing BOILER.DAT file,
   set IFNCE= 1; else set IFNCE= 0
-- Currently, IFNCE =  0

         Press: C to change
                Return to Continue
C
1

File BOILER.DAT has been read
Press Return to continue

Gas-side section number (JGSHB) from which gas-side heat
balance is calculated in the Boiler Performance Model (BPM)
-- Currently, JGSHB=  0

         Press: C to change
                Return to Continue
C
4

I-index (IEX) of the 2D zone which locates in front
of the gas-side section JGSHB
-- Currently, IEX=  0

         Press: C to change
                Return to Continue
```

```
C
16

In the following, you will map I-indices used in the furnace
code (2DHT) with those used in the Boiler Performance Model
Press Return to continue

                                                ZONE INDEX IN
  SECTION INDEX   SECTION NAME    S/W INDEX    THE 2DHT CODE
                                               Lower i,Upper i
        2         S.Heater III        6             0       0
        4         R.Heater III       11             0       0
        8         S.Heater II         4             0       0
       11         Economiser          1             0       0
       12         Air Preheater      12             0       0

For Information Only
-- set Lower i and Upper i to zero for all sections
   which don't overlap with the 2DHT zone arrangements

         Press: C to change
                Return to Continue
C

                                                ZONE INDEX IN
  SECTION INDEX   SECTION NAME    S/W INDEX    THE 2DHT CODE
                                               Lower i,Upper i
        2         S.Heater III        6             0       0

         Press: C to change
                Return to Continue
C

Enter lower i and upper i :
11 16

                                                ZONE INDEX IN
  SECTION INDEX   SECTION NAME    S/W INDEX    THE 2DHT CODE
                                               Lower i,Upper i
        1         Furnace             2             0       0
        2         S.Heater III        6            11      16
        3         S.Heater IV         0             0       0
        4         R.Heater III       11             0       0
        5         S.Heater V          0             0       0
        6         R.Heater II         0             0       0
        7         Drum/S.Wall         0             0       0
        8         S.Heater II         4             0       0
        9         R.Heater I          0             0       0
       10         S.Heater I          0             0       0
       11         Economiser          1             0       0
       12         Air Preheater      12             0       0

         Press: C to change
                Return to Continue


Inlet gas temperature (K) of the first section
(JGSHB =   4) :  1197.3700

         Press: C to change
                Return to Continue


Flue Gas Temperature Into Section 12 :      0.00
```

-- If you don't know the temperature, guess one
   (must be smaller than the temperature of a previous section)
-- Zero is not allowed

Press: C to change
Return to Continue

C
598.33

Flue Gas Temperature (K) into Each Boiler Section

SECTION INDEX	SECTION NAME	Flue Gas Temperature (K)
1	Furnace	400.0000
2	S.Heater III	1397.0500
3	S.Heater IV	1197.3700
4	R.Heater III	1197.3700
5	S.Heater V	1197.3700
6	R.Heater II	1197.3700
7	Drum/S.Wall	1197.3700
8	S.Heater II	997.6900
9	R.Heater I	997.6900
10	S.Heater I	997.6900
11	Economiser	798.0100
12	Air Preheater	598.3300

Note:
Default values were calculated by linear interpolation or extrapolation between inlet temperatures of section JGSHB and section 12

Heat Flux (kW) Distribution

SECTION INDEX	SECTION NAME	HEAT FLUX (kW)
1	Furnace	63457.262
2	S.Heater III	22788.689
3	S.Heater IV	0.000
4	R.Heater III	0.000
5	S.Heater V	0.000
6	R.Heater II	0.000
7	Drum/S.Wall	0.000
8	S.Heater II	0.000
9	R.Heater I	0.000
10	S.Heater I	0.000
11	Economiser	0.000
12	Air Preheater	0.000

Press: C to change
Return to Continue

Flue Gas Mass Flow Rate into Upper Furnace: 57.8488 Kg/s

Press: C to change
Return to Continue

Flue Gas Mass Flow Rate (KG/S)

SECTION INDEX	SECTION NAME	Flue Gas Mass Flow Rate (KG/S)
1	Furnace	57.8488
2	S.Heater III	57.8488
3	S.Heater IV	57.8488
4	R.Heater III	57.8488
5	S.Heater V	57.8488
6	R.Heater II	57.8488
7	Drum/S.Wall	57.8488
8	S.Heater II	57.8488

9	R.Heater I	57.8488
10	S.Heater I	57.8488
11	Economiser	57.8488
12	Air Preheater	57.8488

Press: C to change
Return to Continue

Flue Gas Composition, Volume Fraction Wet
CO2:0.1224 H2O:0.1348 N2:0.7306 O2:0.0122

Press: C to change
Return to Continue

Total Fuel Flow Rate (kg,wet/s), FMFUEL : 3.4903
-- Includes any reburn or co-firing fuels

Press: C to change
Return to Continue

Upper Heating Value (kJ/kg,wet), HUSW : 43277.3984
-- Includes the effect of any reburn or co-firing fuels

Press: C to change
Return to Continue

Lower Heating Value (kJ/kg,dry), HLOW : 41052.9609
-- Includes the effect of any reburn or co-firing fuels

Press: C to change
Return to Continue

Fuel Moisture (kg/kg,wet), PMOI : 0.0168
-- Includes the effect of any reburn or co-firing fuels

Press: C to change
Return to Continue

Net Furnace Heat Release (kW), FHR : 152426.0620

Press: C to change
Return to Continue

Air Flow Rate (kg,wet/s), FMAPH : 52.5703

Press: C to change
Return to Continue

Air Composition, in Volume Fraction Wet
CO2:0.0000 H2O:0.0156 N2:0.7776 O2:0.2067

Press: C to change
Return to Continue

Convergence Criterion for Boiler Heat Balance : 0.000000

```
 -- Defined as the maximum difference (K) in flue gas
    temperature at economiser outlet between two successive
    iterations

           Press: C to change
                  Return to Continue
C
0.0001

Convergence Criterion for Boiler Mass Balance :  0.000000
-- Defined as the maximum difference (kg/s) in steam mass
   flow at S.H. outlet between two successive iterations

           Press: C to change
                  Return to Continue
C
0.0001

Maximum Number of Iterations (or Sub-Iterations if NCASE=2)
for Boiler Heat Balance :    0

           Press: C to change
                  Return to Continue
C
5

Output Level of Boiler Efficiency Code (LOUTBO) :    0
Set LOUTBO= 1 for brief output
Set LOUTBO= 2 for detailed output

           Press: C to change
                  Return to Continue
C
1

Default output file name (from BPINPT code) : BPIN0201.075

           Press: C to change
                  Return to Continue


Default output file name (from BPM code) : BPOT0201.075

           Press: C to change
                  Return to Continue


NOTE:
-- Output file was saved as file BPIN0201.075
-- To update BPIN0201.075 further, you have to copy file BPIN0201.075
   to file BINPUT.DAT under DOS, then rerun BPINPT.EXE
-- If you want to save the original contents of file
   BINPUT.DAT, make sure you save it with a different name
```

Listing 3.15. Contents of file BPIN0201.075 (Case 2).

0201075.0 075BPOT0201.075

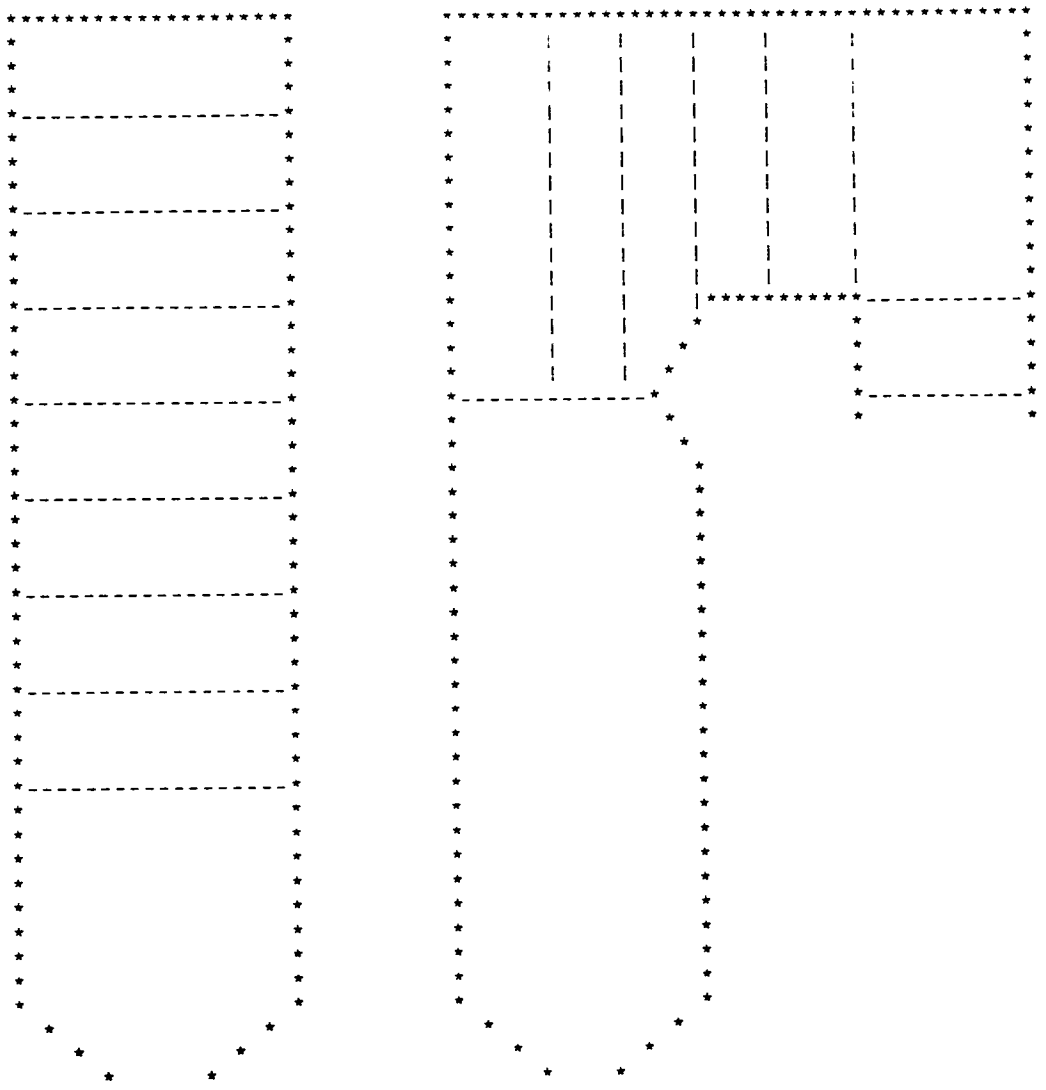
	1			
	2			
	0			
	1			
	16			
	12	4	0	
	2	6	7	11
	8	10	5	4
	9	3	1	12
	2	6	0	11
	0	0	0	4
	0	0	1	12
	8	7	6	11
	0	0		
	0	0	6	11
	0	0		
	0	1	0	2
	0	0	0	2
	0	0	2	2
	0	0	0	0
	0	0	0	0
	0	0	0	0
	0			
	0.0000			
	0.0000			
3.4903	41052.9609	0.0000		0.0000
43277.3984				
	0.0001	0.9830	0.0168	0.0001
152426.0620				
0.0000	0.0000	0.0000		0.0000
0.0000				
	57.8488	57.8488	57.8488	57.8488
	57.8488	57.8488	57.8488	57.8488
	57.8488	57.8488	57.8488	57.8488
	63457.262	22788.689	0.000	0.000
	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000
	0.1224	0.1348	0.7306	0.0122
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0156	0.7776	0.2067
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
	613.1500	489.1500	2.0238	13.5776
	1.8239	12.6656		
	793.1500	813.1500		
	4			
	0.0000	598.3300		
	400.0000	1397.0500	1197.3700	1197.3700
	1197.3700	1197.3700	1197.3700	997.6900
	997.6900	997.6900	798.0100	598.3300
	570.1500	732.1500	813.1500	613.1500
	813.1500	613.1500	732.1500	651.1500
	613.1500	651.1500	489.1500	0.0000
	651.1500	813.1500	813.1500	793.1500
	813.1500	613.1500	732.1500	732.1500
	613.1500	651.1500	570.1500	0.0000
	13.3496	12.8936	12.6656	2.0238
	12.6656	2.0238	12.8936	13.1216
	2.0238	13.1216	13.5776	0.0000
	13.1216	12.6656	12.6656	1.8239
	12.6656	2.0238	12.8936	12.8936
	2.0238	13.1216	13.3496	0.0000
	47.0000			
	47.0000	47.0000	47.0000	39.1322
	47.0000	39.1322	47.0000	47.0000
	39.1322	47.0000	47.0000	0.0000

```
0.0000    0.0000    0.0000  167.2300
0.0000    0.0000    0.0000  131.7400
0.0000    0.0000   61.6868    0.0000
0.0000    0.0350    0.0000    0.0350
0.0000    0.0000    0.0000    0.0350
0.0000    0.0000    0.0350    0.0000
0.0000  750.3500    0.0000 1090.0000
0.0000    0.0000    0.0000 2807.1599
0.0000    0.0000 1500.3800    1.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    5.4446
0.0000    0.0508    0.0000    0.0508
0.0000    0.0000    0.0000    0.0571
0.0000    0.0000    0.0381    0.0000
0.0000   53.1550    0.0000   40.4800
0.0000    0.0000    0.0000   30.7000
0.0000    0.0000   30.7000    0.0000
     1
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0035    0.0000    0.0029
0.0000    0.0000    0.0000    0.0048
0.0000    0.0000    0.0035    0.0000
0.8326
338.0000  538.0000   52.5703
  0.0000   57.8488
298.1500  489.1500  489.1500
  0.0000    0.0000  813.1500  793.1500
  0.0000    0.0000
     1
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    1.3500    0.0000    1.5000
0.0000    0.0000    0.0000    1.6000
0.0000    0.0000    1.6670    0.0000
0.0000    7.6500    0.0000    2.9000
0.0000    0.0000    0.0000    1.6900
0.0000    0.0000    1.8670    0.0000
0.0050
     0        11         0         0
     0         0         0         0
     0         0         0         0
     0        16         0         0
     0         0         0         0
     0         0         0         0
     5         0         0
0.000100  0.000100  0.000000  0.000000
     1         0
```

Listing 3.16. Contents of file BPOT0201.075 (Case 2).

OUTPUTS FROM BOILER PERFORMANCE MODEL (BPM)

Output File Name: BPOT0201.075



1 2

ITERB= 1 Error of boil. heat balance: -10403. kW
Rel. error of heat balance : -7.9524 %

ITERB= 2 Error of boil. heat balance: 266. kW
Rel. error of heat balance : 0.2038 %

ITERB= 3 Error of boil. heat balance: 6. kW
Rel. error of heat balance : 0.0047 %

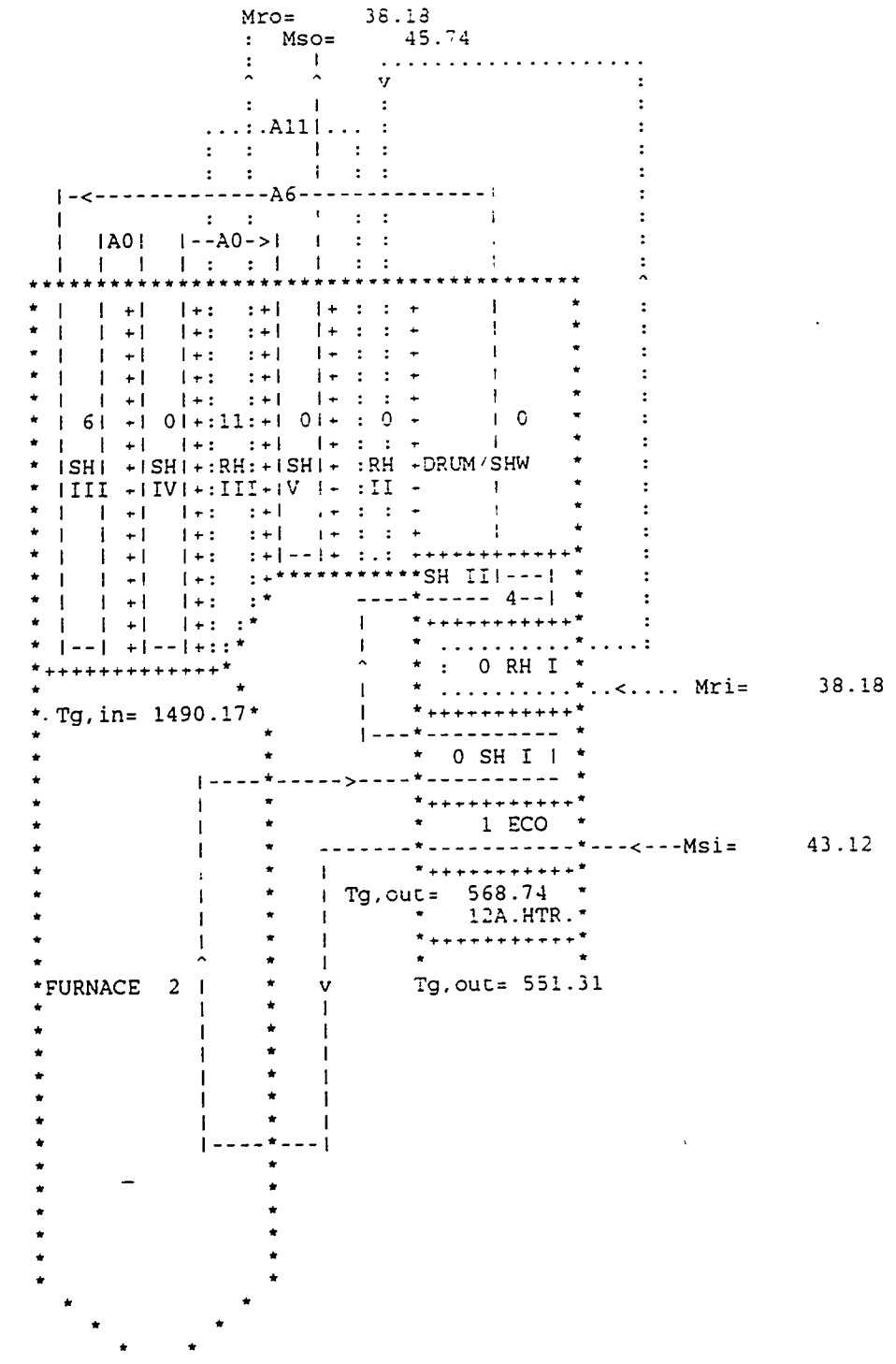
ITERB= 4 Error of boil. heat balance: 0. kW
Rel. error of heat balance : 0.0001 %

ITERB= 5 Error of boil. heat balance: 0. kW

Rel. error of heat balance : 0.0000 %

ITERB= 5 Error of boil. heat balance: 0. KW
Rel. error of heat balance : 0.0000 %

THIS IS TYPE 2 BOILER CONFIGURATION



2

Chapter 4

4.0 CASE 3 FILES

This chapter documents all the input and output files associated with the execution of the Case 3 example as defined in Chapter 1. Case 3 example demonstrates model set-up using the 2DINPT code for a contiunation run. The results obtained from the 2DHT code were also recorded. Although this case includes gaseous-fuel reburning applications, the RBINPT and the RBNOX codes were not exercised as their use have already been demonstrated in Case 2. The user may refer to Figure 1.1 for the 2D boiler zone-arrangement. Files included in this chapter are as follows:

- The record of the 2DINPT interactive sessions (Listing 4.1). --- This record shows the procedures of updatinging an input data file (i.e., file 2DIN0201.075), step-by-step, for a "continuation" run. The input file prepared for the 2DHT code has a file name as 2DIN0301.075. Note that the boiler's deposit thickness/thermal conductivity ratios on the upper furnace-walls were changed, to reflect the assumption of "dirtier" walls. The boiler flow field was assumed to be the same as the flow of the Case 2 example, hence, the forward and the recirculating data files (FORWA.DAT and RECIR.DAT) are not shown here. The input array file specified for this case is IARR0301.075, which actually is an exact copy of the output array file OARR0201.075 generated by the Case 2 example. Note also that in order to read the input array file specified, the parameter value of NREAD was set to 1.

- The contents of the file 2DIN0301.075 (Listing 4.2).

- The contents of the computer-terminal output (Listing 4.3). --- This was the outputs directed to the computer terminal screen, showing the progress of the 2DHT code execution.

- The contents of file 2DOT0301.075 (Listing 4.4). --- File 2DOT0301.075 was created upon completion of the 2DHT furnace-code execution. This file contains the predicted boiler thermal-performance information.

- The contents of file BOILER.DAT (Listing 4.5). --- Again, this file was created upon completion of the 2DHT code execution, and may be used for later boiler performance predictions by executing the BPM code. The user is suggested to save this file under a different name (e.g., BOIL0301.075) if he wishes to reproduce the results of this case, as this file will be over-written every time the 2DHT code is executed. This case example does not include the demonstration of the BPM code execution. The user should refer to Case 2 example if he is interested in running the BPM code for this case.

- The contents of the file REBURN.DAT (Listing 4.6).

Listing 4.1. Record of 2DINPT interactive session (Case 3).

```
2DINPT


-- This is an interactive program (2DINPT) to create
   or update a data file which is required to run the
   EER two-dimensional heat transfer code (2DHT).
-- Version 1.70, May, 1992


************************ Attention *********************
 This interactive program accepts inputs from keyboard
 in UPPER case only.
 -- Please set your keyboard to the UPPER case symbols
    (i.e., Caps Lock !).
 -- To continue, type C and press Return (or Enter).
*****************************************************

C

STATUS OF INPUT FILE:
---------------------
To Create an input file, Press: C
To Update an input file,        Return

You chose to update an existing input file.

NOTE:
-- To update an existing file, you have to copy the
   existing file to file "INPUT.DAT" under DOS before you
   execute this input code.

To continue, press Return


 Chapter 1 :
-------------
INPUT/OUTPUT SPECIFICATIONS AND PARAMETERS WHICH
CONTROL THE EXTENT OF NUMERICAL CALCULATIONS

         Press: P to by-pass this chapter
                Return to proceed through

Specify the name (BOLNAM) of the boiler:  BOILER 1
-- Maximum characters allowed: 24
-- Characters can be alphabetic or numeric

         Press: C to change
                Return to continue

Specify a two-digit case number (NRCS) for
current run (e.g., 01, 02, or 03):   02
-- Case number can be used to distinguish the boiler operating
   conditions, or parametric parameters being studied

         Press: C to change
                Return to continue  C
03

Specify a two-digit version number (NRVS) for
current run (e.g., 01, 02, or 03):   01
-- Version number can be used to further document cases run
   under the same case number as specified above
```

```
         Press: C to change
                Return to continue

Specify boiler load (CLOAD) for current run:    75.0
-- Boiler load may be described as 60.5, 90.0, or 100.0,
   to show the % of current load relative to the boiler MCR

         Press: C to change
                Return to continue

Name of output file (FINPT) from this program:   2DIN0201.075
-- Default file name is 2DINcsvs.LLL
-- csvs represents the case number and the version numbers
-- LLL shows the boiler load percentage

         Press: D for default values
                C to change
                Return to continue  D

Name of input array file (FINPTAR):   IARR0201.075
-- The default name has format as IARRcsvs.LLL
-- IARR denotes "input array" for the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output array file (FINPTAR):   OARR0201.075
-- The default name has format as OARRcsvs.LLL
-- OARR denotes "output array" from the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output file (FHDOPT) from the 2DHT code:   2DOT0201.075
-- The default name has format as 2DOTcsvs.LLL
-- 2DOT denotes "output file" from the 2DHT code

         Press: D for the default file name
                C to change the file name
                B to direct the file to your monitor
                Return to continue  D

Specification of output level (LOUTPUT) :
Current output level is DEFAULT.
-- DEFAULT setting is most useful and recommended.
-- In addition to the default setting, you can choose from
   four other output levels : 1, 2, 3, and 4.
-- Higher output levels give more comprehehsive information.

         Press: D for default values
                C to change
                Return to continue

You can include your comments on the front page
of the printout :
-- Comment block may consist of 10 lines
-- Each line may have a max. of 78 characters
To continue, press Return

Current comments are:
UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
GAS REBURNING
```

```
" Line  3 is blank "
" Line  4 is blank "
" Line  5 is blank "
" Line  6 is blank "
" Line  7 is blank "
" Line  8 is blank "
" Line  9 is blank "
" Line 10 is blank "

         Press: C to change
                Return to continue  C

UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH

         Press: C to change
                Return to continue

GAS REBURNING

         Press: C to change
                Return to continue

" Line  3 is blank "

         Press: C to change
                Return to continue  C
CHANGING K / DELTA S TO SHOW HOW TO CONDUCT CONTINUATION RUN FROM

" Line  4 is blank "

         Press: C to change
                Return to continue  C
CASE 2 (2DIN0201.075)

" Line  5 is blank "

         Press: C to change
                Return to continue

" Line  6 is blank "

         Press: C to change
                Return to continue

" Line  7 is blank "

         Press: C to change
                Return to continue

" Line  8 is blank "

         Press: C to change
                Return to continue

" Line  9 is blank "

         Press: C to change
                Return to continue

" Line 10 is blank "

         Press: C to change
                Return to continue
```

```
Maximum number of iterations for this run
NIMAX=100
-- During the test phase, set NIMAX =1
-- For production runs, use NIMAX values between 30 and 100

         Press: C to change
                Return to continue

Number of iterations at which the averaging procedure
is initialized to smooth-out the Monte Carlo effects :
NITACC= 71
-- For runs without averaging, set NITACC = NIMAX.
-- For complete averaging, set NITACC =1.
-- For typical runs, set NITACC = NIMAX - 30.

         Press: C to change
                Return to continue

Number of sub-iterations for fixed carbon mass
balances per iteration of total heat balance :
NIMX=  1
-- During test phase, set NIMX=1
-- For coal combustion, set NIMX between 5 and 10
-- For gaseous and oil fuels, set NIMX=1

         Press: C to change
                Return to continue

(a) Number of divisions on the largest linear dimension
    of volume zones: NMAX= 2
(b) Divisions of polar angle: NPHI= 4
(c) Cut-off value for beam tracking: EXACT=0.000100
Default values are: NMAX  = 2
                    NPHI  = 4
                    EXACT = 0.0001
NMAX and NPHI must be even numbers

         Press: D for default values
                C to change
                Return to continue

Number of iterations after which field variables
of total heat balances are printed :
NPRIN= 100
-- Default value is NPRIN=NIMAX (recommended)

         Press: D for default values
                C to change
                Return to continue

Switches to print detailed outputs of:
-- total energy balance for volume and surface zones
-- mass balance for volume zones
Currently, switches are set to print the above information.

         Enter: C to change
                Return to continue

Switches to write or read files to/from hard disk :
NWRTE: Switch to save data file at the end of the 2DHT run
       Currently, NWRTE= 1
NREAD: Switch to read variable values from a restarting
       file at the beginning of the 2DHT run
       Currently, NREAD= 0
```

```
-- For trial runs     , set NWRTE=1 and NREAD=0.
-- For continued runs, set NWRTE=1 and NREAD=1.

         Press: C to change
                Return to continue  C
1 1

NWRTE= 1, NREAD= 1, Are these values O.K. ?

         Press: C to change
                Return to continue

 Chapter 2 :
-------------
BOILER FURNACE OPERATING DATA

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 3 :
-------------
INITIAL PARTICLE SIZE DISTRIBUTION

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 4 :
-------------
PARAMETERS FOR CHAR AND VOLATILE BURN-OUT

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 5 :
-------------
PARAMETERS FOR ASH REACTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 7 :
-------------
SPECIFICATION OF FURNACE MODEL GEOMETRY

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 8 :
-------------
PARAMETERS FOR REBURNING OR CO-FIRING

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 9 :
-------------
SPECIFICATION OF HEAT EXTRACTIONS
```

```
         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 11 :
--------------
RELATIVE MASS FLOW RATE DISTRIBUTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 12 :
--------------
PRESCRIPTION OF RECIRCULATING FLOW FIELD

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 13 :
--------------
PRESCRIPTION OF TURBULENT MASS FLUX VECTORS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 14 :
--------------
FUEL INLET FLOWS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 15 :
--------------
DATA FOR INITIAL VOLUME AND SURFACE ZONE TEMPERATURES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 16 :
--------------
DATA FOR EMISSIVITIES AND DEPOSIT CONDUCTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through


--- Specification of Surface Zone Emissivities ---

         Press: P to by-pass this subsection
                Return to proceed through  P


--- Specification of Surface Emissivity for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through  P
```

```
--- Specification of Deposit Conductivity/Thickness Ratios ---

         Press: P to by-pass this subsection
                Return to proceed through

Deposit thermal-conductivity/thickness ratios
CS(*,*) for surface zones in kw/m**2 K :
-- Default values for non-outlet zones are: 0.4, 0.8 and 1.0
   for coal, oil and gas fired furnaces, respectively
-- Default values for outlet zones are 0.0

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  C

Uniform value of deposit thermal conductivity to
thickness ratios CS(*,*) : 0.8

Deposit thermal conductivity to thickness ratios
CS(*,1) in kw/m**2 K :
 0.8000  0.8000  0.8000  0.8000

         Press: C to change
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,3) in kw/m**2 K :
 0.0000  0.0000  0.8000  0.8000

         Press: C to change
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,2) in kw/m**2 K :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,4) in kw/m**2 K :
 0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000
 0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000  0.8000

         Press: C to change
                Return to continue

         Press: C to check surface-zone CS(*,*) values one more time
                Return to continue without checking


--- Specification of Deposit Conductivity/Thickness Ratios for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through

Deposit thermal conductivity/thickness ratios
for furnace outlet surfaces
-- Default is CS(*,*)= 0.0 (recommended)

         Press: D for default values
                C to change
```

```
                Return to continue

NOTE:
-- Output file was saved as file 2DIN0301.075
-- To update 2DIN0301.075 further, you have to copy file 2DIN0301.075
   to file INPUT.DAT under DOS, then rerun 2DINPT.EXE
-- If you want to save the original contents of file
   INPUT.DAT, make sure you save it with a different name
```

Listing 4.2. Contents of file 2DIN0301.075 (Case 3).

```
BOILER 1
03
01
75.0    075
2DIN0301.075
IARR0301.075
OARR0301.075
GRAF
2DOT0301.075
   4   1
c UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
c GAS REBURNING
c CHANGING K / DELTA S TO SHOW HOW TO CONDUCT CONTINUATION RUN FROM
c CASE 2 (2DIN0201.075)
c
c
c
c
c
c
 100
    09999.000009999.00000
  71
   1
   2   40.000100
 100
   0
   1   1
   1   1
   0
   0   1   0
  0.0001  0.9798  0.0200  0.0001
  0.8603  0.1174  0.0061  0.0061  0.0100  0.0001
525.000000  0.000000  0.000000
  0.0000
 42133.2
  2.9393
  376.15
  2.0781
   52.5703
  0.0000
  0.0000
 50.0000  0.0317
  493.15
  0.0000     0.0
  0.0147
  611.10
 0.0000167 0.0000233 0.0000300 0.0000367 0.0000433 0.0000500 0.0000567 0.0000633
 0.0000700 0.0000767
  0.0130  0.0567  0.1542  0.2110  0.1981  0.1510  0.0974  0.0617  0.0471  0.0098
   1050.52    690.00
 179000.00  61000.00      1.00
 13.6364  545.45
  0.2218   8420.
  0.2000
  0.300000  0.300000  0.002917  0.002917
   0
   0   1   0   0
    0.0000
   0    0.000000-  0.000000   74.094742    0.000000    0.000000
    0.000000    0.000000    0.000000    0.000000
   5
0.00000000000.00000000000.00000000000.00000000000.0000000000
  0.000000  0.000000  0.000000  0.000000  0.000000
    0.00    0.00    0.00    0.00    0.00
    0.00    0.00    0.00
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
  0
0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
0.0000000 0.0000000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.0000
  0
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000000
0.1000000
 19   4
  1  10  19
   0.0000  0.0000
 0.0000
   0.00
  0
 1.9760  1.9759  1.9200  1.8000  1.1500  1.8000  1.3851  1.3851  1.5851  1.2621
 1.3601  1.3601  1.3601  1.3601  1.6430  1.6430  1.7361  1.7361  2.3079
 1.1534  1.1534  1.2514  0.4879
  1   1   2   3
 19  19  14   9
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  2   3   4   4   4   4   4   4   4   3   3   3   3   3   2   2   2   2   2
  1   0   1
 1.7882  573.15
 0.5510
 298.15
 2.1580
44302.7
 0.0000
 0.930000  0.020000  0.020000  0.000000  0.005000  0.000000  0.025000  0.000000
 0.000000  0.000000  0.000000
0.0000000 0.0000000
 0.4378   1580.
 0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  1.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0   0
300.00000   0.00000   0.00000
  0.00000   0.00000   0.00000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  2.4646
 3.8887  3.8887  0.0000  0.0000  9.2101  9.2101 11.4566 11.4566  2.9108
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.5925  2.5925  0.0000  0.0000  5.5261  5.5261  7.6377  7.6377  1.9405
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.1146  2.1146  2.1148  2.1148  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  800.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00  800.00  800.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.7000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.7000  0.7000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.8000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.4000  0.4000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
 0    0     0    0     0    0     0    0     0    1     3    3     1    1     7    7     9    9     2
 0    0     0    0     0    0     0    0     0   24    21   21    21   21    22   22    24   24    30
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0508
0.0508    0.0508    0.0508    0.0508    0.0508    0.0508    0.0508    0.0508    0.0508
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.5402
1.0497    1.0497    3.1495    3.1495    0.2867    0.2867    0.2303    0.2303    0.9333
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.9660
0.7844    0.7844    0.7844    0.7844    0.6802    0.6802    0.7022    0.7022    0.6603
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0200
0.0200    0.0200    0.0200    0.0200    0.0200    0.0200    0.0500    0.0500    0.0500
  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00    720.00
720.00    720.00    720.00    720.00    786.39    786.39    765.56    765.56    765.56
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000
1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000    1.0000
 0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
0.0000    0.0000    0.0000    0.0000
0.0000    0.2466    0.0000    0.0000
0.0000    0.0000    0.3288    0.0000
0.0000    0.0000    0.1403    0.1063
0.0166    0.0498    0.1851    0.1172
0.0415    0.1246    0.3225    0.1866
0.0664    0.1993    0.5768    0.3447
0.0697    0.2091    0.5564    0.2813
0.0697    0.2091    0.4705    0.2378
0.1051    0.3152    0.5797    0.0000
0.1051    0.3152    0.5797    0.0000
0.1051    0.3152    0.5797    0.0000
0.1051    0.3152    0.5797    0.0000
0.1051    0.3152    0.5797    0.0000
0.2500    0.7500    0.0000    0.0000
0.4500    0.7500    0.0000    0.0000
0.2500    0.7500    0.0000    0.0000
0.2500    0.7500    0.0000    0.0000
0.2500    0.7500    0.0000    0.0000
0.2500    0.7500    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.2466    0.0000    0.0000    0.0000
0.1096    0.2192    0.0000    0.0000
0.0822    0.1644    0.0000    0.0000
0.0548    0.1095    0.0000    0.0000
0.0548    0.1095    0.0000    0.0000
0.1233    0.2465    0.0000    0.0000
0.0647    0.1940    0.0000    0.0000
0.0323    0.0970    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.2000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.2466    0.0000    0.0000    0.0000    0.0000    0.0685    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.2000    0.0000    0.0000    0.0000
0.0000    0.3288    0.0000    0.0000    0.0000    0.2055    0.0000    0.0000    0.0000    0.0000
```

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.1063	0.0000	0.0000	0.0886	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.1370	0.0274	0.0440	0.0249	0.0249	0.0619	0.0324	0.0677	0.0000
0.0000	0.0000	0.0000	0.1449	0.2000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0822	0.1487	0.0996	0.0996	0.1242	0.1294	0.2708	0.0000
0.0000	0.0000	0.0000	0.5797	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.1936	0.2370	0.2370	0.1039	0.0434	0.3800	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.2044	0.3065	0.3065	0.0404	0.0000	0.1422	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	-0.2500	-0.3750	-0.3750	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	
1.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
1600.00	1600.00	1600.00	1600.00	1.00	1.00	1.00	1.00	1.00	
1.00	1.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
350.00	1200.00	1200.00	1200.00						
800.00	800.00	1200.00	1200.00						
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00
1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	
1.0000	0.7000	0.7000	0.7000						
1.0000	1.0000	0.7000	0.7000						
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	
0.8000	0.8000	0.8000	0.8000						
0.0000	0.0000	0.8000	0.8000						
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000
0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	0.8000	
100.00	100.00								

Listing 4.3. Screen output from the 2DHT code (Case 3).

2DHT

```
iter.no.=  1, act.err.=   3.449 %, avg.err.=   3.449 %, 20 it.err.=   3.449 %,
              hb. err.=  -1.841 %
iter.no.=  2, act.err.=   1.217 %, avg.err.=   2.333 %, 20 it.err.=   2.333 %,
              hb. err.=  -0.366 %
iter.no.=  3, act.err.=   0.315 %, avg.err.=   1.660 %, 20 it.err.=   1.660 %,
              hb. err.=  -0.733 %
iter.no.=  4, act.err.=   0.789 %, avg.err.=   1.442 %, 20 it.err.=   1.442 %,
              hb. err.=  -0.227 %
iter.no.=  5, act.err.=  -0.547 %, avg.err.=   1.044 %, 20 it.err.=   1.044 %,
              hb. err.=   0.481 %
iter.no.=  6, act.err.=  -0.078 %, avg.err.=   0.857 %, 20 it.err.=   0.857 %,
              hb. err.=   0.513 %
iter.no.=  7, act.err.=  -0.073 %, avg.err.=   0.724 %, 20 it.err.=   0.724 %,
              hb. err.=  -0.453 %
iter.no.=  8, act.err.=   1.989 %, avg.err.=   0.882 %, 20 it.err.=   0.882 %,
              hb. err.=  -0.722 %
iter.no.=  9, act.err.=  -0.359 %, avg.err.=   0.744 %, 20 it.err.=   0.744 %,
              hb. err.=   0.408 %
iter.no.= 10, act.err.=  -2.217 %, avg.err.=   0.448 %, 20 it.err.=   0.448 %,
              hb. err.=   0.607 %
iter.no.= 11, act.err.=  -0.896 %, avg.err.=   0.326 %, 20 it.err.=   0.326 %,
              hb. err.=   0.112 %
iter.no.= 12, act.err.=   0.768 %, avg.err.=   0.363 %, 20 it.err.=   0.363 %,
              hb. err.=  -0.248 %
iter.no.= 13, act.err.=  -0.680 %, avg.err.=   0.283 %, 20 it.err.=   0.283 %,
              hb. err.=   0.610 %
iter.no.= 14, act.err.=   0.491 %, avg.err.=   0.298 %, 20 it.err.=   0.298 %,
              hb. err.=  -0.071 %
iter.no.= 15, act.err.=   0.550 %, avg.err.=   0.314 %, 20 it.err.=   0.314 %,
              hb. err.=  -0.530 %
iter.no.= 16, act.err.=  -0.229 %, avg.err.=   0.280 %, 20 it.err.=   0.280 %,
              hb. err.=  -0.139 %
iter.no.= 17, act.err.=  -0.303 %, avg.err.=   0.246 %, 20 it.err.=   0.246 %,
              hb. err.=   0.197 %
iter.no.= 18, act.err.=   0.549 %, avg.err.=   0.263 %, 20 it.err.=   0.263 %,
              hb. err.=  -0.388 %
iter.no.= 19, act.err.=  -0.818 %, avg.err.=   0.206 %, 20 it.err.=   0.206 %,
              hb. err.=   1.000 %
iter.no.= 20, act.err.=  -0.878 %, avg.err.=   0.152 %, 20 it.err.=   0.152 %,
              hb. err.=  -0.034 %
iter.no.= 21, act.err.=   0.470 %, avg.err.=   0.167 %, 20 it.err.=   0.003 %,
              hb. err.=  -0.233 %
iter.no.= 22, act.err.=   1.326 %, avg.err.=   0.220 %, 20 it.err.=   0.008 %,
              hb. err.=  -0.299 %
iter.no.= 23, act.err.=  -0.081 %, avg.err.=   0.207 %, 20 it.err.=  -0.011 %,
              hb. err.=   0.387 %
iter.no.= 24, act.err.=   0.870 %, avg.err.=   0.234 %, 20 it.err.=  -0.007 %,
              hb. err.=   0.021 %
iter.no.= 25, act.err.=  -1.247 %, avg.err.=   0.175 %, 20 it.err.=  -0.042 %,
              hb. err.=   0.484 %
iter.no.= 26, act.err.=  -1.471 %, avg.err.=   0.112 %, 20 it.err.=  -0.112 %,
              hb. err.=   0.709 %
iter.no.= 27, act.err.=  -1.555 %, avg.err.=   0.050 %, 20 it.err.=  -0.186 %,
              hb. err.=   0.451 %
iter.no.= 28, act.err.=   0.919 %, avg.err.=   0.081 %, 20 it.err.=  -0.240 %,
              hb. err.=  -0.745 %
iter.no.= 29, act.err.=   0.163 %, avg.err.=   0.084 %, 20 it.err.=  -0.213 %,
              hb. err.=  -0.388 %
iter.no.= 30, act.err.=   1.320 %, avg.err.=   0.125 %, 20 it.err.=  -0.037 %,
              hb. err.=  -0.723 %
iter.no.= 31, act.err.=   0.213 %, avg.err.=   0.128 %, 20 it.err.=   0.019 %,
              hb. err.=   0.358 %
iter.no.= 32, act.err.=  -0.005 %, avg.err.=   0.124 %, 20 it.err.=  -0.020 %,
              hb. err.=  -0.242 %
iter.no.= 33, act.err.=   1.103 %, avg.err.=   0.153 %, 20 it.err.=   0.069 %,
              hb. err.=  -0.284 %
iter.no.= 34, act.err.=  -1.373 %, avg.err.=   0.109 %, 20 it.err.=  -0.024 %,
              hb. err.=   0.519 %
iter.no.= 35, act.err.=  -0.187 %, avg.err.=   0.100 %, 20 it.err.=  -0.061 %,
              hb. err.=   0.399 %
```

```
iter.no.= 36, act.err.=  -0.792 %, avg.err.=   0.075 %, 20 it.err.=  -0.089 %,
              hb. err.=  -0.004 %
iter.no.= 37, act.err.=   0.457 %, avg.err.=   0.086 %, 20 it.err.=  -0.051 %,
              hb. err.=  -0.068 %
iter.no.= 38, act.err.=  -0.759 %, avg.err.=   0.063 %, 20 it.err.=  -0.116 %,
              hb. err.=   0.549 %
iter.no.= 39, act.err.=   0.244 %, avg.err.=   0.068 %, 20 it.err.=  -0.063 %,
              hb. err.=  -0.049 %
iter.no.= 40, act.err.=   0.231 %, avg.err.=   0.072 %, 20 it.err.=  -0.008 %,
              hb. err.=  -0.229 %
iter.no.= 41, act.err.=  -0.280 %, avg.err.=   0.064 %, 20 it.err.=  -0.045 %,
              hb. err.=   0.211 %
iter.no.= 42, act.err.=   0.719 %, avg.err.=   0.079 %, 20 it.err.=  -0.075 %,
              hb. err.=  -0.141 %
iter.no.= 43, act.err.=  -0.629 %, avg.err.=   0.063 %, 20 it.err.=  -0.103 %,
              hb. err.=   0.551 %
iter.no.= 44, act.err.=  -1.519 %, avg.err.=   0.027 %, 20 it.err.=  -0.222 %,
              hb. err.=   0.539 %
iter.no.= 45, act.err.=   0.750 %, avg.err.=   0.043 %, 20 it.err.=  -0.122 %,
              hb. err.=  -0.150 %
iter.no.= 46, act.err.=   1.112 %, avg.err.=   0.066 %, 20 it.err.=   0.007 %,
              hb. err.=  -0.051 %
iter.no.= 47, act.err.=  -3.017 %, avg.err.=   0.000 %, 20 it.err.=  -0.066 %,
              hb. err.=   0.804 %
iter.no.= 48, act.err.=   1.109 %, avg.err.=   0.024 %, 20 it.err.=  -0.057 %,
              hb. err.=  -0.545 %
iter.no.= 49, act.err.=  -0.335 %, avg.err.=   0.016 %, 20 it.err.=  -0.082 %,
              hb. err.=   0.144 %
iter.no.= 50, act.err.=  -1.346 %, avg.err.=  -0.011 %, 20 it.err.=  -0.215 %,
              hb. err.=   0.506 %
iter.no.= 51, act.err.=   0.736 %, avg.err.=   0.004 %, 20 it.err.=  -0.189 %,
              hb. err.=   0.068 %
iter.no.= 52, act.err.=   1.693 %, avg.err.=   0.036 %, 20 it.err.=  -0.104 %,
              hb. err.=  -0.745 %
iter.no.= 53, act.err.=  -0.276 %, avg.err.=   0.030 %, 20 it.err.=  -0.173 %,
              hb. err.=   0.581 %
iter.no.= 54, act.err.=  -1.721 %, avg.err.=  -0.002 %, 20 it.err.=  -0.190 %,
              hb. err.=   0.364 %
iter.no.= 55, act.err.=  -0.596 %, avg.err.=  -0.013 %, 20 it.err.=  -0.211 %,
              hb. err.=  -0.411 %
iter.no.= 56, act.err.=  -0.759 %, avg.err.=  -0.026 %, 20 it.err.=  -0.209 %,
              hb. err.=  -0.120 %
iter.no.= 57, act.err.=  -0.223 %, avg.err.=  -0.030 %, 20 it.err.=  -0.243 %,
              hb. err.=  -0.072 %
iter.no.= 58, act.err.=   0.302 %, avg.err.=  -0.024 %, 20 it.err.=  -0.190 %,
              hb. err.=  -0.088 %
iter.no.= 59, act.err.=  -0.016 %, avg.err.=  -0.024 %, 20 it.err.=  -0.203 %,
              hb. err.=   0.807 %
iter.no.= 60, act.err.=  -0.461 %, avg.err.=  -0.031 %, 20 it.err.=  -0.238 %,
              hb. err.=   0.012 %
iter.no.= 61, act.err.=   0.364 %, avg.err.=  -0.025 %, 20 it.err.=  -0.206 %,
              hb. err.=  -0.057 %
iter.no.= 62, act.err.=   1.719 %, avg.err.=   0.003 %, 20 it.err.=  -0.156 %,
              hb. err.=  -1.026 %
iter.no.= 63, act.err.=  -1.585 %, avg.err.=  -0.022 %, 20 it.err.=  -0.203 %,
              hb. err.=   0.837 %
iter.no.= 64, act.err.=   0.586 %, avg.err.=  -0.012 %, 20 it.err.=  -0.098 %,
              hb. err.=   0.250 %
iter.no.= 65, act.err.=   0.458 %, avg.err.=  -0.005 %, 20 it.err.=  -0.113 %,
              hb. err.=  -0.036 %
iter.no.= 66, act.err.=   0.130 %, avg.err.=  -0.003 %, 20 it.err.=  -0.162 %,
              hb. err.=  -0.079 %
iter.no.= 67, act.err.=  -0.263 %, avg.err.=  -0.007 %, 20 it.err.=  -0.024 %,
              hb. err.=  -0.269 %
iter.no.= 68, act.err.=  -2.020 %, avg.err.=  -0.037 %, 20 it.err.=  -0.181 %,
              hb. err.=   0.824 %
iter.no.= 69, act.err.=   0.095 %, avg.err.=  -0.035 %, 20 it.err.=  -0.159 %,
              hb. err.=   0.106 %
iter.no.= 70, act.err.=   0.929 %, avg.err.=  -0.021 %, 20 it.err.=  -0.045 %,
              hb. err.=   0.278 %
iter.no.= 71, act.err.=  -0.135 %, avg.err.=  -0.022 %, 20 it.err.=  -0.089 %,
              hb. err.=   0.120 %
```

```
iter.no.= 72, act.err.=  -0.668 %, avg.err.=  -0.031 %, 20 it.err.=  -0.207 %,
              hb. err.=   0.132 %
iter.no.= 73, act.err.=  -0.777 %, avg.err.=  -0.042 %, 20 it.err.=  -0.232 %,
              hb. err.=  -0.495 %
iter.no.= 74, act.err.=   0.402 %, avg.err.=  -0.036 %, 20 it.err.=  -0.126 %,
              hb. err.=   0.388 %
iter.no.= 75, act.err.=  -0.102 %, avg.err.=  -0.037 %, 20 it.err.=  -0.101 %,
              hb. err.=  -0.169 %
iter.no.= 76, act.err.=  -0.245 %, avg.err.=  -0.039 %, 20 it.err.=  -0.076 %,
              hb. err.=  -0.072 %
iter.no.= 77, act.err.=   0.019 %, avg.err.=  -0.039 %, 20 it.err.=  -0.064 %,
              hb. err.=  -0.052 %
iter.no.= 78, act.err.=   0.975 %, avg.err.=  -0.026 %, 20 it.err.=  -0.030 %,
              hb. err.=   0.566 %
iter.no.= 79, act.err.=  -1.425 %, avg.err.=  -0.043 %, 20 it.err.=  -0.100 %,
              hb. err.=  -0.860 %
iter.no.= 80, act.err.=   1.194 %, avg.err.=  -0.028 %, 20 it.err.=  -0.018 %,
              hb. err.=   0.871 %
iter.no.= 81, act.err.=  -1.036 %, avg.err.=  -0.040 %, 20 it.err.=  -0.088 %,
              hb. err.=  -0.473 %
iter.no.= 82, act.err.=  -0.370 %, avg.err.=  -0.044 %, 20 it.err.=  -0.192 %,
              hb. err.=  -0.100 %
iter.no.= 83, act.err.=   0.514 %, avg.err.=  -0.038 %, 20 it.err.=  -0.087 %,
              hb. err.=   0.437 %
iter.no.= 84, act.err.=   0.269 %, avg.err.=  -0.034 %, 20 it.err.=  -0.105 %,
              hb. err.=   0.326 %
iter.no.= 85, act.err.=  -1.017 %, avg.err.=  -0.046 %, 20 it.err.=  -0.177 %,
              hb. err.=  -0.597 %
iter.no.= 86, act.err.=   0.344 %, avg.err.=  -0.041 %, 20 it.err.=  -0.166 %,
              hb. err.=   0.438 %
iter.no.= 87, act.err.=  -0.761 %, avg.err.=  -0.049 %, 20 it.err.=  -0.191 %,
              hb. err.=  -0.331 %
iter.no.= 88, act.err.=   0.334 %, avg.err.=  -0.045 %, 20 it.err.=  -0.073 %,
              hb. err.=   0.397 %
iter.no.= 89, act.err.=  -0.831 %, avg.err.=  -0.054 %, 20 it.err.=  -0.119 %,
              hb. err.=  -0.374 %
iter.no.= 90, act.err.=   0.381 %, avg.err.=  -0.049 %, 20 it.err.=  -0.147 %,
              hb. err.=   0.477 %
iter.no.= 91, act.err.=  -0.991 %, avg.err.=  -0.059 %, 20 it.err.=  -0.190 %,
              hb. err.=  -0.463 %
iter.no.= 92, act.err.=   0.399 %, avg.err.=  -0.054 %, 20 it.err.=  -0.136 %,
              hb. err.=   0.436 %
iter.no.= 93, act.err.=  -0.284 %, avg.err.=  -0.057 %, 20 it.err.=  -0.111 %,
              hb. err.=  -0.069 %
iter.no.= 94, act.err.=  -0.401 %, avg.err.=  -0.060 %, 20 it.err.=  -0.152 %,
              hb. err.=  -0.136 %
iter.no.= 95, act.err.=  -0.767 %, avg.err.=  -0.068 %, 20 it.err.=  -0.185 %,
              hb. err.=  -0.477 %
iter.no.= 96, act.err.=   1.303 %, avg.err.=  -0.053 %, 20 it.err.=  -0.107 %,
              hb. err.=   0.905 %
iter.no.= 97, act.err.=  -0.405 %, avg.err.=  -0.057 %, 20 it.err.=  -0.129 %,
              hb. err.=  -0.219 %
iter.no.= 98, act.err.=  -0.634 %, avg.err.=  -0.063 %, 20 it.err.=  -0.209 %,
              hb. err.=  -0.395 %
iter.no.= 99, act.err.=   0.151 %, avg.err.=  -0.061 %, 20 it.err.=  -0.130 %,
              hb. err.=   0.121 %
iter.no.=100, act.err.=   0.010 %, avg.err.=  -0.060 %, 20 it.err.=  -0.190 %,
              hb. err.=  -0.002 %
```

Listing 4.4. Contents of file 2DOT0301.075 (Case 3).

```
**********************
*                    *
* GENERAL INFORMATION *
*                    *
**********************

                        BOILER NAME:        BOILER 1
                        CASE NUMBER:        03
                        VERSION NUMBER:     01
                        THERMAL LOAD:        75.0     % OF FULL LOAD
***************
*             *
* INPUT/OUTPUT *
*             *
***************

                        NREAD:                1
                        NWRTE:                1

                        NAME OF INPUT DATA FILE:              2DIN0301.075 (copied to 2DINPT.DAT)
                        NAME OF INPUT ARRAY FILE:             IARR0301.075
                        NAME OF OUTPUT ARRAY FILE:            OARR0301.075
                        NAME OF GRAPHICS OUTPUT FILE:         GRAF
                        NAME OF OUTPUT DATA FILE:             2DOT0301.075
                        OUTPUT LEVEL:                         DEFAULT
*****************
*               *
* USER'S COMMENTS *
*               *
*****************

c UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
c GAS REBURNING
c CHANGING K / DELTA S TO SHOW HOW TO CONDUCT CONTINUATION RUN FROM
c CASE 2 (2DIN0201.075)
c
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c
c
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SUMMARY OF INPUT PARAMETERS

FUEL TYPE:	LIQUID	
TOTAL FUEL FLOW:	3.4903	KG WET/S
TOTAL AIR FLOW:	52.5703	KG WET/S
EXCESS AIR:	6.6991	%
O2-CONTENT OF FLUE GAS:	1.4070	VOL. % DRY
SEC. AIR TEMPERATURE:	493.1500	K
PRIM. MIXTURE TEMPERATURE:	376.1500	K
AMOUNT OF PRIM. AIR: IN % OF STOICH. AIR:	0.0000	%
ATOMIZING STEAM FLOW:	0.0000	KG STEAM/KG FUEL DRY

FUEL PROPERTY -

BASED ON FUEL MIXTURE			
PROXIMATE: CFIX		0.0001	KG/KG WET
VOL		0.9830	KG/KG WET
MOI		0.0168	KG/KG WET
ASH		0.0001	KG/KG WET
ULTIMATE:	C	0.8374	KG/KG DRY
	H	0.1359	KG/KG DRY
	N	0.0116	KG/KG DRY
	O	0.0066	KG/KG DRY
	S	0.0084	KG/KG DRY
	ASH	0.0001	KG/KG DRY
BASED ON FUEL MIXTURE			
LOWER HEATING VALUE:		41052.9609	KJ/KG DRY
BASED ON BURNER FUEL			
UPPER HEATING VALUE:		42133.1992	KJ/KG WET
LOWER HEATING VALUE:		40431.3359	KJ/KG DRY

REBURNING -

REBURN OR COFIRING:	YES	
FUEL TYPE:	GAS	
FUEL FLOW:	0.5510	KG DRY/S
FGR FLOW:	1.7882	KG/S
FUEL TEMPERATURE.	298.1500	K
FGR TEMPERATURE:	573.1500	K

ASH RADIATION -

CLOUD SPECIFIC ABSORPTION COEFFICIENT:	13.6364	1/((KG/M**3)M)
CLOUD SPECIFIC SURFACE AREA:	545.4500	M**2/KG
SCATTERING:	NO	
ABSORPTION EFFICIENCY:	0.1000	
SCATTERING EFFICIENCY:	0.0000	

NUMERICAL PARAMETERS -

NMAX:	2
NPHI:	4
EXACT:	0.00010
NO. OF ITERATIONS:	100
NO. OF AVERAGED ITERATIONS:	30
WEIGHTING FACTOR FOR HEAT FLUXES OF A PREVIOUS RUN:	0

STOICHIOMETRIC CALCULATIONS AT COMPLETE COMBUSTION

NAME OF VARIABLE	MEANING OF VARIABLE	VALUE	UNITS
O2MINT	STOICHIOMETRIC O2	3.3114	KG O2/KG FUEL DRY
AIRMNT	STOICHIOMETRIC AIR	14.2169	KG AIR DRY/KG FUEL DRY
AIRNR	TOTAL AIR NUMBER	1.0670	-
H2OFUT	HUMIDITY OF FUEL	0.0171	KG H2O/KG FUEL DRY
H2OA2	HUMIDITY OF AIR	0.0099	KG H2O/KG AIR DRY
FUTOT	FLOW RATE OF DRY FUEL	3.4315	KG FUEL DRY/S
DMA	FLOW RATE OF DRY AIR	52.0538	KG AIR DRY/S
DMH2O	FLOW RATE OF H2O	0.5753	KG H2O /S
DMTOT	TOTAL INPUT MASS FLOW RATE	57.8488	KG /S
HL	TOT.NET CAL. VALUE OF DRY FUEL	41052.9609	KJ/KG FUEL DRY
O2MINV	STOICHIOMETRIC O2 FOR VOLATILE FUELS	3.3111	KG O2/KG FUEL DRY
AIRMINV	STOICHIOMETRIC AIR FOR VOLATILE FUELS	14.2159	KG AIR DRY/KG FUEL DRY
FUS	MASS FLOW RATE OF BURNER FUEL	2.8805	KG FUEL DRY/S
FUSW	MASS FLOW RATE OF BURNER FUEL	2.9393	KG FUEL WET/S
FUG	MASS FLOW RATE OF REBURN FUEL	0.5510	KG FUEL DRY/S
FUGW	MASS FLOW RATE OF REBURN FUEL	0.5510	KG FUEL WET/S
FUGV	VOLUME FLOW RATE OF REBURN FUEL	0.3953	M3N GAS DRY/S
FUGVW	VOLUME FLOW RATE OF REBURN FUEL	0.3953	M3N GAS WET/S
DMA2	MASS FLOW RATE OF TOTAL OR SEC. AIR	52.0538	KG AIR DRY/S
DMA2W	MASS FLOW RATE OF TOTAL OR SEC. AIR	52.5703	KG AIR WET/S
DMA2V	VOLUME FLOW RATE OF TOTAL OR SEC. AIR	43.5654	M3N AIR DRY/S
DMA2VW	VOLUME FLOW RATE OF TOTAL OR SEC. AIR	44.2577	M3N AIR WET/S
DMCG	VOLUME FLOW RATE OF COMBUSTION GASES	42.1258	M3N GAS DRY/S
DMCGW	VOLUME FLOW RATE OF COMBUSTION GASES	48.6861	M3N GAS WET/S
HLS	NET CAL. VALUE OF BURNER FUEL	40431.3359	KJ/KG FUEL DRY
HUSW	GROSS CAL. VALUE OF BURNER FUEL	42133.1992	KJ/KG FUEL WET
HLG	NET CAL. VALUE OF REBURN FUEL	44302.6992	KJ/KG REBURN-FUEL DRY
HUGW	GROSS CAL. VALUE OF REBURN FUEL	49381.1367	KJ/KG REBURN-FUEL WET
HLGV	NET CAL. VALUE OF REBURN FUEL	31785.6992	KJ/M3N GAS DRY
HUGVW	GROSS CAL. VALUE OF REBURN FUEL	39382.1992	KJ/M3N GAS WET
SFLOWF	ATOMIZING STEAM IN BURNER FUEL	0.0000	KG-STEAM/SEC

MASS CONCENTRATION OF GASEOUS SPECIES IN KG/KG WET

CO2	H2O	N2	O2	VOL	SO2	ASH	CHAR	SOOT
0.1878	0.0846	0.7130	0.0136	0.0000	0.0010	0.0000	0.0000	0.0000

CONCENTRATION OF GASEOUS SPECIES IN VOL.FRACTION WET

CO2	H2O	N2	O2	VOL	SO2
0.1224	0.1347	0.7302	0.0122	0.0000	0.0005

CONCENTRATION OF GASEOUS SPECIES IN VOL. FRACTION DRY

CO2	H2O	N2	O2	VOL	SO2
0.1415	0.0000	0.8439	0.0141	0.0000	0.0005

SO2 CONCENTRATION IN PPM MASS 1027.
SO2 CONCENTRATION IN PPM VOL WET 460.
SO2 CONCENTRATION IN PPM VOL DRY 531.

HEAT CAPACITY OF COMBUSTION SPECIES (KJ/KG-K)

	CO2	H2O	N2	O2	VOL	SO2	ASH	CHAR	SOOT
AT 493.15K	0.9319689	1.9024371	1.0447987	0.9416904	2.5248535	0.6756042	0.8373599	1.0724180	0.9727679
AT 376.15K	0.8821020	1.8765520	1.0403634	0.9260021	2.3311000	0.6448221	0.8373600	0.9819483	0.9222868
AT 298.25K	0.8434441	1.8582036	1.0395815	0.9173627	2.2140925	0.6205368	0.8373599	0.9184768	0.7111415
AT 1800.00K	1.2005430	2.3140147	1.1634477	1.0747626	4.3484931	0.8270922	0.8373600	1.6863927	1.5045161
AT 900.00K	1.0583812	2.0220246	1.0806181	0.9992388	3.2324150	0.7527937	0.8373600	1.3415941	1.3412676
AT 573.15K	0.9621025	1.9230694	1.0497636	0.9533783	2.6651895	0.6944230	0.8373600	1.1309191	1.0639425

MEAN HEAT CAPACITIES OF SOME INPUT/OUTPUT STREAMS

INPUT STREAM	TEMPERATURE (K)	MEAN Cp (KJ/KG-K)
AIR	376.15	1.0222045
AIR	493.15	1.0294459
FLUE GAS	573.15	1.1055170
FLUE GAS	900.00	1.1546530
FLUE GAS	1800.00	1.2662147

MASS BALANCE FOR VOLUME ZONES

NR	I	J	MCONIN KG/S	MCONNT KG/S	MDIFIN KG/S	MDFNT KG/S	MTOTIN KG/S	MTOTEX KG/S	MTOTNT KG/S
1	1		14.266	0.000	14.803	0.000	29.068	29.068	0.000
1	2		14.266	0.000	17.624	0.000	31.889	31.889	0.000
2	1		14.266	0.000	16.213	0.000	30.478	30.478	0.000
2	2		26.946	0.000	39.128	0.000	66.074	66.074	0.000
2	3		19.021	0.000	28.859	0.000	47.880	47.880	0.000
3	1		6.340	0.000	11.321	0.000	17.661	17.661	0.000
3	2		14.266	0.000	31.110	0.000	45.376	45.376	0.000
3	3		19.021	0.000	50.854	0.000	69.875	69.875	0.000
3	4		6.149	0.000	22.110	0.000	28.259	28.259	0.000
4	1		4.755	0.000	11.613	0.000	16.368	16.368	0.000
4	2		12.056	0.000	33.513	0.000	45.569	45.569	0.000
4	3		19.316	-0.006	49.537	0.000	68.853	68.847	-0.006
4	4		17.974	0.006	28.687	0.000	46.661	46.667	0.006
5	1		2.210	0.000	12.337	0.000	14.547	14.547	0.000
5	2		5.792	0.006	35.104	0.000	40.866	40.872	0.006
5	3		24.418	0.000	44.517	0.000	68.935	68.935	0.000
5	4		24.511	-0.006	25.930	0.000	50.440	50.435	-0.006
6	1		3.292	0.000	21.490	0.000	24.782	24.782	0.000
6	2		6.126	0.000	65.451	0.000	71.578	71.578	0.000
6	3		33.367	0.000	75.389	0.000	108.757	108.757	0.000
6	4		28.525	0.000	41.445	0.000	69.971	69.971	0.000
7	1		3.581	0.000	20.492	0.000	24.072	24.072	0.000
7	2		7.185	0.000	59.340	0.000	66.525	66.525	0.000
7	3		39.378	-0.006	56.414	0.000	95.792	95.786	-0.006
7	4		22.278	0.006	30.985	0.000	53.263	53.269	0.006
8	1		2.164	0.000	16.485	0.000	18.648	18.648	0.000
8	2		8.359	0.000	50.576	0.000	58.935	58.935	0.000
8	3		34.698	0.006	53.610	0.000	88.308	88.313	0.006
8	4		15.273	-0.006	28.080	0.000	44.353	44.347	-0.006
9	1		5.080	0.000	13.335	0.000	19.415	19.415	0.000
9	2		22.150	0.000	42.362	0.000	64.512	64.512	0.000
9	3		49.200	0.000	64.797	0.000	113.998	113.998	0.000
9	4		21.983	0.000	26.615	0.000	48.598	48.598	0.000
10	1		6.080	0.000	9.556	0.000	15.636	15.636	0.000
10	2		18.234	0.000	28.664	0.000	46.898	46.898	0.000
10	3		33.535	0.000	41.858	0.000	75.393	75.393	0.000
11	1		6.080	0.000	6.469	0.000	12.549	12.549	0.000
11	2		18.234	0.000	19.403	0.000	37.637	37.637	0.000
11	3		33.535	0.000	35.684	0.000	69.219	69.219	0.000
12	1		6.080	0.000	6.469	0.000	12.549	12.549	0.000
12	2		18.234	0.000	19.403	0.000	37.637	37.637	0.000
12	3		33.535	0.000	35.684	0.000	69.219	69.219	0.000
13	1		6.080	0.000	9.795	0.000	15.875	15.875	0.000
13	2		18.234	0.000	22.730	0.000	40.964	40.964	0.000
13	3		33.535	0.000	35.684	0.000	69.219	69.219	0.000
14	1		14.462	0.000	14.825	0.000	29.287	29.287	0.000
14	2		51.769	0.000	32.790	0.000	84.559	84.559	0.000
14	3		33.535	0.000	17.842	0.000	51.377	51.377	0.000
15	1		26.032	0.000	14.969	0.000	41.001	41.001	0.000
15	2		43.387	0.000	49.536	0.000	92.922	92.922	0.000
16	1		26.032	0.000	14.969	0.000	41.001	41.001	0.000
16	2		43.387	0.000	49.536	0.000	92.922	92.922	0.000
17	1		14.462	0.000	11.498	0.000	25.961	25.961	0.000
17	2		43.387	0.000	34.495	0.000	77.882	77.882	0.000
18	1		14.462	0.000	11.498	0.000	25.961	25.961	0.000
18	2		43.387	0.000	34.495	0.000	77.882	77.882	0.000
19	1		14.462	0.000	5.749	0.000	20.211	20.211	0.000
19	2		43.387	0.000	17.247	0.000	60.634	60.634	0.000
TOTAL MASS BALANCE FOR THE FURNACE VOLUME									
INCLUDING SYMMETRICAL FLUXES IF EXISTING:			1195.72	0.00	1720.98	0.00	2914.70	2914.70	0.00

iter. no.= 1, act.err.= 3.4486 %, avg.err.= 3.4486 %, 20 it.err.= 3.4486 %, hb.err.= -1.8414 %
iter. no.= 2, act.err.= 1.2166 %, avg.err.= 2.3326 %, 20 it.err.= 2.3326 %, hb.err.= -0.3659 %
iter. no.= 3, act.err.= 0.3148 %, avg.err.= 1.9600 %, 20 it.err.= 1.6600 %, hb.err.= -0.7335 %
iter. no.= 4, act.err.= 0.7889 %, avg.err.= 1.4422 %, 20 it.err.= 1.4422 %, hb.err.= -0.2266 %
iter. no.= 5, act.err.= -0.5474 %, avg.err.= 1.0443 %, 20 it.err.= 1.0443 %, hb.err.= 0.4811 %
iter. no.= 6, act.err.= -0.0780 %, avg.err.= 0.8572 %, 20 it.err.= 0.8572 %, hb.err.= 0.5130 %
iter. no.= 7, act.err.= -0.0734 %, avg.err.= 0.7243 %, 20 it.err.= 0.7243 %, hb.err.= -0.4532 %
iter. no.= 8, act.err.= 1.9887 %, avg.err.= 0.8823 %, 20 it.err.= 0.8823 %, hb.err.= -0.7222 %
iter. no.= 9, act.err.= -0.3587 %, avg.err.= 0.7445 %, 20 it.err.= 0.7445 %, hb.err.= 0.4080 %
iter. no.= 10, act.err.= -2.2169 %, avg.err.= 0.4483 %, 20 it.err.= 0.4483 %, hb.err.= 0.6067 %

iter. no.= 11,	act.err.=	-0.8957 %,	avg.err.=	0.3261 %,	20 it.err.=	0.3261 %,	hb.err.=	0.1117 %	
iter. no.= 12,	act.err.=	0.7683 %,	avg.err.=	0.3630 %,	20 it.err.=	0.3630 %,	hb.err.=	-0.2475 %	
iter. no.= 13,	act.err.=	-0.6801 %,	avg.err.=	0.2827 %,	20 it.err.=	0.2827 %,	hb.err.=	0.6101 %	
iter. no.= 14,	act.err.=	0.4908 %,	avg.err.=	0.2976 %,	20 it.err.=	0.2976 %,	hb.err.=	-0.0712 %	
iter. no.= 15,	act.err.=	0.5496 %,	avg.err.=	0.3144 %,	20 it.err.=	0.3144 %,	hb.err.=	-0.5298 %	
iter. no.= 16,	act.err.=	-0.2289 %,	avg.err.=	0.2804 %,	20 it.err.=	0.2804 %,	hb.err.=	-0.1390 %	
iter. no.= 17,	act.err.=	-0.3035 %,	avg.err.=	0.2461 %,	20 it.err.=	0.2461 %,	hb.err.=	0.1972 %	
iter. no.= 18,	act.err.=	0.5490 %,	avg.err.=	0.2629 %,	20 it.err.=	0.2629 %,	hb.err.=	-0.3884 %	
iter. no.= 19,	act.err.=	-0.8178 %,	avg.err.=	0.2060 %,	20 it.err.=	0.2060 %,	hb.err.=	0.3998 %	
iter. no.= 20,	act.err.=	-0.8781 %,	avg.err.=	0.1518 %,	20 it.err.=	0.1518 %,	hb.err.=	-0.0339 %	
iter. no.= 21,	act.err.=	0.4701 %,	avg.err.=	0.1670 %,	20 it.err.=	0.0029 %,	hb.err.=	-0.2332 %	
iter. no.= 22,	act.err.=	1.3259 %,	avg.err.=	0.2197 %,	20 it.err.=	0.0084 %,	hb.err.=	-0.2991 %	
iter. no.= 23,	act.err.=	-0.0806 %,	avg.err.=	0.2066 %,	20 it.err.=	-0.0114 %,	hb.err.=	0.3871 %	
iter. no.= 24,	act.err.=	0.8699 %,	avg.err.=	0.2343 %,	20 it.err.=	-0.0073 %,	hb.err.=	0.0212 %	
iter. no.= 25,	act.err.=	-1.2470 %,	avg.err.=	0.1750 %,	20 it.err.=	-0.0423 %,	hb.err.=	0.4843 %	
iter. no.= 26,	act.err.=	-1.4714 %,	avg.err.=	0.1117 %,	20 it.err.=	-0.1120 %,	hb.err.=	0.7088 %	
iter. no.= 27,	act.err.=	-1.5546 %,	avg.err.=	0.0500 %,	20 it.err.=	-0.1860 %,	hb.err.=	0.4567 %	
iter. no.= 28,	act.err.=	0.9188 %,	avg.err.=	0.0810 %,	20 it.err.=	-0.2395 %,	hb.err.=	-0.7445 %	
iter. no.= 29,	act.err.=	0.1631 %,	avg.err.=	0.0838 %,	20 it.err.=	-0.2134 %,	hb.err.=	-0.3884 %	
iter. no.= 30,	act.err.=	1.3203 %,	avg.err.=	0.1250 %,	20 it.err.=	-0.0366 %,	hb.err.=	-0.7231 %	
iter. no.= 31,	act.err.=	0.2130 %,	avg.err.=	0.1279 %,	20 it.err.=	0.0188 %,	hb.err.=	0.3582 %	
iter. no.= 32,	act.err.=	-0.0048 %,	avg.err.=	0.1237 %,	20 it.err.=	-0.0198 %,	hb.err.=	-0.2416 %	
iter. no.= 33,	act.err.=	1.1034 %,	avg.err.=	0.1534 %,	20 it.err.=	0.0694 %,	hb.err.=	-0.2838 %	
iter. no.= 34,	act.err.=	-1.3729 %,	avg.err.=	0.1085 %,	20 it.err.=	-0.0238 %,	hb.err.=	0.5195 %	
iter. no.= 35,	act.err.=	-0.1874 %,	avg.err.=	0.1001 %,	20 it.err.=	-0.0607 %,	hb.err.=	0.3393 %	
iter. no.= 36,	act.err.=	-0.7917 %,	avg.err.=	0.0753 %,	20 it.err.=	-0.0888 %,	hb.err.=	-0.0040 %	
iter. no.= 37,	act.err.=	0.4566 %,	avg.err.=	0.0856 %,	20 it.err.=	-0.0508 %,	hb.err.=	-0.0678 %	
iter. no.= 38,	act.err.=	-0.7588 %,	avg.err.=	0.0634 %,	20 it.err.=	-0.1162 %,	hb.err.=	0.5486 %	
iter. no.= 39,	act.err.=	0.2439 %,	avg.err.=	0.0680 %,	20 it.err.=	-0.0631 %,	hb.err.=	-0.0485 %	
iter. no.= 40,	act.err.=	0.2314 %,	avg.err.=	0.0721 %,	20 it.err.=	-0.0076 %,	hb.err.=	-0.2294 %	
iter. no.= 41,	act.err.=	-0.2798 %,	avg.err.=	0.0635 %,	20 it.err.=	-0.0451 %,	hb.err.=	0.2113 %	
iter. no.= 42,	act.err.=	0.7188 %,	avg.err.=	0.0791 %,	20 it.err.=	-0.0755 %,	hb.err.=	-0.1413 %	
iter. no.= 43,	act.err.=	-0.6288 %,	avg.err.=	0.0627 %,	20 it.err.=	-0.1029 %,	hb.err.=	0.5514 %	
iter. no.= 44,	act.err.=	-1.5188 %,	avg.err.=	0.0267 %,	20 it.err.=	-0.2223 %,	hb.err.=	0.5390 %	
iter. no.= 45,	act.err.=	0.7500 %,	avg.err.=	0.0428 %,	20 it.err.=	-0.1225 %,	hb.err.=	-0.1503 %	
iter. no.= 46,	act.err.=	1.1119 %,	avg.err.=	0.0660 %,	20 it.err.=	0.0067 %,	hb.err.=	-0.0515 %	
iter. no.= 47,	act.err.=	-3.0165 %,	avg.err.=	0.0004 %,	20 it.err.=	-0.0664 %,	hb.err.=	0.8037 %	
iter. no.= 48,	act.err.=	1.1093 %,	avg.err.=	0.0235 %,	20 it.err.=	-0.0569 %,	hb.err.=	-0.5446 %	
iter. no.= 49,	act.err.=	-0.3355 %,	avg.err.=	0.0162 %,	20 it.err.=	-0.0818 %,	hb.err.=	0.1440 %	
iter. no.= 50,	act.err.=	-1.3460 %,	avg.err.=	-0.0110 %,	20 it.err.=	-0.2151 %,	hb.err.=	0.5059 %	
iter. no.= 51,	act.err.=	0.7360 %,	avg.err.=	0.0036 %,	20 it.err.=	-0.1890 %,	hb.err.=	0.0681 %	
iter. no.= 52,	act.err.=	1.6933 %,	avg.err.=	0.0361 %,	20 it.err.=	-0.1041 %,	hb.err.=	-0.7454 %	
iter. no.= 53,	act.err.=	-0.2758 %,	avg.err.=	0.0302 %,	20 it.err.=	-0.1730 %,	hb.err.=	0.5809 %	
iter. no.= 54,	act.err.=	-1.7208 %,	avg.err.=	-0.0022 %,	20 it.err.=	-0.1904 %,	hb.err.=	0.3643 %	
iter. no.= 55,	act.err.=	-0.5961 %,	avg.err.=	-0.0130 %,	20 it.err.=	-0.2109 %,	hb.err.=	-0.4115 %	
iter. no.= 56,	act.err.=	-0.7586 %,	avg.err.=	-0.0263 %,	20 it.err.=	-0.2092 %,	hb.err.=	-0.1201 %	
iter. no.= 57,	act.err.=	-0.2231 %,	avg.err.=	-0.0298 %,	20 it.err.=	-0.2432 %,	hb.err.=	-0.0723 %	
iter. no.= 58,	act.err.=	0.3017 %,	avg.err.=	-0.0240 %,	20 it.err.=	-0.1902 %,	hb.err.=	-0.0878 %	
iter. no.= 59,	act.err.=	-0.0160 %,	avg.err.=	-0.0239 %,	20 it.err.=	-0.2032 %,	hb.err.=	0.8073 %	
iter. no.= 60,	act.err.=	-0.4609 %,	avg.err.=	-0.0312 %,	20 it.err.=	-0.2378 %,	hb.err.=	0.0125 %	
iter. no.= 61,	act.err.=	0.3638 %,	avg.err.=	-0.0247 %,	20 it.err.=	-0.2056 %,	hb.err.=	-0.0572 %	
iter. no.= 62,	act.err.=	1.7195 %,	avg.err.=	0.0034 %,	20 it.err.=	-0.1556 %,	hb.err.=	-1.0261 %	
iter. no.= 63,	act.err.=	-1.5845 %,	avg.err.=	-0.0218 %,	20 it.err.=	-0.2034 %,	hb.err.=	0.8365 %	
iter. no.= 64,	act.err.=	0.5855 %,	avg.err.=	-0.0123 %,	20 it.err.=	-0.0981 %,	hb.err.=	0.2502 %	
iter. no.= 65,	act.err.=	0.4577 %,	avg.err.=	-0.0051 %,	20 it.err.=	-0.1127 %,	hb.err.=	-0.0361 %	
iter. no.= 66,	act.err.=	0.1295 %,	avg.err.=	-0.0030 %,	20 it.err.=	-0.1619 %,	hb.err.=	-0.0786 %	
iter. no.= 67,	act.err.=	-0.2634 %,	avg.err.=	-0.0069 %,	20 it.err.=	-0.0242 %,	hb.err.=	-0.2691 %	
iter. no.= 68,	act.err.=	-2.0203 %,	avg.err.=	-0.0365 %,	20 it.err.=	-0.1807 %,	hb.err.=	0.8239 %	
iter. no.= 69,	act.err.=	0.0947 %,	avg.err.=	-0.0346 %,	20 it.err.=	-0.1592 %,	hb.err.=	0.1063 %	
iter. no.= 70,	act.err.=	0.9294 %,	avg.err.=	-0.0208 %,	20 it.err.=	-0.0454 %,	hb.err.=	0.2778 %	
iter. no.= 71,	act.err.=	-0.1353 %,	avg.err.=	-0.0225 %,	20 it.err.=	-0.0890 %,	hb.err.=	0.1199 %	
iter. no.= 72,	act.err.=	-0.6683 %,	avg.err.=	-0.0314 %,	20 it.err.=	-0.2071 %,	hb.err.=	0.1316 %	
iter. no.= 73,	act.err.=	-0.7775 %,	avg.err.=	-0.0416 %,	20 it.err.=	-0.2321 %,	hb.err.=	-0.4953 %	
iter. no.= 74,	act.err.=	0.4024 %,	avg.err.=	-0.0356 %,	20 it.err.=	-0.1260 %,	hb.err.=	0.3876 %	
iter. no.= 75,	act.err.=	-0.1023 %,	avg.err.=	-0.0365 %,	20 it.err.=	-0.1013 %,	hb.err.=	-0.1688 %	
iter. no.= 76,	act.err.=	-0.2451 %,	avg.err.=	-0.0393 %,	20 it.err.=	-0.0756 %,	hb.err.=	-0.0717 %	
iter. no.= 77,	act.err.=	0.0192 %,	avg.err.=	-0.0385 %,	20 it.err.=	-0.0635 %,	hb.err.=	-0.0521 %	
iter. no.= 78,	act.err.=	0.9751 %,	avg.err.=	-0.0255 %,	20 it.err.=	-0.0298 %,	hb.err.=	0.5659 %	
iter. no.= 79,	act.err.=	-1.4246 %,	avg.err.=	-0.0432 %,	20 it.err.=	-0.1003 %,	hb.err.=	-0.8598 %	
iter. no.= 80,	act.err.=	1.1937 %,	avg.err.=	-0.0278 %,	20 it.err.=	-0.0175 %,	hb.err.=	0.8715 %	
iter. no.= 81,	act.err.=	-1.0363 %,	avg.err.=	-0.0402 %,	20 it.err.=	-0.0875 %,	hb.err.=	-0.4728 %	
iter. no.= 82,	act.err.=	-0.3696 %,	avg.err.=	-0.0442 %,	20 it.err.=	-0.1920 %,	hb.err.=	-0.1000 %	
iter. no.= 83,	act.err.=	0.5141 %,	avg.err.=	-0.0375 %,	20 it.err.=	-0.0871 %,	hb.err.=	0.4371 %	
iter. no.= 84,	act.err.=	0.2694 %,	avg.err.=	-0.0339 %,	20 it.err.=	-0.1029 %,	hb.err.=	0.3255 %	
iter. no.= 85,	act.err.=	-1.0165 %,	avg.err.=	-0.0454 %,	20 it.err.=	-0.1766 %,	hb.err.=	-0.5967 %	
iter. no.= 86,	act.err.=	0.3444 %,	avg.err.=	-0.0409 %,	20 it.err.=	-0.1658 %,	hb.err.=	0.4379 %	
iter. no.= 87,	act.err.=	-0.7605 %,	avg.err.=	-0.0492 %,	20 it.err.=	-0.1907 %,	hb.err.=	-0.3307 %	
iter. no.= 88,	act.err.=	0.3340 %,	avg.err.=	-0.0448 %,	20 it.err.=	-0.0730 %,	hb.err.=	0.3967 %	
iter. no.= 89,	act.err.=	-0.8314 %,	avg.err.=	-0.0536 %,	20 it.err.=	-0.1193 %,	hb.err.=	-0.3744 %	
iter. no.= 90,	act.err.=	0.3805 %,	avg.err.=	-0.0488 %,	20 it.err.=	-0.1467 %,	hb.err.=	0.4772 %	
iter. no.= 91,	act.err.=	-0.9909 %,	avg.err.=	-0.0592 %,	20 it.err.=	-0.1895 %,	hb.err.=	-0.4633 %	
iter. no.= 92,	act.err.=	0.3989 %,	avg.err.=	-0.0542 %,	20 it.err.=	-0.1362 %,	hb.err.=	0.4358 %	
iter. no.= 93,	act.err.=	-0.2837 %,	avg.err.=	-0.0567 %,	20 it.err.=	-0.1115 %,	hb.err.=	-0.0692 %	
iter. no.= 94,	act.err.=	-0.4013 %,	avg.err.=	-0.0603 %,	20 it.err.=	-0.1516 %,	hb.err.=	-0.1362 %	
iter. no.= 95,	act.err.=	-0.7665 %,	avg.err.=	-0.0678 %,	20 it.err.=	-0.1849 %,	hb.err.=	-0.4768 %	
iter. no.= 96,	act.err.=	1.3030 %,	avg.err.=	-0.0535 %,	20 it.err.=	-0.1075 %,	hb.err.=	0.9054 %	
iter. no.= 97,	act.err.=	-0.4053 %,	avg.err.=	-0.0571 %,	20 it.err.=	-0.1287 %,	hb.err.=	-0.2193 %	
iter. no.= 98,	act.err.=	-0.6339 %,	avg.err.=	-0.0630 %,	20 it.err.=	-0.2091 %,	hb.err.=	-0.3947 %	
iter. no.= 99,	act.err.=	0.1510 %,	avg.err.=	-0.0608 %,	20 it.err.=	-0.1303 %,	hb.err.=	0.1205 %	

THE DISTRIBUTION OF SPSU in m**2/kg AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.280E+02	2.203E+02	2.164E+02	2.200E+02	2.289E+02	2.354E+02	2.568E+02	0.000E-01
J= 3	0.000E-01	2.310E+02	2.297E+02	2.260E+02	2.246E+02	2.271E+02	2.299E+02	2.345E+02	2.458E+02	2.471E+02
J= 2	2.316E+02	2.312E+02	2.303E+02	2.291E+02	2.295E+02	2.314E+02	2.333E+02	2.367E+02	2.429E+02	2.445E+02
J= 1	2.316E+02	2.314E+02	2.313E+02	2.313E+02	2.324E+02	2.339E+02	2.351E+02	2.377E+02	2.415E+02	2.428E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	2.479E+02	2.483E+02	2.484E+02	2.485E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	2.453E+02	2.458E+02	2.463E+02	2.475E+02	2.475E+02	2.474E+02	2.474E+02	2.474E+02	2.474E+02	
J= 1	2.433E+02	2.439E+02	2.450E+02	2.466E+02	2.469E+02	2.470E+02	2.470E+02	2.470E+02	2.470E+02	
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	

THE DISTRIBUTION OF UBRT in Fraction of Input fixed-c AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	8.201E-01	9.370E-01	1.001E+00	9.452E-01	8.268E-01	7.511E-01	5.694E-01	0.000E-01
J= 3	0.000E-01	7.788E-01	7.961E-01	8.489E-01	8.698E-01	8.366E-01	8.039E-01	7.523E-01	6.451E-01	6.304E-01
J= 2	7.702E-01	7.765E-01	7.881E-01	8.050E-01	8.009E-01	7.801E-01	7.599E-01	7.251E-01	6.658E-01	6.489E-01
J= 1	7.710E-01	7.733E-01	7.752E-01	7.760E-01	7.646E-01	7.500E-01	7.377E-01	7.119E-01	6.752E-01	6.625E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	6.220E-01	6.181E-01	6.162E-01	6.153E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	6.406E-01	6.355E-01	6.313E-01	6.226E-01	6.225E-01	6.229E-01	6.228E-01	6.228E-01	6.228E-01	
J= 1	6.571E-01	6.513E-01	6.413E-01	6.289E-01	6.263E-01	6.261E-01	6.260E-01	6.260E-01	6.260E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF PO2 in Vol. Fraction. Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.099E-02	3.189E-02	5.358E-02	3.778E-02	1.175E-02	7.687E-03	3.966E-02	0.000E-01
J= 3	0.000E-01	9.557E-03	1.000E-02	1.090E-02	1.352E-02	8.612E-03	3.904E-03	3.271E-03	1.627E-02	1.389E-02
J= 2	9.151E-03	9.372E-03	9.593E-03	9.225E-03	7.500E-03	4.611E-03	2.741E-03	3.438E-03	9.735E-03	1.014E-02
J= 1	9.100E-03	9.082E-03	8.937E-03	8.279E-03	6.152E-03	4.059E-03	3.238E-03	4.010E-03	6.930E-03	7.587E-03

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	1.367E-02	1.368E-02	1.374E-02	1.374E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	1.006E-02	1.017E-02	1.058E-02	1.227E-02	1.220E-02	1.209E-02	1.209E-02	1.209E-02	1.209E-02	
J= 1	7.674E-03	8.043E-03	9.181E-03	1.111E-02	1.150E-02	1.150E-02	1.151E-02	1.151E-02	1.151E-02	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF FUL0 in kg/(kg.mixture AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	5.904E-02	5.968E-02	5.984E-02	5.874E-02	5.455E-02	5.216E-02	4.199E-02	0.000E-01
J= 3	0.000E-01	5.874E-02	5.888E-02	5.921E-02	5.911E-02	5.805E-02	5.645E-02	5.412E-02	4.865E-02	4.888E-02
J= 2	5.863E-02	5.869E-02	5.873E-02	5.870E-02	5.811E-02	5.697E-02	5.573E-02	5.397E-02	5.104E-02	5.075E-02
J= 1	5.861E-02	5.860E-02	5.847E-02	5.818E-02	5.738E-02	5.643E-02	5.545E-02	5.415E-02	5.234E-02	5.193E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	4.888E-02	4.888E-02	4.888E-02	4.888E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	5.072E-02	5.065E-02	5.045E-02	4.965E-02	4.968E-02	4.973E-02	4.973E-02	4.973E-02	4.973E-02	
J= 1	5.186E-02	5.167E-02	5.111E-02	5.018E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOL0 in Number of Vol. Lumps Released AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.000E+00	2.095E+03	3.129E+03	3.137E+03	1.400E+01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	8.000E+00	1.900E+01	1.600E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF SO2 in Vol. Fraction. Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	5.378E-04	4.843E-04	4.174E-04	4.464E-04	4.787E-04	4.707E-04	3.800E-04	0.000E-01
J= 3	0.000E-01	5.359E-04	5.374E-04	5.410E-04	5.311E-04	5.264E-04	5.124E-04	4.911E-04	4.411E-04	4.432E-04
J= 2	5.351E-04	5.354E-04	5.356E-04	5.358E-04	5.291E-04	5.183E-04	5.062E-04	4.897E-04	4.630E-04	4.603E-04
J= 1	5.349E-04	5.348E-04	5.330E-04	5.298E-04	5.214E-04	5.116E-04	5.033E-04	4.913E-04	4.748E-04	4.710E-04

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	4.432E-04	4.432E-04	4.431E-04	4.431E-04	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	4.600E-04	4.594E-04	4.575E-04	4.502E-04	4.504E-04	4.508E-04	4.508E-04	4.508E-04	4.508E-04	
J= 1	4.703E-04	4.686E-04	4.634E-04	4.549E-04	4.532E-04	4.532E-04	4.532E-04	4.532E-04	4.532E-04	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

UNBURN FIXED CARBON AT FURNACE EXIT = 62.35% AFTER 100 ITERATIONS

ATOM OUTFLUX IN KG/S :

C=	2.964200	H=	0.547442	N=	41.251564	O= 13.055581
S=	0.029718	A=	0.000297			

SUM= 57.848801

ATOM INFLUX IN KG/S :

C=	2.965163	H=	0.547721	N=	41.244305	O= 13.061593
S=	0.029724	A=	0.000297			

SUM= 57.848804

ATOM BALANCE -> (OUT-IN)/IN IN % :

C=	-0.032444	H=	-0.051038	N=	0.017601	O= -0.046028
S=	-0.020322	A=	-0.006609			

SUM= -0.000007

ENERGY BALANCE FOR VOLUME ZONES AND TOTAL FURNACE EFFICIENCY AFTER 100 ITERATIONS

I J TPSAD TEX RHOG OLD CP EX QCONIN QCONNT QDIFIN QDIFNT QCHEIN QCHENT QRADIN QRADNT QTOTIN QTOTEX QTOTNT TNEW

		K	K	KG/M3	KJ/KGK	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	KW	K
1	1	1394.7	1385.0	0.25380	1.21719	38835.	-381.	0.	39.	0.	0.	12675.	343.	51510.	51511.	0.	1385.
2	1	1420.9	1417.3	0.24802	1.22108	41801.	-151.	0.	0.	0.	0.	13467.	151.	55268.	55268.	0.	1417
3	1	1500.3	1491.1	0.23570	1.22999	26139.	-224.	0.	0.	0.	0.	14331.	224.	40470.	40470.	0.	1491
4	1	1571.5	1567.7	0.22412	1.23928	25848.	-95.	0.	0.	0.	0.	14797.	95.	40644.	40644.	0.	1568.
5	1	1632.4	1625.0	0.21603	1.24754	24200.	-120.	0.	0.	0.	-31.	10009.	151.	34209.	34240.	0.	1625.
6	1	1656.9	1657.7	0.21154	1.25332	42226.	1.	0.	0.	0.	-93.	16427.	92.	58653.	58745.	0.	1658
7	1	1655.1	1657.5	0.21140	1.25462	41128.	-72.	0.	0.	0.	-108.	12583.	180.	53711.	53819.	0.	1658
8	1	1647.2	1636.3	0.21400	1.25257	31468.	-212.	0.	0.	0.	-77.	12226.	289	43694.	43771.	0.	1636.
9	1	1603.7	1601.9	0.21845	1.24786	31569.	18.	0.	0.	0.	-62.	13694.	44.	45263.	45325.	0.	1602.
10	1	1558.8	1513.1	0.23123	1.23778	24483.	-969.	0.	155.	0.	-15.	9128.	829.	33611.	33626.	0.	1513.
11	1	1482.1	1435.9	0.24366	1.22880	18337.	-793.	0.	263.	0.	0.	9237.	930.	27574.	27574.	0.	1436.
12	1	1418.6	1392.3	0.25128	1.22345	17248.	-451.	0.	247.	0.	0.	8986.	204.	26234.	26234.	0.	1392.
13	1	1371.0	1369.0	0.25550	1.22024	20787.	-42.	0.	0.	0	0.	8801.	42.	29588.	29588.	0.	1369.
14	1	1309.8	1307.3	0.26747	1.21191	35919.	-100.	0.	0.	0.	0.	7864.	100.	43783.	43783.	0.	1307.
15	1	1265.9	1246.5	0.28052	1.20398	47878.	-1064.	0.	512.	0.	0.	8087.	552.	55966.	55966.	0.	1246.
16	1	1229.7	1211.2	0.28870	1.19933	45901.	-1005.	0.	481.	0.	0.	7559.	523.	53460.	53460.	0.	1211.
17	1	1178.9	1125.7	0.31061	1.18774	27323.	-1806.	0.	1336.	0.	0.	6674.	469.	33997.	33997.	0.	1126.
18	1	1107.7	1064.1	0.32860	1.17905	24910.	-1465.	0.	1111.	0.	0.	5823.	354.	30732.	30732.	0.	1064.
19	1	1064.1	1043.9	0.33494	1.17616	18253.	-524.	0.	345.	0.	0.	7626.	178.	25878.	25878.	0.	1044.
1	2	1386.2	1345.0	0.26134	1.21228	42234.	-1763.	0.	389.	0.	0.	35418.	1374.	77652.	77652.	0.	1345.
2	2	1392.8	1389.4	0.25302	1.21754	88091.	-302.	0.	0.	0.	0.	38957.	302.	127048.	127048.	0.	1389.
3	2	1470.2	1464.9	0.23999	1.22633	65250.	-324.	0.	0.	0.	0.	41820.	324.	107070.	107071.	0.	1465.
4	2	1576.1	1561.2	0.22517	1.23733	71946.	-733.	0.	0.	0.	-71.	43257.	804.	115203.	115274.	0.	1561.
5	2	1653.2	1643.6	0.21372	1.24812	68568.	59.	0.	0.	0.	-604.	30171.	544.	98739.	99342.	0.	1644.
6	2	1684.6	1681.6	0.20861	1.25554	123814.	518.	0.	0.	0.	-972.	49932.	453.	173746.	174718.	0.	1682.
7	2	1686.9	1683.5	0.20812	1.25853	115414.	573.	0.	0.	0.	-1077.	38719.	503.	154133.	155210.	0.	1684.
8	2	1669.4	1663.4	0.21042	1.25671	100633.	485.	0.	0.	0.	-1035.	37943.	550.	138575.	139610.	0.	1663.
9	2	1614.8	1604.6	0.21798	1.24747	105426.	-288.	0.	0.	0.	-664.	39911.	952.	145336.	146001.	0.	1605
10	2	1564.9	1552.5	0.22527	1.24148	73787.	-753.	0.	0.	0.	-62.	30044.	814.	103831.	103893.	0.	1553.
11	2	1518.4	1479.2	0.23643	1.23316	56811.	-1993.	0.	568.	0.	-31.	29202.	1456.	86013.	86044.	0.	1479.
12	2	1451.9	1417.1	0.24679	1.22582	53411.	-1786.	0.	524.	0.	0.	27043.	1262.	80454.	80454.	0.	1417.
13	2	1384.8	1372.9	0.25473	1.22031	54385.	-661.	0.	0.	0.	0.	25878.	661.	80263.	80263.	0.	1373.
14	2	1299.6	1296.4	0 26968	1 21016	102510.	-354.	0	0.	0.	0	22996.	354	125506.	125505.	0.	1296
15	2	1260.1	1237.1	0.28263	1.20252	107758.	-2844	0.	1102.	0.	0.	23655.	1742.	131413.	131413.	0.	1237
16	2	1212.5	1191.3	0.29348	1.19650	101897.	-2591	0.	1002.	0.	0.	21667.	1589.	123564.	123564.	0.	1191.
17	2	1164.3	1121.2	0.31182	1.18694	80465.	-4378.	0.	2801.	0.	0.	19585.	1577.	100050.	100050.	0.	1121
18	2	1104.4	1068.2	0.32730	1.17947	74386.	-3648.	0.	2397	0.	0.	17422.	1251.	91807.	91807.	0.	1068.
19	2	1068.2	1044.9	0.33460	1.17613	55072.	-1817.	0	908.	0.	0.	22503.	909.	77576.	77576.	0.	1045
2	3	1394.3	1354.1	0.25964	1.21311	63927.	-2596.	0.	628.	0.	0.	66512.	1968.	130439.	130439.	0.	1354.
3	3	1411.6	1406.9	0.24992	1.21911	94849.	-396.	0.	0.	0.	-42.	71225.	438.	166074.	166116.	0.	1407.
4	3	1588.1	1564.7	0.22479	1.23624	101940.	5866.	0.	0.	0.	-7901.	78700.	2035.	180640.	188541.	0.	1565.
5	3	1699.8	1663.2	0.21131	1.24844	108568.	8904.	0.	0.	0.	-12406.	55175.	3502.	163743.	176149.	0.	1663.
6	3	1733.0	1701.5	0.20627	1.25707	182879.	8974.	0.	0.	0.	-12808.	89621.	3833.	272500.	285307.	0.	1701.
7	3	1746.2	1695.2	0.20652	1.26451	166562.	2667.	0.	0.	0.	-4736.	69929.	2068.	236491.	241227.	0.	1695.
8	3	1692.4	1673.9	0.20894	1.26157	151739.	1526.	0.	0.	0.	-3896.	68782.	2370.	220521.	224417.	0.	1674.
9	3	1596.2	1584.4	0.22057	1.24335	180886.	1429.	0.	0.	0.	-3415.	69187.	1985.	250073.	253488.	0.	1584.
10	3	1564.0	1538.9	0.22712	1.23841	117143.	-1297.	0.	332.	0.	-1329.	52513.	2294.	169656.	170985.	0.	1539.
11	3	1499.8	1454.9	0.24023	1.22882	102427.	-4035.	0.	1177.	0.	-216.	50619.	3074.	153046.	153263.	0.	1455.
12	3	1419.8	1377.3	0.25378	1.21959	95038.	-3936.	0.	1069.	0.	-46.	45450.	2914.	140489.	140535.	0.	1377.
13	3	1349.5	1315.8	0.26563	1.21201	88505.	-3126.	0.	979.	0.	0.	41854.	2148.	130359.	130359.	0.	1316.
14	3	1315.8	1268.8	0.27549	1.20604	63371.	-3230.	0.	1112.	0.	0.	38511.	2118.	101883.	101883.	0.	1269.
3	4	1454.5	1391.8	0.25271	1.21677	38731.	-1127.	0.	582.	0.	-1342.	33472.	1887.	72204.	73545.	0.	1392.
4	4	1558.5	1471.6	0.23792	1.23037	53444.	13927.	0.	455.	-36.	-20281.	38765.	5900.	92173.	112491.	0.	1472.
5	4	1517.9	1476.1	0.23587	1.23780	54977.	18568.	0.	278.	-54.	-22348.	31119.	3502.	86041.	108444.	0.	1476.
6	4	1637.3	1554.0	0.22429	1.25004	89228.	20617.	0.	477.	-54.	-29137.	47346.	8043.	136520.	165710.	0.	1554.
7	4	1639.3	1599.4	0.21709	1.28239	83903.	4978.	0.	404.	0.	-8395.	30972.	3013.	114875.	123270.	0.	1599.
8	4	1684.1	1625.2	0.21435	1.26856	72895.	1773.	0.	432.	0.	-4097.	31494.	1891.	104390.	108486.	0.	1625.
9	4	1496.4	1474.0	0.23678	1.22220	68055.	1788.	0.	556.	0.	-3427.	27053.	1082.	95108.	98534.	0.	1474

HEAT BALANCE FOR VOLUME ZONES: 4.11E-06 3.92E-04 0. 2.3E-04-1.4E-02-1.4E-05 1.8E+06 7.9E+04 5.9E+06 6.1E-06-3.8E+00

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	DTMAX K	I	J	RDTMAX %	I	J	DQMAX KW	I	J	RDQMAX %	DQTOTAL KW	RDQTOTAL %
7	1	0.00	7	1	0.000	7	2	-0.3	8	1	0.000	-3.8	0.000

HEAT FLUX TO ADDITIONAL HEAT SINKS IN KW

CONVECTIVE FLUX	RADIATIVE FLUX	TOTAL FLUX
15714.0117	21241.3457	36955.3594

SURFACE TEMPERATURES OF ADDITIONAL HEAT SINKS IN K --- represented by TWSINK(i,j)

TWSINK(10, j) =	915.17	0.00	0.00
TWSINK(11, j) =	840.93	836.33	825.56
TWSINK(12, j) =	833.77	824.30	808.01
TWSINK(13, j) =	0.00	0.00	797.28
TWSINK(14, j) =	0.00	0.00	787.33
TWSINK(15, j) =	841.84	846.14	
TWSINK(16, j) =	830.49	837.32	
TWSINK(17, j) =	804.21	806.38	
TWSINK(18, j) =	796.68	799.69	
TWSINK(19, j) =	797.84	792.85	

MEAN FURNACE EXIT TEMPERATURE = 1044.68K AFTER 100 ITERATIONS
TOTAL FURNACE EFFICIENCY = 66.6472 % WITH 140724. KW HEAT RELEASE AND 11572. KW SENSIBLE INPUT

CHEM. HEAT OUTFLUX IN KW :
FUEL= 6.2 SULF.= 0.0 SUM = 6.2
SENS. HEAT OUTFLUX IN KW :
EXT.= 50792.7 REC. = 0.0 SUM = 50792.7
OUTFLUX TO HEAT SINKS IN KW :
RAD.= 78839.2 CONV.= 22662.0 SUM = 101501.2
TOTAL HEAT OUTFLUX : 152300.1 KW
CHEM. HEAT INFLUX IN KW :
FUEL= 140873.8 EVAP.= -143.5 CALC.= 0.0
SULF= 0.0 SUM = 140730.3
SENS. HEAT AIR INFLUX IN KW :
SEC.= 10553.1 PRIM.= 0.0 TRANS.= 0.0
REC.= 0.0 SUM = 10553.1
SENS. HEAT FUEL INFLUX IN KW :
DRY = 466.9 H2OG = 8.6 SUM = 475.5
SENS. HEAT SORBENT INFLUX IN KW :
CAO = 0.0 H2OG = 0.0 CO2G = 0.0 SUM = 0.0
SENS. HEAT BURNER-STEAM INFLUX IN KW- 0.0
SENS. HEAT FLUE GAS INFLUX IN KW: 543 6
TOTAL HEAT INFLUX : 152302.5 KW
GAS ZONE HEAT BALANCE :

HEAT BALANCE -> OUT - IN : -2.3 KW
HEAT BALANCE -> (OUT-IN)/IN : -0.001539 %

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW K	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTN KW	TNEWW K
1	1	1	751.1	0.	468.	39.	-39.	505.	-429.	544.	544.	0.	751.1
1	2	1	706.3	0.	955.	118.	-118.	961.	-837.	1079.	1079.	0.	706.3
2	3	1	726.0	0.	2119.	213.	-213.	2160.	-1906.	2373.	2373.	0.	726.0
3	4	1	722.0	0.	1034.	115.	-115.	1045.	-919.	1160.	1160.	0.	722.0

SURFACE ZONE HEAT BALANCE : 0.0E-01 4.6E+03 4.8E+02-4.8E+02 4.7E+03-4.1E+03 5.2E+03 5.2E+03 3.0E-04

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX K	I	J	M	RDTMAX %	I	J	M	DQMAX KW	I	J	M	RDQMAX %	DQTOTAL KW	RDQTOTAL %
3	4	1	0.00	3	4	1	0.000	3	4	1	0.0	3	4	1	0.000	0.0	0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW K	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTN KW	TNEWW K
14	3	3	675.8	0.	1194.	201.	-201.	1184.	-993.	1385.	1385.	0.	675.8
9	4	3	732.6	0.	1133.	127.	-127.	1139.	-1006.	1266.	1266.	0.	732.6

SURFACE ZONE HEAT BALANCE : 0.0E-01 2.3E+03 3.3E+02-3.3E+02 2.3E+03-2.0E+03 2.7E+03 2.7E+03-2.4E-04

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX K	I	J	M	RDTMAX %	I	J	M	DQMAX KW	I	J	M	RDQMAX %	DQTOTAL KW	RDQTOTAL %
9	4	3	0.00	9	4	3	0.000	9	4	3	0.0	9	4	3	0.000	0.0	0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW K	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTN KW	TNEWW K
1	2	4	700.4	0.	2045.	271.	-271.	2047.	-1774.	2319.	2319.	0.	700.4
2	3	4	714.7	0.	3662.	415.	-415.	3704.	-3246.	4119.	4119.	0.	714.7
3	4	4	740.7	0.	5061.	467.	-467.	5177.	-4594.	5644.	5644.	0.	740.7
4	4	4	795.7	0.	6758.	455.	-455.	7031.	-6303.	7486.	7486.	0.	795.7
5	4	4	829.3	0.	5104.	278.	-278.	5375.	-4826.	5653.	5653.	0.	829.3
6	4	4	844.7	0.	8551.	477.	-477.	8998.	-8073.	9475.	9475.	0.	844.7
7	4	4	817.7	0.	5819.	405.	-405.	6039.	-5415.	6444.	6444.	0.	817.7
8	4	4	790.0	0.	5041.	432.	-432.	5153.	-4608.	5585.	5585.	0.	790.0
9	4	4	748.5	0.	4428.	430.	-430.	4500.	-3998.	4930.	4930.	0.	748.5
10	3	4	740.4	0.	2919.	331.	-331.	2925.	-2588.	3256.	3256.	0.	740.4
11	3	4	690.2	0.	1923.	342.	-342.	1855.	-1582.	2197.	2197.	0.	690.2
12	3	4	675.9	0.	1577.	314.	-314.	1515.	-1263.	1829.	1829.	0.	675.9
13	3	4	666.6	0.	1350.	290.	-290.	1298.	-1060.	1588.	1588.	0.	666.6
14	3	4	659.0	0.	1165.	273.	-273.	1120.	-893.	1393.	1393.	0.	659.0
15	2	4	631.8	0.	395.	212.	-212.	334.	-183.	546.	546.	0.	631.8
16	2	4	630.9	0.	378.	196.	-196.	331.	-182.	528.	528.	0.	630.9
17	2	4	624.9	0.	277.	184.	-184.	246.	-94.	430.	430.	0.	624.9
18	2	4	622.2	0.	223.	165.	-165.	208.	-58.	373.	373.	0.	622.2
19	2	4	638.2	0.	724.	200.	-200.	744.	-524.	944.	944.	0.	638.2

SURFACE ZONE HEAT BALANCE : 0.0E-01 5.7E+04 6.1E-03-6.1E-03 5.9E+04-5.1E+04 6.5E+04 6.5E+04 4.8E-03

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX K	I	J	M	RDTMAX %	I	J	M	DQMAX KW	I	J	M	RDQMAX %	DQTOTAL KW	RDQTOTAL %
19	2	4	0.00	19	2	4	0.000	3	4	4	0.0	17	2	4	0.000	0.0	0.000

THE DISTRIBUTION OF T in K AFTER 100 ITERATIONS

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	1.392E+03	1.472E+03	1.476E+03	1.554E+03	1.599E+03	1.625E+03	1.474E+03	0.000E-01
J= 3	0.000E-01	1.354E+03	1.407E+03	1.565E+03	1.663E+03	1.701E+03	1.695E+03	1.674E+03	1.584E+03	1.539E+03
J= 2	1.345E+03	1.389E+03	1.465E+03	1.561E+03	1.644E+03	1.682E+03	1.684E+03	1.663E+03	1.605E+03	1.553E+03
J= 1	1.385E+03	1.417E+03	1.491E+03	1.568E+03	1.625E+03	1.658E+03	1.658E+03	1.636E+03	1.602E+03	1.513E+03

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	1.455E+03	1.377E+03	1.316E+03	1.269E+03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	1.479E+03	1.417E+03	1.373E+03	1.296E+03	1.237E+03	1.191E+03	1.121E+03	1.068E+03	1.045E+03	
J= 1	1.436E+03	1.392E+03	1.369E+03	1.307E+03	1.246E+03	1.211E+03	1.126E+03	1.064E+03	1.044E+03	

I	J	I=11 CO2 KG/KG	I=12 H2O KG/KG	I=13 N2 KG/KG	I=14 O2 KG/KG	I=15 VOL KG/KG	I=16 SO2 KG/KG	I=17 ASH KG/KG	I=18 CHAR KG/KG	I=19 SOOT KG/KG
1	1	0.1966	0.0804	0.7118	0.0101	0.0000	0.0012	0.0000	0.0000	0.0000
2	1	0.1966	0.0804	0.7117	0.0101	0.0000	0.0012	0.0000	0.0000	0.0000
3	1	0.1968	0.0807	0.7114	0.0100	0.0000	0.0012	0.0000	0.0000	0.0000
4	1	0.1972	0.0813	0.7111	0.0093	0.0000	0.0012	0.0000	0.0000	0.0000
5	1	0.1981	0.0830	0.7107	0.0070	0.0000	0.0012	0.0000	0.0000	0.0000
6	1	0.1987	0.0846	0.7107	0.0047	0.0001	0.0011	0.0000	0.0000	0.0000
7	1	0.1985	0.0855	0.7107	0.0039	0.0002	0.0011	0.0000	0.0000	0.0000
8	1	0.1970	0.0860	0.7110	0.0048	0.0001	0.0011	0.0000	0.0000	0.0000
9	1	0.1936	0.0857	0.7117	0.0080	0.0000	0.0011	0.0000	0.0000	0.0000
10	1	0.1927	0.0855	0.7120	0.0087	0.0000	0.0011	0.0000	0.0000	0.0000
11	1	0.1925	0.0855	0.7121	0.0088	0.0000	0.0011	0.0000	0.0000	0.0000
12	1	0.1921	0.0854	0.7122	0.0092	0.0000	0.0011	0.0000	0.0000	0.0000
13	1	0.1908	0.0852	0.7124	0.0105	0.0000	0.0011	0.0000	0.0000	0.0000
14	1	0.1886	0.0848	0.7129	0.0126	0.0000	0.0010	0.0000	0.0000	0.0000
15	1	0.1882	0.0847	0.7130	0.0131	0.0000	0.0010	0.0000	0.0000	0.0000
16	1	0.1882	0.0847	0.7130	0.0131	0.0000	0.0010	0.0000	0.0000	0.0000
17	1	0.1882	0.0847	0.7130	0.0131	0.0000	0.0010	0.0000	0.0000	0.0000
18	1	0.1882	0.0847	0.7130	0.0131	0.0000	0.0010	0.0000	0.0000	0.0000
19	1	0.1882	0.0847	0.7130	0.0131	0.0000	0.0010	0.0000	0.0000	0.0000
1	2	0.1965	0.0803	0.7118	0.0102	0.0000	0.0012	0.0000	0.0000	0.0000
2	2	0.1965	0.0802	0.7117	0.0104	0.0000	0.0012	0.0000	0.0000	0.0000
3	2	0.1964	0.0801	0.7116	0.0107	0.0000	0.0012	0.0000	0.0000	0.0000
4	2	0.1966	0.0803	0.7117	0.0103	0.0000	0.0012	0.0000	0.0000	0.0000
5	2	0.1976	0.0817	0.7110	0.0084	0.0001	0.0012	0.0000	0.0000	0.0000
6	2	0.1989	0.0839	0.7104	0.0053	0.0003	0.0012	0.0000	0.0000	0.0000
7	2	0.1994	0.0857	0.7099	0.0033	0.0005	0.0011	0.0000	0.0000	0.0000
8	2	0.1973	0.0863	0.7108	0.0042	0.0004	0.0011	0.0000	0.0000	0.0000
9	2	0.1907	0.0851	0.7119	0.0111	0.0001	0.0011	0.0000	0.0000	0.0000

10	2	0.1900	0.0851	0.7122	0.0116	0.0000	0.0010	0.0000	0.0000	0.0000
11	2	0.1901	0.0851	0.7123	0.0115	0.0000	0.0010	0.0000	0.0000	0.0000
12	2	0.1899	0.0851	0.7124	0.0116	0.0000	0.0010	0.0000	0.0000	0.0000
13	2	0.1894	0.0849	0.7126	0.0121	0.0000	0.0010	0.0000	0.0000	0.0000
14	2	0.1874	0.0845	0.7131	0.0139	0.0000	0.0010	0.0000	0.0000	0.0000
15	2	0.1875	0.0845	0.7131	0.0139	0.0000	0.0010	0.0000	0.0000	0.0000
16	2	0.1876	0.0845	0.7131	0.0137	0.0000	0.0010	0.0000	0.0000	0.0000
17	2	0.1876	0.0845	0.7131	0.0137	0.0000	0.0010	0.0000	0.0000	0.0000
18	2	0.1876	0.0845	0.7131	0.0137	0.0000	0.0010	0.0000	0.0000	0.0000
19	2	0.1876	0.0845	0.7131	0.0137	0.0000	0.0010	0.0000	0.0000	0.0000
2	3	0.1964	0.0801	0.7117	0.0106	0.0000	0.0012	0.0000	0.0000	0.0000
3	3	0.1962	0.0798	0.7118	0.0111	0.0000	0.0012	0.0000	0.0000	0.0000
4	3	0.1955	0.0790	0.7122	0.0120	0.0000	0.0012	0.0000	0.0000	0.0000
5	3	0.1933	0.0784	0.7111	0.0149	0.0009	0.0012	0.0000	0.0000	0.0001
6	3	0.1962	0.0809	0.7107	0.0097	0.0014	0.0012	0.0000	0.0000	0.0001
7	3	0.1987	0.0840	0.7088	0.0047	0.0027	0.0012	0.0000	0.0000	0.0000
8	3	0.1973	0.0859	0.7099	0.0040	0.0018	0.0011	0.0000	0.0000	0.0000
9	3	0.1833	0.0826	0.7141	0.0184	0.0006	0.0010	0.0000	0.0000	0.0000
10	3	0.1852	0.0838	0.7141	0.0157	0.0001	0.0010	0.0000	0.0000	0.0000
11	3	0.1855	0.0840	0.7140	0.0155	0.0000	0.0010	0.0000	0.0000	0.0000
12	3	0.1855	0.0841	0.7139	0.0155	0.0000	0.0010	0.0000	0.0000	0.0000
13	3	0.1855	0.0841	0.7138	0.0156	0.0000	0.0010	0.0000	0.0000	0.0000
14	3	0.1855	0.0841	0.7138	0.0156	0.0000	0.0010	0.0000	0.0000	0.0000
3	4	0.1959	0.0794	0.7114	0.0122	0.0000	0.0012	0.0000	0.0000	0.0000
4	4	0.1741	0.0709	0.7123	0.0351	0.0053	0.0011	0.0000	0.0001	0.0011
5	4	0.1512	0.0630	0.7117	0.0592	0.0114	0.0009	0.0000	0.0002	0.0023
6	4	0.1662	0.0696	0.7102	0.0419	0.0095	0.0010	0.0000	0.0002	0.0016
7	4	0.1896	0.0792	0.7020	0.0138	0.0142	0.0011	0.0000	0.0000	0.0002
8	4	0.1916	0.0831	0.7081	0.0091	0.0070	0.0011	0.0000	0.0000	0.0000
9	4	0.1600	0.0737	0.7194	0.0442	0.0019	0.0009	0.0000	0.0000	0.0000

THE DISTRIBUTION OF QG in kW/m**3 AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	8.431E+01	2.812E+02	2.613E+02	3.833E-02	1.867E+02	1.171E-02	5.856E+01	0.000E-01
J= 3	0.000E-01	4.321E+01	9.893E+00	4.903E+01	1.321E+02	9.236E+01	6.476E+01	7.421E+01	5.432E+01	7.883E+01
J= 2	5.546E+01	1.219E+01	1.348E+01	3.561E+01	3.776E+01	2.009E+01	2.897E+01	3.169E+01	4.790E+01	5.147E+01
J= 1	4.149E+01	1.834E+01	2.788E+01	1.266E+01	3.149E+01	1.220E+01	3.106E+01	4.987E+01	6.605E+00	1.571E+02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	9.803E+01	9.291E+01	6.848E+01	6.754E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	8.537E+01	7.402E+01	3.879E+01	2.078E+01	8.458E+01	7.714E+01	7.243E+01	5.747E+01	3.141E+01	
J= 1	9.329E+01	3.586E+01	7.397E+00	1.752E+01	8.043E+01	7.617E+01	6.470E+01	4.872E+01	1.848E+01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF TRES in sec AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.886E-01	1.063E-01	5.971E-02	6.511E-02	6.497E-02	8.619E-02	8.386E-02	0.000E-01
J= 3	0.000E-01	2.378E-01	1.601E-01	1.436E-01	9.096E-02	8.575E-02	7.239E-02	7.752E-02	7.591E-02	9.273E-02
J= 2	1.966E-01	9.735E-02	1.326E-01	1.113E-01	7.457E-02	6.504E-02	5.391E-02	6.157E-02	6.795E-02	7.664E-02
J= 1	7.425E-02	6.855E-02	1.090E-01	1.035E-01	7.061E-02	6.333E-02	5.005E-02	6.532E-02	7.438E-02	7.600E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	1.150E-01	1.203E-01	1.248E-01	1.621E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	1.118E-01	1.154E-01	1.123E-01	5.556E-02	6.506E-02	6.913E-02	9.148E-02	9.352E-02	1.562E-01	
J= 1	1.138E-01	1.157E-01	9.121E-02	5.234E-02	4.733E-02	5.202E-02	9.184E-02	9.361E-02	1.568E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOHR in kW AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.342E+03	2.032E+04	2.217E+04	2.766E+04	8.395E+03	1.300E+03	2.766E+01	0.000E-01
J= 3	0.000E-01	0.000E-01	4.149E+01	7.731E+03	1.241E+04	1.281E+04	1.383E+03	1.106E+02	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	5.532E+01	3.873E+02	2.766E+02	4.149E+01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOL in kg/(kg.mixture) AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	0.000E-01	6.398E-03	1.352E-02	9.322E-03	1.316E-03	2.314E-05	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	5.465E-05	8.485E-04	2.956E-04	3.928E-05	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	9.557E-06	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

J= 4	7.220E+02
J= 3	7.260E+02

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J= 2   7.063E+02
J= 1   7.511E+02

        M1= 1

     THE DISTRIBUTION OF  QIN in kW/m**2 AFTER  100 ITERATIONS

J= 4   1.281E+02
J= 3   1.339E+02
J= 2   1.095E+02
J= 1   1.208E+02

        M1= 1

     THE DISTRIBUTION OF  QW in kW/m**2 AFTER  100 ITERATIONS

J= 4  -8.871E+01
J= 3  -9.191E+01
J= 2  -7.618E+01
J= 1  -1.120E+02

        M1= 1

     THE DISTRIBUTION OF  TW in K AFTER  100 ITERATIONS

J= 4   7.326E+02
J= 3   6.758E+02
J= 2   8.000E+02
J= 1   8.000E+02

        M3= 1

     THE DISTRIBUTION OF  QIN in kW/m**2 AFTER  100 ITERATIONS

J= 4   1.397E+02
J= 3   7.337E+01
J= 2   3.641E+01
J= 1   3.902E+01

        M3= 1

     THE DISTRIBUTION OF  QW in kW/m**2 AFTER  100 ITERATIONS

J= 4  -9.722E+01
J= 3  -5.180E+01
J= 2  -1.319E+01
J= 1  -1.580E+01

        M3= 1

     THE DISTRIBUTION OF  TW in K AFTER  100 ITERATIONS

M4= 1   7.004E+02  7.147E+02  7.407E+02  7.957E+02  8.293E+02  8.447E+02  8.177E+02  7.900E+02  7.485E+02  7.404E+02

          I= 1       I= 2       I= 3       I= 4       I= 5       I= 6       I= 7       I= 8       I= 9       I=10

M4= 1   6.902E+02  6.759E+02  6.666E+02  6.590E+02  6.318E+02  6.309E+02  6.249E+02  6.222E+02  6.382E+02

          I=11       I=12       I=13       I=14       I=15       I=16       I=17       I=18       I=19

     THE DISTRIBUTION OF  QIN in kW/m**2 AFTER  100 ITERATIONS

M4= 1   1.021E+02  1.198E+02  1.515E+02  2.195E+02  2.627E+02  2.809E+02  2.450E+02  2.091E+02  1.595E+02  1.481E+02

          I= 1       I= 2       I= 3       I= 4       I= 5       I= 6       I= 7       I= 8       I= 9       I=10

M4= 1   8.717E+01  7.119E+01  6.097E+01  5.264E+01  2.002E+01  1.988E+01  1.397E+01  1.179E+01  3.179E+01

          I=11       I=12       I=13       I=14       I=15       I=16       I=17       I=18       I=19

     THE DISTRIBUTION OF  QW in kW/m**2 AFTER  100 ITERATIONS

M4= 1  -7.141E+01 -8.289E+01 -1.037E+02 -1.477E+02 -1.746E+02 -1.869E+02 -1.653E+02 -1.432E+02 -1.099E+02 -1.035E+02

          I= 1       I= 2       I= 3       I= 4       I= 5       I= 6       I= 7       I= 8       I= 9       I=10

M4= 1  -6.326E+01 -5.186E+01 -4.439E+01 -3.833E+01 -1.658E+01 -1.586E+01 -1.103E+01 -8.862E+00 -2.165E+01

          I=11       I=12       I=13       I=14       I=15       I=16       I=17       I=18       I=19
iter. no.=100,  act.err.=   0.0101 %.  avg.err.=  -0.0601 %.  20 it.err.=  -0.1895 %.  hb.err.=  -0.0015 %

BALANCE OF TOTAL RADIATIVE EXCHANGE
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NUMBER OF BEAMS =  354960

SUM OF EMITTED RADIATION (KW) :
VOLUME ZONES      WALL SECTIONS              M=1        M=2        M=3        M=4          TOTAL
 1.913E+06          2.382E+04          5.879E+02  7.597E-03  7.130E-02  1.492E-04      1.937E+06

SUM OF ABSORBED RADIATION (KW) :
VOLUME ZONES      WALL SECTIONS              M=1        M=2        M=3        M=4          TOTAL
 1.871E+06          6.622E+04          4.671E+03  0.000E-01  2.943E-03  5.860E-04      1.937E+06

SUM OF NET EMITTED RADIATION (KW) :
VOLUME ZONES      WALL SECTIONS              M=1        M=2        M=3        M=4          TOTAL
```

4.239E+04 -4.240E+04 -4.084E+03 7.597E+03 -2.230E+03 -4.368E-04 -7.453E+00

ERROR OF RADIATIVE ENERGY BALANCE = -3.848E-04 %

TOTAL HEAT BALANCE :
HEAT TO FURNACE WALLS IN KW :
RAD.= 57355.7 CONV.= 6948.6 SUM = 64304.3
HEAT TO FURNACE EXIT IN KW :
RAD.= 231.3 CONV.= 0.0 SUM = 231.3
HEAT TO FURNACE HOPPER IN KW :
RAD.= 0.0 CONV.= 0.0 SUM = 0.0

HEAT FLUXES TO ZONAL HEAT EXCHANGERS IN KW :

ZONE I	BY RADI.	BY CONV.	SUM
10	1874.3	155.5	2029.8
11	4260.3	1666.2	5926.5
12	3658.8	1526.1	5184.9
13	1362.2	687.8	2050.0
14	1147.5	638.6	1786.1
15	2721.5	1401.8	4123.4
16	2147.2	1287.5	3434.7
17	2046.2	3953.6	5999.8
18	1613.3	3343.6	4956.9
19	410.0	1053.2	1463.2

CLOSURE OF TOTAL HEAT BALANCE :
HEAT FLUX FROM FLUE GAS : 101501.2 KW
HEAT FLUX TO HEAT SINKS : 101491.0 KW
DIFFERENCE : -10.2 KW
ACT. PERCENTAGE ERROR : 0.010068 %
AVG. PERCENTAGE ERRRR : -0.060126 %
AVG. ERROR OF LAST 20 IT. : -0.189528 %

I INDEX	X-CO-ORDINATE M	NET NORM. MASS FLUX -	MEAN TEMP. K	MEAN RES. TIME Sec	SUM OF RES. TIME Sec
1	0.988	0.2466	1345.05	0.6008	1.6383
2	2.964	0.5754	1381.25	0.6052	1.0353
3	4.912	0.5754	1442.42	0.7327	0.3663
4	6.772	0.5489	1544.30	0.6644	0.3322
5	8.247	0.6221	1602.68	0.3583	0.8435
6	9.722	0.9348	1646.66	0.3620	1.2036
7	11.314	0.9619	1663.75	0.2685	1.5189
8	12.700	0.8578	1657.35	0.3028	1.8045
9	14.185	1.0000	1592.64	0.3149	2.1134
10	15.608	1.0000	1540.51	0.1970	2.3693
11	16.919	1.0000	1460.61	0.2239	2.5797
12	18.279	1.0000	1391.47	0.2350	2.8092
13	19.640	1.0000	1339.50	0.2442	3.0488
14	21.000	1.0000	1299.17	0.2551	3.2984
15	22.501	1.0000	1241.30	0.1339	3.4930
16	24.144	1.0000	1196.30	0.1388	3.6293
17	25.834	1.0000	1122.36	0.1563	3.7769
18	27.570	1.0000	1067.19	0.1644	3.9372
19	29.592	1.0000	1044.66	0.2232	4.1310

MEAN GAS SPECIES CONCENTRATION ALONG FURNACE :

I	X-CO-ORD. M	CO2 VOL% WET	H2O VOL% WET	N2 VOL% WET	O2 VOL% WET	VOL VOL% WET	SO2 VOL% WET
1	0.988	12.8810	12.8603	73.2878	0.9175	0.0000	0.0534
2	2.964	12.8776	12.8444	73.2874	0.9372	0.0000	0.0534
3	4.912	12.8705	12.8131	73.2797	0.9833	0.0000	0.0534
4	6.772	12.5470	12.4817	73.2684	1.4430	0.2075	0.0523
5	8.247	11.8671	11.8961	73.0665	2.4220	0.6989	0.0494
6	9.722	12.0926	12.2471	72.9040	1.9287	0.7779	0.0498
7	11.314	12.7685	13.1684	72.3411	0.6448	1.0260	0.0511
8	12.700	12.7490	13.5554	72.6253	0.4916	0.5293	0.0495
9	14.185	12.1701	13.3364	73.0326	1.3435	0.0715	0.0460
10	15.608	12.2243	13.4420	73.0469	1.2266	0.0141	0.0460
11	16.919	12.2330	13.4621	73.0442	1.2121	0.0026	0.0460
12	18.279	12.2287	13.4631	73.0418	1.2204	0.0000	0.0459
13	19.640	12.2091	13.4523	73.0443	1.2484	0.0000	0.0458
14	21.000	12.2374	13.4676	73.0293	1.2198	0.0000	0.0460
15	22.501	12.2430	13.4703	73.0302	1.2105	0.0000	0.0460
16	24.144	12.2387	13.4680	73.0310	1.2163	0.0000	0.0460
17	25.834	12.2386	13.4679	73.0312	1.2163	0.0000	0.0460
18	27.570	12.2386	13.4678	73.0314	1.2163	0.0000	0.0460
19	29.592	12.2386	13.4678	73.0314	1.2163	0.0000	0.0460

OTHER MEAN QUANTITIES ALONG FURNACE :

I	X-CO-ORD. M	CARBON IN ASH %	TOT. FUEL HEAT REL. %	VOLATILE HEAT REL. %	SO2 REDUCTION %	CAO UTIL. %
1	0.988	39.7862	0.0000	0.0000	0.0000	0.0000
2	2.964	39.9644	0.0001	0.0000	0.0001	0.0000
3	4.912	40.4573	0.9819	1.1876	0.0002	0.0000
4	6.772	41.8713	21.0634	25.3207	0.0002	0.0000
5	8.247	43.2612	46.2229	55.3444	0.0002	0.0000
6	9.722	42.9312	76.7915	90.3325	0.0002	0.0000
7	11.314	41.4723	86.9537	98.7648	0.0002	0.0000
8	12.700	40.6730	93.4169	99.9762	0.0002	0.0000
9	14.185	39.3090	98.7889	100.0000	0.0002	0.0000
10	15.608	38.7512	99.7871	100.0000	0.0003	0.0000
11	16.919	38.4581	99.9626	100.0000	0.0003	0.0000
12	18.279	38.3088	99.9956	100.0000	0.0004	0.0000
13	19.640	38.2308	99.9956	100.0000	0.0004	0.0000
14	21.000	38.1753	99.9956	100.0000	0.0005	0.0000
15	22.501	38.1591	99.9956	100.0000	0.0005	0.0000
16	24.144	38.1527	99.9956	100.0000	0.0006	0.0000
17	25.834	38.1495	99.9956	100.0000	0.0006	0.0000
18	27.570	38.1480	99.9956	100.0000	0.0007	0.0000
19	29.592	38.1472	99.9956	100.0000	0.0007	0.0000

Listing 4.5. Contents of file BOILER.DAT (Case 3).

0301075.0 075

```
 64304.25      0.00      0.00      0.00      0.00
     0.00      0.00      0.00      0.00   2261.16
  5926.50   5184.94   2050.02   1786.12   4123.37
  3434.69   5999.79   4956.91   1463.19      0.00
     0.00      0.00      0.00      0.00      0.00
     0.00      0.00      0.00      0.00      0.00
1345.05 1381.25 1442.42 1544.30 1602.68
1646.66 1663.75 1657.35 1592.64 1540.51
1460.61 1391.47 1339.50 1299.17 1241.30
1196.30 1122.36 1067.19 1044.68    0.00
   0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00
 0.1288  0.1288  0.1287  0.1255  0.1187
 0.1209  0.1277  0.1275  0.1217  0.1222
 0.1223  0.1223  0.1221  0.1224  0.1224
 0.1224  0.1224  0.1224  0.1224  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.1286  0.1284  0.1281  0.1248  0.1190
 0.1225  0.1317  0.1356  0.1334  0.1344
 0.1346  0.1346  0.1345  0.1347  0.1347
 0.1347  0.1347  0.1347  0.1347  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.7334  0.7334  0.7333  0.7353  0.7381
 0.7373  0.7342  0.7320  0.7315  0.7311
 0.7309  0.7309  0.7309  0.7308  0.7308
 0.7308  0.7308  0.7308  0.7308  1.0000
 1.0000  1.0000  1.0000  1.0000  1.0000
 1.0000  1.0000  1.0000  1.0000  1.0000
 0.0092  0.0094  0.0098  0.0144  0.0242
 0.0193  0.0064  0.0049  0.0134  0.0123
 0.0121  0.0122  0.0125  0.0122  0.0121
 0.0122  0.0122  0.0122  0.0122  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0156  0.7776  0.2067
  57.8488
  52.5703
   3.4903
 0.0001  0.9830  0.0168  0.0001
 43277.40
 41052.96
152439.86
```

Listing 4.6. Contents of file REBURN.DAT (Case 3).

```
c UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
c GAS REBURNING
c CHANGING K / DELTA S TO SHOW HOW TO CONDUCT CONTINUATION RUN FROM
c CASE 2 (2DIN0201.075)
c
c
c
c
c
c
0301075.0
   0    1    0
  19    3    1    1
   4    5    6
   7
   9
  0.0200  0.0000
  0.8603  0.1174  0.0100  0.0061  0.0061  3.227536
  0.9880  2.9639  4.9119  6.7719  8.2469  9.7219 11.3145 12.6996 14.1847 15.6083
 16.9194 18.2795 19.6396 20.9997 22.5012 24.1442 25.8338 27.5699 29.5919
 1345.05 1381.25 1442.42 1544.30 1602.68 1646.66 1663.75 1657.35 1592.64 1540.51
 1460.61 1391.47 1339.50 1299.17 1241.30 1196.30 1122.36 1067.19 1044.68
  0.6008  0.6052  0.7327  0.6644  0.3583  0.3620  0.2685  0.3028  0.3149  0.1970
  0.2239  0.2350  0.2442  0.2551  0.1339  0.1388  0.1563  0.1644  0.2232
```

Chapter 5

5.0 CASE 4 FILES

This chapter documents all the input and output files associated with the execution of the Case 4 example as defined in Chapter 1. Case 4 example demonstrates model set-up using the 2DINPT code, and the results obtained from the 2DHT code, for the wall-fired boiler (Boiler 1) which uses *gas* as fuel. This case does not include gaseous fuel reburning applications, therefore, the RBINPT and the RBNOX codes were not used. The user may refer to Figure 1.1 for the 2D boiler zone-arrangement. Files included in this chapter are as follows:

- The record of the 2DINPT interactive session (Listing 5.1). --- This record shows the procedures of preparing an input data file step-by-step. The input file prepared for the 2DHT code has a file name as 2DIN0401.100. Note that the 2DINPT code was operated under the "updating" mode, which means that file 2DIN0401.100 was established from the modification of an existing data file (in this case, file 2DIN0201.075).

- The contents of file FORWA.DAT (Listing 5.2). --- This file was created upon completion of the 2DINPT code execution. The user is suggested to save this file under a different name (e.g., FORW0401.100) if he wishes to reproduce the Case 4 results, as this file will be over-written every time the 2DINPT code is executed. This file contains the user-specified information for the creation of the boiler forward mass fluxes.

- The contents of file RECIR.DAT (Listing 5.3). --- This file was created upon completion of the 2DINPT code execution. The user is suggested to save this file under a different name (e.g., RECI0401.100) if he wishes to reproduce the results of this case, as this file will be over-written every time the 2DINPT code is executed. This file contains the user-specified information for the creation of the boiler recirculating mass fluxes.

- The contents of the file 2DIN0401.100 (Listing 5.4).

- The contents of the computer-terminal output (Listing 5.5). --- This was the outputs directed to the computer terminal screen, showing the progress of the 2DHT code execution.

- The contents of file 2DOT0401.100 (Listing 5.6). --- File 2DOT0401.100 was created upon completion of the 2DHT furnace-code execution. This file contains the predicted boiler thermal-performance information.

- The contents of file BOILER.DAT (Listing 5.7). --- Again, this file was created upon completion of the 2DHT code execution, and may be used for later boiler performance predictions by executing the BPM code. The user is suggested to save this file under a different name (e.g., BOIL0401.100) if he wishes to reproduce this case, as this file will be over-written everytime the 2DHT code is executed. This case example does not include the demonstration of the BPM code execution. The user should refer to Case 2 example if he is interested in running the BPM code for this case.

Listing 5.1. Record of 2DINPT interactive session (Case 4).

```
2DINPT


-- This is an interactive program (2DINPT) to create
   or update a data file which is required to run the
   EER two-dimensional heat transfer code (2DHT).
-- Version 1.70, May, 1992


********************** Attention *********************
 This interactive program accepts inputs from keyboard
 in UPPER case only.
 -- Please set your keyboard to the UPPER case symbols
    (i.e., Caps Lock !).
 -- To continue, type C and press Return (or Enter).
******************************************************

C

STATUS OF INPUT FILE:
---------------------
To Create an input file, Press: C
To Update an input file,        Return

You chose to update an existing input file.

NOTE:
-- To update an existing file, you have to copy the
   existing file to file "INPUT.DAT" under DOS before you
   execute this input code.

To continue, press Return


 Chapter 1 :
-------------
INPUT/OUTPUT SPECIFICATIONS AND PARAMETERS WHICH
CONTROL THE EXTENT OF NUMERICAL CALCULATIONS

         Press: P to by-pass this chapter
                Return to proceed through

Specify the name (BOLNAM) of the boiler:  BOILER 1
-- Maximum characters allowed: 24
-- Characters can be alphabetic or numeric

         Press: C to change
                Return to continue

Specify a two-digit case number (NRCS) for
current run (e.g., 01, 02, or 03):   02
-- Case number can be used to distinguish the boiler operating
   conditions, or parametric parameters being studied

         Press: C to change
                Return to continue  C
04

Specify a two-digit version number (NRVS) for
current run (e.g., 01, 02, or 03):   01
-- Version number can be used to further document cases run
   under the same case number as specified above
```

```
         Press: C to change
                Return to continue

Specify boiler load (CLOAD) for current run:     75.0
-- Boiler load may be described as 60.5, 90.0, or 100.0,
   to show the % of current load relative to the boiler MCR

         Press: C to change
                Return to continue  C
100.

Name of output file (FINPT) from this program:   2DIN0201.075
-- Default file name is 2DINcsvs.LLL
-- csvs represents the case number and the version numbers
-- LLL shows the boiler load percentage

         Press: D for default values
                C to change
                Return to continue  D

Name of input array file (FINPTAR):   IARR0201.075
-- The default name has format as IARRcsvs.LLL
-- IARR denotes "input array" for the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output array file (FINPTAR):   OARR0201.075
-- The default name has format as OARRcsvs.LLL
-- OARR denotes "output array" from the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output file (FHDOPT) from the 2DHT code:   2DOT0201.075
-- The default name has format as 2DOTcsvs.LLL
-- 2DOT denotes "output file" from the 2DHT code

         Press: D for the default file name
                C to change the file name
                B to direct the file to your monitor
                Return to continue  D

Specification of output level (LOUTPUT) :
Current output level is DEFAULT.
-- DEFAULT setting is most useful and recommended.
-- In addition to the default setting, you can choose from
   four other output levels : 1, 2, 3, and 4.
-- Higher output levels give more comprehehsive information.

         Press: D for default values
                C to change
                Return to continue

You can include your comments on the front page
of the printout :
-- Comment block may consist of 10 lines
-- Each line may have a max. of 78 characters
To continue, press Return

Current comments are:
UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH
```

```
GAS REBURNING
" Line  3 is blank "
" Line  4 is blank "
" Line  5 is blank "
" Line  6 is blank "
" Line  7 is blank "
" Line  8 is blank "
" Line  9 is blank "
" Line 10 is blank "

         Press: C to change
                Return to continue  C

UPDATE INPUT DATA FILE 2DIN0101.100 FOR OIL FIRING AT 75% LOAD WITH

         Press: C to change
                Return to continue  C
UPDATE INPUT DATA FILE 2DIN0201.075 FOR GAS FIRING AT 100% LOAD

GAS REBURNING

         Press: C to change
                Return to continue  C


" Line  3 is blank "

         Press: C to change
                Return to continue

" Line  4 is blank "

         Press: C to change
                Return to continue

" Line  5 is blank "

         Press: C to change
                Return to continue

" Line  6 is blank "

         Press: C to change
                Return to continue

" Line  7 is blank "

         Press: C to change
                Return to continue

" Line  8 is blank "

         Press: C to change
                Return to continue

" Line  9 is blank "

         Press: C to change
                Return to continue

" Line 10 is blank "

         Press: C to change
                Return to continue
```

```
Maximum number of iterations for this run
NIMAX=100
-- During the test phase, set NIMAX =1
-- For production runs, use NIMAX values between 30 and 100

          Press: C to change
                 Return to continue

Number of iterations at which the averaging procedure
is initialized to smooth-out the Monte Carlo effects :
NITACC= 71
-- For runs without averaging, set NITACC = NIMAX.
-- For complete averaging, set NITACC =1.
-- For typical runs, set NITACC = NIMAX - 30.

          Press: C to change
                 Return to continue

Number of sub-iterations for fixed carbon mass
balances per iteration of total heat balance :
NIMX=  1
-- During test phase, set NIMX=1
-- For coal combustion, set NIMX between 5 and 10
-- For gaseous and oil fuels, set NIMX=1

          Press: C to change
                 Return to continue

(a) Number of divisions on the largest linear dimension
    of volume zones: NMAX= 2
(b) Divisions of polar angle: NPHI= 4
(c) Cut-off value for beam tracking: EXACT=0.000100
Default values are: NMAX  = 2
                    NPHI  = 4
                    EXACT = 0.0001
NMAX and NPHI must be even numbers

          Press: D for default values
                 C to change
                 Return to continue

Number of iterations after which field variables
of total heat balances are printed :
NPRIN= 100
-- Default value is NPRIN=NIMAX (recommended)

          Press: D for default values
                 C to change
                 Return to continue

Switches to print detailed outputs of:
-- total energy balance for volume and surface zones
-- mass balance for volume zones
Currently, switches are set to print the above information.

          Enter: C to change
                 Return to continue

Switches to write or read files to/from hard disk :
NWRTE: Switch to save data file at the end of the 2DHT run
       Currently, NWRTE= 1
NREAD: Switch to read variable values from a restarting
       file at the beginning of the 2DHT run
       Currently, NREAD= 0
```

```
-- For trial runs     , set NWRTE=1 and NREAD=0.
-- For continued runs, set NWRTE=1 and NREAD=1.

         Press: C to change
                Return to continue

NWRTE= 1, NREAD= 0, Are these values O.K. ?

         Press: C to change
                Return to continue

 Chapter 2 :
-------------
BOILER FURNACE OPERATING DATA

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

FUEL TYPE:
For gaseous fuels, set NGAS= 1, NLIQ= 0, NSLL= 0.
For liquid  fuels, set NGAS= 0, NLIQ= 1, NSLL= 0.
For solid   fuels, set NGAS= 0, NLIQ= 0, NSLL= 1.
Currently, NGAS= 0 NLIQ= 1 NSLL= 0

         Press: C to change
                Return to continue  C
1 0 0

You chose gas as fuel
Press Return to continue

Do you want to change fuel composition ?
-- If you select to change, you have to
   re-enter species volume fractions !!

         Press: C to change
                Return to continue  C

Fuel composition, in dry volume fraction :
   CH4        C2H6       C3H8       CXHY       CO         CO2
 0.000000   0.000000   0.000000   0.000000   0.000000   0.000000
    H2          N2         SO2        SO3         S
 0.000000   0.000000   0.000000   0.000000   0.000000


         Press: C to change
                Return to continue  C

Type in volume fractions of the following species :
   CH4        C2H6       C3H8       CxHy       CO         CO2
0.93 0.02 0.02 0.0 0.0 0.005

Type in volume fractions of the following species :
    H2          N2         SO2        SO3         S
0.0 0.025 0.0 0.0 0.0

Check the fuel compositions one more time ?

         Press: C to check
                Return to continue  C

Fuel composition, in dry volume fraction :
   CH4        C2H6       C3H8       CXHY       CO         CO2
```

```
 0.930000   0.020000   0.020000   0.000000   0.000000   0.005000
    H2         N2         SO2        SO3         S
 0.000000   0.025000   0.000000   0.000000   0.000000


          Press: C to change
                 Return to continue

Check the fuel compositions one more time ?

          Press: C to check
                 Return to continue

Fuel moisture content, in kg-water/kg(wet) fuel :  0.0200

          Press: C to change
                 Return to continue  C
0.0

The following is only information

Equivalent proximate analysis of fuel in kg/kg wet
PCFX=0.0001  PVOL=0.9998  PMOI=0.0000  PASH=0.0001

Equivalent ultimate analysis of fuel in kg/kg dry
UCAR=0.7176  UHYD=0.2327  UNIT=0.0404
UOXY=0.0092  USUL=0.0000  UASH=0.0001

Press Return to continue

Gross (higher) heating value of fuel in kj/kg wet :
HUSW= 42133.2

          Press: C to change
                 Return to continue  C
49380.7

Fuel flow rate in kg wet / sec :
FUSW=  2.9393

          Press: C to change
                 Return to continue  C
4.2122

Gross fuel heat input is   208001.4 kw

          Press: C to change
                 Return to continue

Temperature of gaseous fuel in K :
TFS=  376.15

          Press: C to change
                 Return to continue  C
298.15

Specific heat of fuels in kj/kg dry K :
CPFS=  2.0781
Default value is 2.2490 for gas

          Press: D for default values
                 C to change
                 Return to continue  C
2.1575
```

```
Air Flow Rates and Properties
Current settings:
  Total air (wet, kg/sec) flow rate =  52.5703
  Total stochiometric air ratio =   0.0000
  O2 % (dry) in flue gas =   0.0000

You have three options to choose:
  Option A -- Specify total air flow rate (wet) in kg/sec
  Option B -- Specify total stochiometric air ratio
  Option C -- Specify O2 % (dry) in the flue gas

         Press: A, B, or C for your option
                Return to continue  A

TOTAL AIR FLOW IN KG WET/S DMA2W=   52.5703

         Press: C to change
                Return to continue  C
72.5921

 DMA2W =  72.5921
 AIRNR =   0.0000
 FLUO2D=   0.0000
Are these final settings O.K. ?

         Press: C to change
                Return to continue

Water vapor content in air
(a) Relative humidity in % : RELHA2= 50.0000
(b) Saturation pressure in bar : PSH2A2=  0.0317
Default values are 50 % and 0.0317 bar at 298.15 K

         Press: D for default values
                C to change
                Return to continue

Temperature of secondary air in K :
TA2=  493.15

         Press: C to change
                Return to continue  C
491.

Amount of primary air in % of stoichiometric air :
PASTCH= 0.0
Default value is 20%

         Press: D for default values
                C to change
                Return to continue

Convective heat transfer coefficient at furnace walls
in kw/m**2 K : ALPHA=  0.0147
Default value is 0.0116 kw/m**2 K

         Press: D for default values
                C to change
                Return to continue  C
0.0186

Cool side temperature of furnace walls in K :
TOUT=611.10
Default value is 750.0 K
```

```
         Press: D for default values
                C to change
                Return to continue

 Chapter 3 :
-------------
INITIAL PARTICLE SIZE DISTRIBUTION

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Gas Firing:
Default values have been automatically set
Press Return to continue

 Chapter 4 :
-------------
PARAMETERS FOR CHAR AND VOLATILE BURN-OUT

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Fuel "Volatile" Burnout Characteristics
"Volatile" burnout time in sec : TLFMAX=  0.22
-- Default values are 0.7 sec
-- For highly swirling flow, set TLFMAX=0.4
-- For delayed mixing flame such for T-fired
   boiler, set TLFMAX=1.4

         Press: D for default values
                C to change
                Return to continue  C
0.1750

Number of lumps used to represent fuel "volatile"
combustion : NVLTOT=   8420.
-- Default value is 10000.

         Press: D for default values
                C to change
                Return to continue  D

Fractional conversion of "volatile" carbon to soot :
CMCVLS=  0.20
-- Default value is 0.1 (for high volatile bituminous flames)
-- For lignite flames, set to 0.05
-- For heavy oil flames, set to 0.2
-- For non-luminous gaseous flames, set to 0.0

         Press: D for default values
                C to change
                Return to continue  C
0.0

 Chapter 5 :
-------------
PARAMETERS FOR ASH REACTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through
```

```
Fraction of total sulfur as pyritic sulfur :
PRSULF=  0.0000
-- Default value is 0.0
-- For gas and oil firing, may set to 0.0

         Press: D for default values
                C to change
                Return to continue

 Chapter 7 :
-------------
SPECIFICATION OF FURNACE MODEL GEOMETRY

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 8 :
-------------
PARAMETERS FOR REBURNING OR CO-FIRING

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Switch for reburning or co-firing
0: to turn-off, 1: to turn-on this option
Currently, NREB=    1

         Press: C to change
                Return to continue  C
0

The follwoing is for information only:
-- You tried to convert a reburning data file for
   non-reburning applications.
-- Flow rates of reburn fuel and FGR have been set to 0.0
-- You also have to change inlet mass fluxes in Chapter 11.

Press Return to continue

 Chapter 9 :
-------------
SPECIFICATION OF HEAT EXTRACTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 11 :
--------------
RELATIVE MASS FLOW RATE DISTRIBUTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

--- Prescription of Relative Inlet Mass Flows ---
Relative inlet mass flow rates in positive X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue
```

```
Relative inlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.0000  0.2044  0.3065  0.3065  0.0404  0.0000  0.1422  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

          Press: C to change
                 Return to continue  C

DM4( 1, 3) =   0.0000

          Press: C to change
                 Return to continue

DM4( 2, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4( 3, 5) =   0.0000

          Press: C to change
                 Return to continue  C
0.283

DM4( 4, 5) =   0.2044

          Press: C to change
                 Return to continue  C
0.283

DM4( 5, 5) =   0.3065

          Press: C to change
                 Return to continue  C
0.283

DM4( 6, 5) =   0.3065

          Press: C to change
                 Return to continue  C
0.0

DM4( 7, 5) =   0.0404

          Press: C to change
                 Return to continue  C
0.151

DM4( 8, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4( 9, 5) =   0.1422

          Press: C to change
                 Return to continue  C
0.0

DM4(10, 4) =   0.0000

          Press: C to change
                 Return to continue

DM4(11, 4) =   0.0000
```

```
          Press: C to change
                 Return to continue

DM4(12,  4) =    0.0000

          Press: C to change
                 Return to continue

DM4(13,  4) =    0.0000

          Press: C to change
                 Return to continue

DM4(14,  4) =    0.0000

          Press: C to change
                 Return to continue

DM4(15,  3) =    0.0000

          Press: C to change
                 Return to continue

DM4(16,  3) =    0.0000

          Press: C to change
                 Return to continue

DM4(17,  3) =    0.0000

          Press: C to change
                 Return to continue

DM4(18,  3) =    0.0000

          Press: C to change
                 Return to continue

DM4(19,  3) =    0.0000

          Press: C to change
                 Return to continue


Note:
-- You changed the inlet mass fluxes.
-- Existing mass fluxes will be set to 0.0,
   except at the inlets and the outlets.
Press Return to continue.

--- Prescription of Relative Outlet Mass Flows ---
Relative outlet mass flow rates in negative X-direction :
 0.0000  0.0000  0.0000  0.0000

          Press: C to change
                 Return to continue

Relative outlet mass flow rates in positive X-direction :
 0.2500  0.7500

You have two options to modify outlet flow in the
positive X-direction:
   Option A -- Zonewise prescription
   Option B -- Use profile factors
```

```
-- Default is plug flow

         Press: A for option A
                B for option B
                D for the default
                Return to continue

Relative outlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative outlet mass flow rates in positive Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

--- Prescription of Relative Zonal Mass Flow Rates ---

You have two options.
-- Option A: Direct (i.e., zone by zone) prescription
-- Option B: Computer aided prescription (recommended)

         Press: A for option A
                B for option B
                Return to continue  B

You chose option B.
To continue, press Return

Normalized velocities in X-direction :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000
J= 3     0.0000  0.0000
J= 2     0.0000  3.0765
J= 1     0.0000  3.0765
         I=19    I=20
You chose option B.
To continue, press Return


--- Computer aided zonal mass prescription ---
Default distribution is plug flow in positive X-direction,
and superimpose recirculation flows latter.

         Press: D for default distribution
                Return to continue

--- Computer aided zonal mass prescription ---
You have two options to specify the mass flows
in X-direction.
```

```
 Option A: Prescribe forward velocity profiles using
           profile factors, then superimpose recirculation
           flows later (recommended).
 Option B: Prescribe complete velocity profiles (i.e., zonal
           velocity normalized with mean velocity over the
           largest furnace cross-section in the X-direction).

          Press: A for option A
                 B for option B
                 Return to continue  A

Note:
-- Data file FORWA.DAT exists
-- FORWA.DAT contains profile factors of forward velocities
Press Return to continue

Profile factors in X-direction at cross-section I=  2

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  3

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  4

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  5

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  6

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  7

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  8

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I=  9

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I= 10

          Press: C to change
                 Return to continue

Profile factors in X-direction at cross-section I= 11

          Press: C to change
```

```
                Return to continue

Profile factors in X-direction at cross-section I= 12

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 13

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 14

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 15

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 16

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 17

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 18

         Press: C to change
                Return to continue

Profile factors in X-direction at cross-section I= 19

         Press: C to change
                Return to continue

To continue, press Return

Normalized velocities in Y-direction
J= 5     0.0000  0.0000 -0.2982 -0.3181 -0.4978  0.0000 -0.2205  0.0000  0.0000
J= 4     0.0000  0.0000 -0.2622 -0.2797 -0.4378  0.0000 -0.1940  0.0000 -0.3289
J= 3     0.0000  0.0000 -0.1700 -0.1813 -0.2838  0.0000 -0.1257  0.0000 -0.2132
J= 2     0.0000  0.0000 -0.0850 -0.0907 -0.1419  0.0000 -0.0629  0.0000 -0.1066
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000 -1.5124  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000 -0.7562  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19    I=
To continue, press Return
```

```
Residual of total mass balance for volume zones
as fraction of total input mass flow :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19
To continue, press Return

 Chapter 12 :
--------------
PRESCRIPTION OF RECIRCULATING FLOW FIELD

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Note:
-- Recirculation data file (RECIR.DAT) exists
Press Return to continue

Recirculating flow over cross-section I= 2
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
35.76

Existing profile factors in pos. and neg. X-directions
over cross-section I= 2 and J= 1 :  0.000 10.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 2 and J= 2 : 10.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 3
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
26.82
```

```
Existing profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 1 :   0.000   6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 2 :   0.000   4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 3 and J= 3 :  10.000   0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 4
is     0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
17.88

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 1 :   0.000   6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 2 :   0.000   4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 3 :   4.000   0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 4 and J= 4 :   6.000   0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 5
is     0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C
```

```
Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
17.88

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 1 :  0.000  6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 2 :  0.000  4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 3 :  4.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 5 and J= 4 :  6.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 6
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
40.23

Existing profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 1 :  0.000  6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 2 :  0.000  4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 6 and J= 3 :  4.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
```

```
over cross-section I= 6 and J= 4 :   6.000   0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 7
is     0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
26.83

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 1 :   0.000   6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 2 :   0.000   4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 3 :   4.000   0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 7 and J= 4 :   6.000   0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 8
is     0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
14.03

Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 1 :   0.000   5.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 2 :   0.000   5.000
Change existing profile factors ?
```

```
         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 3 :  5.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I= 8 and J= 4 :  5.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 9
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=10
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=11
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue  C

Increase of (i.e., ADDITIONAL !!) recirculating mass flow
over this cross-section in % of inlet mass flow :
20

Existing profile factors in pos. and neg. X-directions
over cross-section I=11 and J= 1 :  0.000  6.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I=11 and J= 2 :  0.000  4.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Existing profile factors in pos. and neg. X-directions
over cross-section I=11 and J= 3 : 10.000  0.000
Change existing profile factors ?

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=12
is    0.00 % of total inlet mass flow.

         Press: C to change
```

```
                Return to continue

Recirculating flow over cross-section I=13
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I=14
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I=15
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I=16
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I=17
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I=18
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue

Recirculating flow over cross-section I=19
is    0.00 % of total inlet mass flow.

          Press: C to change
                 Return to continue

To continue, press Return


Normalized velocities in Y-direction
J= 5     0.0000  0.0000 -0.2982 -0.3181 -0.4978  0.0000 -0.2205  0.0000  0.0000
J= 4     0.0000  0.0000 -0.1698 -0.2797 -0.2450 -0.0739 -0.3079 -0.0782 -0.3289
J= 3     0.0000  0.4816 -0.3352 -0.1813  0.4058 -0.2642 -0.4537 -0.3594 -0.2132
J= 2     1.2843 -0.9633 -0.1952 -0.0907  0.3178 -0.1761 -0.3414 -0.1797 -0.1066
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1  -  I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.5623 -0.5218  0.0000  0.0000 -1.5124  0.0000  0.0000  0.0000  0.0000
J= 2     0.3749 -0.3479  0.0000  0.0000 -0.7562  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
```

```
J= 1      0.0000
          I=19     I=
To continue, press Return

 Chapter 13 :
--------------
PRESCRIPTION OF TURBULENT MASS FLUX VECTORS

          Press: P to by-pass this chapter
                 R to save file and exit 2DINPT
                 Return to proceed through

This is the current relative turbulent mass flux
field with respect to the X-direction :
J= 4      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 3      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 2      0.0000   0.0000   0.0000   0.0690   0.1192   0.2070   0.1789   0.1052   0.0000
J= 1      0.0000   0.0000   0.0000   0.0230   0.0460   0.0690   0.0690   0.0351   0.0000
          I= 1     I= 2     I= 3     I= 4     I= 5     I= 6     I= 7     I= 8     I= 9
J= 4      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 3      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 2      0.0000   0.1333   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 1      0.0000   0.0667   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
          I=10     I=11     I=12     I=13     I=14     I=15     I=16     I=17     I=18
J= 4      0.0000   0.0000
J= 3      0.0000   0.0000
J= 2      0.0000   0.0000
J= 1      0.0000   0.0000
          I=19     I=20     I=
To continue, press Return

This is the current turbulent mass flux field
with respect to the Y-direction :
J= 5      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 4      0.0000   0.0000   0.0771   0.0000   0.0964   0.0000   0.0000   0.0000   0.0000
J= 3      0.0000   0.0000   0.0000   0.0000   0.0920   0.0000   0.0000   0.0000   0.0000
J= 2      0.0000   0.0000   0.0000   0.0000   0.0230   0.0000   0.0000   0.0000   0.0000
J= 1      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
          I= 1     I= 2     I= 3     I= 4     I= 5     I= 6     I= 7     I= 8     I= 9
J= 5      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 4      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 3      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 2      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
J= 1      0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
          I=10     I=11     I=12     I=13     I=14     I=15     I=16     I=17     I=18
J= 5      0.0000
J= 4      0.0000
J= 3      0.0000
J= 2      0.0000
J= 1      0.0000
          I=19     I=
To continue, press Return

You have three options to modify the turbulent field.
Option A : Default distribution calculated by the
           2DHT program (recommended).
Option B : No turbulence at all.
Option C : Column- and row-wise prescriptions.

          Press: a corresponding key for your option
                 Return to continue

Residual of total mass balance for volume zones
as fraction of total input mass flow :
```

```
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000
J= 3     0.0000
J= 2     0.0000
J= 1     0.0000
         I=19
To continue, press Return

 Chapter 14 :
--------------
FUEL INLET FLOWS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Relative Fuel Inlet Flow Rates :
Default distribution assumes fuel inlet flows are
proportional to total mass flow rates, i.e., burners
are fired at same stoichiometry.

         Press: D for default distribution
                Return to continue

Prescription of Relative Fuel Inlet Flow Rates

Relative fuel inlet flow rates in pos. X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative fuel inlet flow rates in neg. Y-direction :
 0.0000  0.0000  0.0000  0.2500  0.3750  0.3750  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue  C

In neg. Y-direction, I =  1 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  2 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  3 FU2 =   0.0000

         Press: C to change
                Return to continue  C
0.283
```

```
In neg. Y-direction, I =  4 FU2 =   0.2500

         Press: C to change
                Return to continue  C
0.283

In neg. Y-direction, I =  5 FU2 =   0.3750

         Press: C to change
                Return to continue  C
0.283

In neg. Y-direction, I =  6 FU2 =   0.3750

         Press: C to change
                Return to continue  C
0.0

In neg. Y-direction, I =  7 FU2 =   0.0000

         Press: C to change
                Return to continue  C
0.151

In neg. Y-direction, I =  8 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  9 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 10 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 11 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 12 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 13 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 14 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 15 FU2 =   0.0000

         Press: C to change
                Return to continue
```

```
In neg. Y-direction, I = 16 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 17 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 18 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 19 FU2 =    0.0000

         Press: C to change
                Return to continue

 Chapter 15 :
--------------
DATA FOR INITIAL VOLUME AND SURFACE ZONE TEMPERATURES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through  P

 Chapter 16 :
--------------
DATA FOR EMISSIVITIES AND DEPOSIT CONDUCTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through


--- Specification of Surface Zone Emissivities ---

         Press: P to by-pass this subsection
                Return to proceed through  P


--- Specification of Surface Emissivity for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through  P


--- Specification of Deposit Conductivity/Thickness Ratios ---

         Press: P to by-pass this subsection
                Return to proceed through

Deposit thermal-conductivity/thickness ratios
CS(*,*) for surface zones in kw/m**2 K :
-- Default values for non-outlet zones are: 0.4, 0.8 and 1.0
   for coal, oil and gas fired furnaces, respectively
-- Default values for outlet zones are 0.0

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  C
```

```
Uniform value of deposit thermal conductivity to
thickness ratios CS(*,*) : 1.6

Deposit thermal conductivity to thickness ratios
CS(*,1) in kw/m**2 K :
 1.6000  1.6000  1.6000  1.6000

         Press: C to change
                Return to continue  C

For clean surfaces with constant temperatures
set CS(*,*)=0.
At J =  1, CS(J,1) =   1.6000

         Press: C to change
                Return to continue  C
0.0

At J =  2, CS(J,1) =   1.6000

         Press: C to change
                Return to continue

At J =  3, CS(J,1) =   1.6000

         Press: C to change
                Return to continue

At J =  4, CS(J,1) =   1.6000

         Press: C to change
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,3) in kw/m**2 K :
 0.0000  0.0000  1.6000  1.6000

         Press: C to change
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,2) in kw/m**2 K :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,4) in kw/m**2 K :
 1.6000  1.6000  1.6000  1.6000  1.6000  1.6000  1.6000  1.6000  1.6000  1.6000
 1.6000  1.6000  1.6000  1.6000  1.6000  1.6000  1.6000  1.6000  1.6000

         Press:-C to change
                Return to continue

         Press: C to check surface-zone CS(*,*) values one more time
                Return to continue without checking


--- Specification of Deposit Conductivity/Thickness Ratios for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through
```

```
Deposit thermal conductivity/thickness ratios
for furnace outlet surfaces
-- Default is CS(*,*)= 0.0 (recommended)

          Press: D for default values
                 C to change
                 Return to continue

NOTE:
-- Output file was saved as file 2DIN0401.100
-- To update 2DIN0401.100 further, you have to copy file 2DIN0401.100
   to file INPUT.DAT under DOS, then rerun 2DINPT.EXE
-- If you want to save the original contents of file
   INPUT.DAT, make sure you save it with a different name
```

Listing 5.2. Contents of file FORWA.DAT (Case 4).

```
    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
    1    1    1
c --
    2    1    2
 1.000  1.000
c --
    3    1    3
 1.000  1.000  1.000
c --
    4    1    4
 1.000  1.000  1.000  1.000
c --
    5    1    4
 1.000  1.000  1.000  1.000
c --
    6    1    4
 1.000  1.000  1.000  1.000
c --
    7    1    4
 1.000  1.000  1.000  1.000
c --
    8    1    4
 1.000  1.000  1.000  1.000
c --
    9    1    4
 1.000  1.000  1.000  1.000
c --
   10    1    3
 1.000  1.000  1.000
c --
   11    1    3
 1.000  1.000  1.000
c --
   12    1    3
 1.000  1.000  1.000
c --
   13    1    3
 1.000  1.000  1.000
c --
   14    1    3
 1.000  1.000  1.000
c --
   15    1    2
 1.000  1.000
c --
   16    1    2
 1.000  1.000
c --
   17    1    2
 1.000  1.000
c --
   18    1    2
 1.000  1.000
c --
   19    1    2
 1.000  1.000
```

Listing 5.3. Contents of file RECIR.DAT (Case 4).

```
    1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
    1   1   1
c --
    2   1   2
  1.000  1.000
c --
    3   1   3
  1.000  1.000  1.000
c --
    4   1   4
  1.000  1.000  1.000  1.000
c --
    5   1   4
  1.000  1.000  1.000  1.000
c --
    6   1   4
  1.000  1.000  1.000  1.000
c --
    7   1   4
  1.000  1.000  1.000  1.000
c --
    8   1   4
  1.000  1.000  1.000  1.000
c --
    9   1   4
  1.000  1.000  1.000  1.000
c --
   10   1   3
  1.000  1.000  1.000
c --
   11   1   3
  1.000  1.000  1.000
c --
   12   1   3
  1.000  1.000  1.000
c --
   13   1   3
  1.000  1.000  1.000
c --
   14   1   3
  1.000  1.000  1.000
c --
   15   1   2
  1.000  1.000
c --
   16   1   2
  1.000  1.000
c --
   17   1   2
  1.000  1.000
c --
   18   1   2
  1.000  1.000
c --
   19   1   2
  1.000  1.000
```

Listing 5.4. Contents of file 2DIN0401.100 (Case 4).

```
BOILER 1
04
01
100.0   100
2DIN0401.100
IARR0401.100
OARR0401.100
GRAF
2DOT0401.100
   4   1
c UPDATE INPUT DATA FILE 2DIN0201.075 FOR GAS FIRING AT 100% LOAD
c
c
c
c
c
c
c
c
c
 100
    09999.000009999.00000
  71
   1
   2   40.000100
 100
   0
   1   1
   1   0
   0
   1   0   0
  0.0001  0.9998  0.0000  0.0001
  0.7176  0.2327  0.0404  0.0092  0.0000  0.0001
  0.0000
 49380.7
  4.2122
  298.15
  2.1575
   72.5921
  0.0000
  0.0000
 50.0000  0.0317
  491.00
  0.0000      0.0
  0.0186
  611.10
 0.0000018 0.0000044 0.0000111 0.0000278 0.0000699 0.0001500 0.0002500 0.0003500
 0.0004500 0.0005500
  0.1000  0.1000  0.1000  0.1000  0.1000  0.1000  0.1000  0.1000  0.1000  0.1000
   1200.00     690.00
      1.00   1200.00       1.00
  0.0000    0.00
  0.1750  10000.
  0.0000
  0.300000  0.300000  0.002917  0.002917
   0
   0   1   0   0
    0.0000
   0    0.000000    0.000000   74.094742    0.000000    0.000000
    0.000000    0.000000    0.000000    0.000000
   5
0.00000000000.00000000000.00000000000.00000000000.0000000000
  0.000000  0.000000  0.000000  0.000000  0.000000
    0.00    0.00    0.00    0.00    0.00
    0.00    0.00    0.00
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0
```

```
0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
0.0000000 0.0000000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.0000
  0
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000000
0.1000000
 19   4
  1  10  19
   0.0000  0.0000
 0.000
   0.00
  0
 1.9760  1.9759  1.9200  1.8000  1.1500  1.8000  1.3851  1.3851  1.5851  1.2621
 1.3601  1.3601  1.3601  1.3601  1.6430  1.6430  1.7361  1.7361  2.3079
 1.1534  1.1534  1.2514  0.4879
  1   1   2   3
 19  19  14   9
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  2   3   4   4   4   4   4   4   4   3   3   3   3   3   2   2   2   2   2
  0   0   0
 0.0000  573.15
 0.0000
 298.15
 2.1580
44302.7
 0.0000
 0.930000  0.020000  0.020000  0.000000  0.005000  0.000000  0.025000  0.000000
 0.000000  0.000000  0.000000
0.0000000 0.0000000
 0.4378   1580.
 0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000    .000  0.0000  1.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0   0
300.00000   0.00000   0.00000
  0.00000   0.00000   0.00000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  2.4646
 3.8887  3.8887  0.0000  0.0000  9.2101  9.2101 11.4566 11.4566  2.9108
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.5925  2.5925  0.0000  0.0000  5.5261  5.5261  7.6377  7.6377  1.9405
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 2.1146  2.1146  2.1148  2.1148  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  800.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00    0.00    0.00  800.00  800.00  800.00  800.00  800.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 800.00  800.00  800.00  800.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.7000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.0000  0.0000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.7000  0.7000  0.7000  0.7000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000  0.8000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.0000  0.0000  0.4000  0.4000  0.6000  0.6000  0.6000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.4000  0.4000  0.4000  0.4000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0   0   0   0   0   0   0   0   0   1   3   3   1   1   7   7   9   9   2
```

```
  0    0    0    0    0    0    0    0    0   24   21   21   21   21   22   22   24   24   30
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0508
0.0508  0.0508  0.0508  0.0508  0.0508  0.0508  0.0508  0.0508  0.0508
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.5402
1.0497  1.0497  3.1495  3.1495  0.2867  0.2867  0.2303  0.2303  0.9333
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.9660
0.7844  0.7844  0.7844  0.7844  0.6802  0.6802  0.7022  0.7022  0.6603
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0200
0.0200  0.0200  0.0200  0.0200  0.0200  0.0200  0.0500  0.0500  0.0500
  0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  720.00
720.00  720.00  720.00  720.00  786.39  786.39  765.56  765.56  765.56
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  1.0000
1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000  1.0000
 0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
0.0000  0.0000  0.0000  0.0000
0.0000  0.3576  0.0000  0.0000
0.0000  0.0000  0.2682  0.0000
0.0230  0.0690  0.2286  0.1412
0.0460  0.1380  0.3554  0.2054
0.0690  0.2070  0.6094  0.3659
0.0690  0.2070  0.5332  0.3081
0.0813  0.2438  0.5415  0.2737
0.0813  0.2438  0.4483  0.2266
0.1051  0.3152  0.5797  0.0000
0.1051  0.3152  0.7797  0.0000
0.1051  0.3152  0.5797  0.0000
0.1051  0.3152  0.5797  0.0000
0.1051  0.3152  0.5797  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.2500  0.7500  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.3576  0.0000  0.0000  0.0000
0.0894  0.1788  0.0000  0.0000
0.0596  0.1192  0.0000  0.0000
0.0596  0.1192  0.0000  0.0000
0.1341  0.2682  0.0000  0.0000
0.0894  0.1789  0.0000  0.0000
0.0351  0.1052  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0667  0.1333  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.3576  0.0000  0.0000  0.0000  0.0745  0.0000  0.0000  0.0000  0.0000  0.0667
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.2682  0.0000  0.0000  0.2235  0.0000  0.0000  0.0000  0.0000  0.2000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

0.0000	0.0000	0.0771	0.0000	0.0964	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.2682	0.0528	0.0230	0.0230	0.0447	0.0666	0.0351	0.0238	0.0000
0.0667	0.0000	0.0000	0.1449	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.1814	0.0920	0.0920	0.1340	0.1771	0.1403	0.0953	0.0000
0.2000	0.0000	0.0000	0.5797	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.2189	0.2189	0.2189	0.0578	0.1854	0.0471	0.2266	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.2830	0.2830	0.2830	0.0000	0.1510	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000						
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.0000	0.0000	-0.2830	-0.2830	-0.2830	0.0000	-0.1510	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	
1.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00
1600.00	1600.00	1600.00	1600.00	1.00	1.00	1.00	1.00	1.00	
1.00	1.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1600.00	1.00
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
350.00	1200.00	1200.00	1200.00						
800.00	800.00	1200.00	1200.00						
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00
1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	
1.0000	0.7000	0.7000	0.7000						
1.0000	1.0000 -	0.7000	0.7000						
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000
0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	0.7000	
0.0000	1.6000	1.6000	1.6000						
0.0000	0.0000	1.6000	1.6000						
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	1.6000
1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	1.6000	
100.00	100.00								

Listing 5.5. Screen output from the 2DHT code (Case 4).

2DHT

```
iter.no.=  1, act.err.= -80.858 %, avg.err.= -80.858 %, 20 it.err.= -80.858 %,
              hb. err.=   6.552 %
iter.no.=  2, act.err.= -30.610 %, avg.err.= -55.734 %, 20 it.err.= -55.734 %,
              hb. err.=   6.799 %
iter.no.=  3, act.err.= -20.621 %, avg.err.= -44.030 %, 20 it.err.= -44.030 %,
              hb. err.=   3.266 %
iter.no.=  4, act.err.= -13.602 %, avg.err.= -36.423 %, 20 it.err.= -36.423 %,
              hb. err.=   0.686 %
iter.no.=  5, act.err.= -10.867 %, avg.err.= -31.311 %, 20 it.err.= -31.311 %,
              hb. err.=   0.203 %
iter.no.=  6, act.err.=  -4.808 %, avg.err.= -26.894 %, 20 it.err.= -26.894 %,
              hb. err.=  -0.980 %
iter.no.=  7, act.err.=  -2.122 %, avg.err.= -23.355 %, 20 it.err.= -23.355 %,
              hb. err.=  -1.802 %
iter.no.=  8, act.err.=  -0.445 %, avg.err.= -20.492 %, 20 it.err.= -20.492 %,
              hb. err.=  -2.667 %
iter.no.=  9, act.err.=   0.572 %, avg.err.= -18.151 %, 20 it.err.= -18.151 %,
              hb. err.=  -1.534 %
iter.no.= 10, act.err.=   2.509 %, avg.err.= -16.085 %, 20 it.err.= -16.085 %,
              hb. err.=  -2.046 %
iter.no.= 11, act.err.=   3.221 %, avg.err.= -14.330 %, 20 it.err.= -14.330 %,
              hb. err.=  -2.560 %
iter.no.= 12, act.err.=   2.274 %, avg.err.= -12.946 %, 20 it.err.= -12.946 %,
              hb. err.=  -2.304 %
iter.no.= 13, act.err.=   2.974 %, avg.err.= -11.722 %, 20 it.err.= -11.722 %,
              hb. err.=  -2.278 %
iter.no.= 14, act.err.=   3.312 %, avg.err.= -10.648 %, 20 it.err.= -10.648 %,
              hb. err.=  -2.158 %
iter.no.= 15, act.err.=   1.845 %, avg.err.=  -9.815 %, 20 it.err.=  -9.815 %,
              hb. err.=  -1.299 %
iter.no.= 16, act.err.=   2.881 %, avg.err.=  -9.022 %, 20 it.err.=  -9.022 %,
              hb. err.=  -1.518 %
iter.no.= 17, act.err.=   2.829 %, avg.err.=  -8.325 %, 20 it.err.=  -8.325 %,
              hb. err.=  -1.881 %
iter.no.= 18, act.err.=   3.058 %, avg.err.=  -7.748 %, 20 it.err.=  -7.748 %,
              hb. err.=  -0.972 %
iter.no.= 19, act.err.=   3.134 %, avg.err.=  -7.175 %, 20 it.err.=  -7.175 %,
              hb. err.=  -1.421 %
iter.no.= 20, act.err.=   2.911 %, avg.err.=  -6.671 %, 20 it.err.=  -6.671 %,
              hb. err.=  -1.354 %
iter.no.= 21, act.err.=   2.016 %, avg.err.=  -6.257 %, 20 it.err.=  -2.527 %,
              hb. err.=  -0.695 %
iter.no.= 22, act.err.=   1.114 %, avg.err.=  -5.922 %, 20 it.err.=  -0.941 %,
              hb. err.=  -0.399 %
iter.no.= 23, act.err.=   1.677 %, avg.err.=  -5.592 %, 20 it.err.=   0.174 %,
              hb. err.=  -1.288 %
iter.no.= 24, act.err.=  -0.725 %, avg.err.=  -5.389 %, 20 it.err.=   0.818 %,
              hb. err.=   0.413 %
iter.no.= 25, act.err.=   1.350 %, avg.err.=  -5.119 %, 20 it.err.=   1.429 %,
              hb. err.=  -1.122 %
iter.no.= 26, act.err.=   1.758 %, avg.err.=  -4.855 %, 20 it.err.=   1.757 %,
              hb. err.=  -1.191 %
iter.no.= 27, act.err.=  -0.078 %, avg.err.=  -4.678 %, 20 it.err.=   1.859 %,
              hb. err.=   0.292 %
iter.no.= 28, act.err.=   0.948 %, avg.err.=  -4.477 %, 20 it.err.=   1.929 %,
              hb. err.=  -0.181 %
iter.no.= 29, act.err.=   0.076 %, avg.err.=  -4.320 %, 20 it.err.=   1.904 %,
              hb. err.=  -0.402 %
iter.no.= 30, act.err.=   1.579 %, avg.err.=  -4.123 %, 20 it.err.=   1.858 %,
              hb. err.=  -0.800 %
iter.no.= 31, act.err.=  -1.211 %, avg.err.=  -4.029 %, 20 it.err.=   1.636 %,
              hb. err.=   0.463 %
iter.no.= 32, act.err.=   2.663 %, avg.err.=  -3.820 %, 20 it.err.=   1.656 %,
              hb. err.=  -1.432 %
iter.no.= 33, act.err.=  -0.747 %, avg.err.=  -3.727 %, 20 it.err.=   1.470 %,
              hb. err.=   0.273 %
iter.no.= 34, act.err.=   0.627 %, avg.err.=  -3.599 %, 20 it.err.=.  1.335 %,
              hb. err.=  -0.121 %
iter.no.= 35, act.err.=   0.941 %, avg.err.=  -3.469 %, 20 it.err.=   1.290 %,
              hb. err.=  -0.318 %
```

```
iter.no.= 36, act.err.=  -0.236 %, avg.err.=  -3.379 %, 20 it.err.=   1.134 %,
              hb. err.=  -0.022 %
iter.no.= 37, act.err.=  -0.104 %, avg.err.=  -3.291 %, 20 it.err.=   1.088 %,
              hb. err.=   0.533 %
iter.no.= 38, act.err.=   0.797 %, avg.err.=  -3.183 %, 20 it.err.=   1.025 %,
              hb. err.=  -0.259 %
iter.no.= 39, act.err.=   0.070 %, avg.err.=  -3.100 %, 20 it.err.=   0.771 %,
              hb. err.=  -0.424 %
iter.no.= 40, act.err.=   0.918 %, avg.err.=  -2.999 %, 20 it.err.=   0.672 %,
              hb. err.=  -0.208 %
iter.no.= 41, act.err.=  -0.595 %, avg.err.=  -2.941 %, 20 it.err.=   0.541 %,
              hb. err.=   0.896 %
iter.no.= 42, act.err.=   0.267 %, avg.err.=  -2.864 %, 20 it.err.=   0.499 %,
              hb. err.=   0.020 %
iter.no.= 43, act.err.=  -1.124 %, avg.err.=  -2.824 %, 20 it.err.=   0.359 %,
              hb. err.=   0.384 %
iter.no.= 44, act.err.=  -0.002 %, avg.err.=  -2.760 %, 20 it.err.=   0.395 %,
              hb. err.=   0.030 %
iter.no.= 45, act.err.=  -0.016 %, avg.err.=  -2.699 %, 20 it.err.=   0.327 %,
              hb. err.=  -0.135 %
iter.no.= 46, act.err.=  -1.341 %, avg.err.=  -2.669 %, 20 it.err.=   0.172 %,
              hb. err.=   0.559 %
iter.no.= 47, act.err.=  -1.407 %, avg.err.=  -2.642 %, 20 it.err.=   0.105 %,
              hb. err.=   0.267 %
iter.no.= 48, act.err.=   1.294 %, avg.err.=  -2.560 %, 20 it.err.=   0.123 %,
              hb. err.=  -0.504 %
iter.no.= 49, act.err.=   0.505 %, avg.err.=  -2.498 %, 20 it.err.=   0.144 %,
              hb. err.=  -0.025 %
iter.no.= 50, act.err.=   0.126 %, avg.err.=  -2.445 %, 20 it.err.=   0.071 %,
              hb. err.=   0.168 %
iter.no.= 51, act.err.=  -0.279 %, avg.err.=  -2.403 %, 20 it.err.=   0.118 %,
              hb. err.=  -0.202 %
iter.no.= 52, act.err.=   0.596 %, avg.err.=  -2.345 %, 20 it.err.=   0.015 %,
              hb. err.=   0.333 %
iter.no.= 53, act.err.=   0.006 %, avg.err.=  -2.301 %, 20 it.err.=   0.052 %,
              hb. err.=   0.096 %
iter.no.= 54, act.err.=  -1.475 %, avg.err.=  -2.286 %, 20 it.err.=  -0.053 %,
              hb. err.=   0.414 %
iter.no.= 55, act.err.=  -0.723 %, avg.err.=  -2.257 %, 20 it.err.=  -0.136 %,
              hb. err.=   0.571 %
iter.no.= 56, act.err.=  -0.245 %, avg.err.=  -2.221 %, 20 it.err.=  -0.137 %,
              hb. err.=  -0.251 %
iter.no.= 57, act.err.=  -0.885 %, avg.err.=  -2.198 %, 20 it.err.=  -0.176 %,
              hb. err.=  -0.181 %
iter.no.= 58, act.err.=   2.044 %, avg.err.=  -2.125 %, 20 it.err.=  -0.113 %,
              hb. err.=  -1.110 %
iter.no.= 59, act.err.=  -0.078 %, avg.err.=  -2.090 %, 20 it.err.=  -0.121 %,
              hb. err.=  -0.040 %
iter.no.= 60, act.err.=   0.376 %, avg.err.=  -2.049 %, 20 it.err.=  -0.148 %,
              hb. err.=   0.338 %
iter.no.= 61, act.err.=  -0.469 %, avg.err.=  -2.023 %, 20 it.err.=  -0.142 %,
              hb. err.=   0.165 %
iter.no.= 62, act.err.=   1.035 %, avg.err.=  -1.974 %, 20 it.err.=  -0.103 %,
              hb. err.=  -1.165 %
iter.no.= 63, act.err.=   1.099 %, avg.err.=  -1.925 %, 20 it.err.=   0.008 %,
              hb. err.=   0.040 %
iter.no.= 64, act.err.=   1.906 %, avg.err.=  -1.865 %, 20 it.err.=   0.103 %,
              hb. err.=  -0.676 %
iter.no.= 65, act.err.=   0.913 %, avg.err.=  -1.822 %, 20 it.err.=   0.150 %,
              hb. err.=  -0.633 %
iter.no.= 66, act.err.=  -0.727 %, avg.err.=  -1.806 %, 20 it.err.=   0.180 %,
              hb. err.=   0.283 %
iter.no.= 67, act.err.=   0.833 %, avg.err.=  -1.766 %, 20 it.err.=   0.292 %,
              hb. err.=  -0.674 %
iter.no.= 68, act.err.=  -0.511 %, avg.err.=  -1.748 %, 20 it.err.=   0.202 %,
              hb. err.=   0.238 %
iter.no.= 69, act.err.=  -0.618 %, avg.err.=  -1.732 %, 20 it.err.=   0.146 %,
              hb. err.=   0.485 %
iter.no.= 70, act.err.=   1.224 %, avg.err.=  -1.689 %, 20 it.err.=   0.201 %,
              hb. err.=  -0.946 %
iter.no.= 71, act.err.=  -0.536 %, avg.err.=  -1.673 %, 20 it.err.=   0.188 %,
              hb. err.=  -0.044 %
```

```
iter.no.= 72, act.err.=   0.136 %, avg.err.=  -1.648 %, 20 it.err.=   0.165 %,
              hb. err.=  -0.196 %
iter.no.= 73, act.err.=   0.219 %, avg.err.=  -1.622 %, 20 it.err.=   0.176 %,
              hb. err.=   0.010 %
iter.no.= 74, act.err.=   0.014 %, avg.err.=  -1.600 %, 20 it.err.=   0.250 %,
              hb. err.=  -0.042 %
iter.no.= 75, act.err.=   0.250 %, avg.err.=  -1.576 %, 20 it.err.=   0.239 %,
              hb. err.=  -0.224 %
iter.no.= 76, act.err.=   0.669 %, avg.err.=  -1.546 %, 20 it.err.=   0.345 %,
              hb. err.=  -0.075 %
iter.no.= 77, act.err.=   0.961 %, avg.err.=  -1.513 %, 20 it.err.=   0.437 %,
              hb. err.=  -0.012 %
iter.no.= 78, act.err.=   0.945 %, avg.err.=  -1.482 %, 20 it.err.=   0.382 %,
              hb. err.=  -0.104 %
iter.no.= 79, act.err.=   0.956 %, avg.err.=  -1.451 %, 20 it.err.=   0.434 %,
              hb. err.=  -0.004 %
iter.no.= 80, act.err.=   1.150 %, avg.err.=  -1.419 %, 20 it.err.=   0.472 %,
              hb. err.=   0.108 %
iter.no.= 81, act.err.=   0.757 %, avg.err.=  -1.392 %, 20 it.err.=   0.534 %,
              hb. err.=  -0.024 %
iter.no.= 82, act.err.=   0.757 %, avg.err.=  -1.366 %, 20 it.err.=   0.520 %,
              hb. err.=  -0.005 %
iter.no.= 83, act.err.=   0.974 %, avg.err.=  -1.337 %, 20 it.err.=   0.514 %,
              hb. err.=   0.114 %
iter.no.= 84, act.err.=   0.665 %, avg.err.=  -1.313 %, 20 it.err.=   0.452 %,
              hb. err.=  -0.006 %
iter.no.= 85, act.err.=   0.394 %, avg.err.=  -1.293 %, 20 it.err.=   0.426 %,
              hb. err.=  -0.066 %
iter.no.= 86, act.err.=   0.721 %, avg.err.=  -1.270 %, 20 it.err.=   0.498 %,
              hb. err.=   0.084 %
iter.no.= 87, act.err.=   0.469 %, avg.err.=  -1.250 %, 20 it.err.=   0.480 %,
              hb. err.=  -0.048 %
iter.no.= 88, act.err.=   0.363 %, avg.err.=  -1.232 %, 20 it.err.=   0.523 %,
              hb. err.=  -0.073 %
iter.no.= 89, act.err.=   0.632 %, avg.err.=  -1.211 %, 20 it.err.=   0.586 %,
              hb. err.=   0.066 %
iter.no.= 90, act.err.=   0.431 %, avg.err.=  -1.192 %, 20 it.err.=   0.546 %,
              hb. err.=  -0.058 %
iter.no.= 91, act.err.=   0.338 %, avg.err.=  -1.176 %, 20 it.err.=   0.590 %,
              hb. err.=  -0.102 %
iter.no.= 92, act.err.=   0.523 %, avg.err.=  -1.157 %, 20 it.err.=   0.609 %,
              hb. err.=   0.018 %
iter.no.= 93, act.err.=   0.628 %, avg.err.=  -1.138 %, 20 it.err.=   0.630 %,
              hb. err.=   0.037 %
iter.no.= 94, act.err.=   0.445 %, avg.err.=  -1.121 %, 20 it.err.=   0.651 %,
              hb. err.=   0.026 %
iter.no.= 95, act.err.=   0.392 %, avg.err.=  -1.105 %, 20 it.err.=   0.658 %,
              hb. err.=   0.021 %
iter.no.= 96, act.err.=   0.494 %, avg.err.=  -1.089 %, 20 it.err.=   0.650 %,
              hb. err.=   0.103 %
iter.no.= 97, act.err.=   0.252 %, avg.err.=  -1.075 %, 20 it.err.=   0.614 %,
              hb. err.=  -0.059 %
iter.no.= 98, act.err.=   0.199 %, avg.err.=  -1.062 %, 20 it.err.=   0.577 %,
              hb. err.=  -0.076 %
iter.no.= 99, act.err.=   0.496 %, avg.err.=  -1.046 %, 20 it.err.=   0.554 %,
              hb. err.=   0.061 %
iter.no.=100, act.err.=   0.373 %, avg.err.=  -1.032 %, 20 it.err.=   0.515 %,
              hb. err.=  -0.011 %
```

Listing 5.6. Contents of file 2DOT0401.100 (Case 4).

```
**********************
*                    *
* GENERAL INFORMATION *
*                    *
**********************

                        BOILER NAME:        BOILER 1
                        CASE NUMBER:        04
                        VERSION NUMBER:     01
                        THERMAL LOAD:       100 /    % OF FULL LOAD

***************
*             *
* INPUT/OUTPUT *
*             *
***************

                        NREAD:                0
                        NWRTE:                1

                        NAME OF INPUT DATA FILE:              2DIN0401.100 (copied to 2DINPT.DAT)
                        NAME OF INPUT ARRAY FILE:             IARR0401.100
                        NAME OF OUTPUT ARRAY FILE:            OARR0401.100
                        NAME OF GRAPHICS OUTPUT FILE.         GRAF
                        NAME OF OUTPUT DATA FILE:             2DOT0401.100
                        OUTPUT LEVEL:                         DEFAULT

*****************
*               *
* USER'S COMMENTS *
*               *
*****************

C UPDATE INPUT DATA FILE 2DIN0201.075 FOR GAS FIRING AT 100% LOAD
C
C
C
C
C
C
C
C
C
```

```
*****************************
*                           *
* SUMMARY OF INPUT PARAMETERS *
*                           *
*****************************

                FUEL TYPE:                                    GAS
                TOTAL FUEL FLOW:                          4.2122    KG WET S
                TOTAL AIR FLOW:                          72.5921    KG WET S
                EXCESS AIR:                               6.0000    %
                O2-CONTENT OF FLUE GAS.                   1.3145    VOL  % DRY
                SEC. AIR TEMPERATURE:                   491.0000    K
                PRIM. MIXTURE TEMPERATURE:              298.1500    K
                AMOUNT OF PRIM  AIR. IN % OF STOICH. AIR:  0.0000   %

FUEL PROPERTY -
**************
                PROXIMATE: CFIX              0.0001     KG/KG WET
                           VOL               0.9998     KG/KG WET
                           MOI               0.0000     KG/KG WET
                           ASH               0.0001     KG/KG WET

                ULTIMATE:    C               0.7176     KG/KG DRY
                             H               0.2327     KG/KG DRY
                             N               0.0404     KG/KG DRY
                             O               0.0092     KG/KG DRY
                             S               0.0000     KG/KG DRY
                           ASH               0.0001     KG/KG DRY


                UPPER HEATING VALUE:      49380.6992     KJ/KG WET
                LOWER HEATING VALUE:      44303.0742     KJ/KG DRY

ASH RADIATION -
**************
                CLOUD SPECIFIC ABSORPTION COEFFICIENT:                  0.0000    1/((KG/M**3)M)
                CLOUD SPECIFIC SURFACE AREA:                            0.0000    M**2/KG
                SCATTERING:                                               NO
                ABSORPTION EFFICIENCY:                                  0.1000
                SCATTERING EFFICIENCY:                                  0.0000

NUMERICAL PARAMETERS -
*********************
                NMAX:                       2
                NPHI:                       4
                EXACT:                      0.00010
                NO. OF ITERATIONS:            100
                NO. OF AVERAGED ITERATIONS:    30
                WEIGHTING FACTOR FOR HEAT FLUXES OF A PREVIOUS RUN:          0

STOICHIOMETRIC CALCULATIONS AT COMPLETE COMBUSTION

NAME OF VARIABLE    MEANING OF VARIABLE                                  VALUE          UNITS
----------------    -------------------                                  -----          -----
O2MINT              STOICHIOMETRIC O2                                     3.7494        KG O2/KG FUEL DRY
AIRMNT              STOICHIOMETRIC AIR                                   16.0974        KG AIR DRY/KG FUEL DRY
AIRNR               TOTAL AIR NUMBER                                      1.0601        -
H2OFUT              HUMIDITY OF FUEL                                      0.0000        KG H2O/KG FUEL DRY
H2OA2               HUMIDITY OF AIR                                       0.0099        KG H2O/KG  AIR DRY
FUTOT               FLOW RATE OF DRY FUEL                                 4.2122        KG FUEL DRY/S
DMA                 FLOW RATE OF DRY AIR                                 71.8788        KG  AIR DRY/S
DMH2O               FLOW RATE OF H2O                                      0.7133        KG  H2O    /S
DMTOT               TOTAL INPUT MASS FLOW RATE                           76.8043        KG         /S
HL                  TOT.NET CAL. VALUE OF DRY FUEL                    44303.0742        KJ/KG FUEL DRY


O2MINV              STOICHIOMETRIC O2 FOR VOLATILE FUELS                  3.7491        KG O2/KG FUEL DRY
AIRMINV             STOICHIOMETRIC AIR FOR VOLATILE FUELS                16.0962        KG AIR DRY/KG FUEL DRY
FUS                 MASS FLOW RATE OF BURNER FUEL                         4.2122        KG FUEL DRY/S
FUSW                MASS FLOW RATE OF BURNER FUEL                         4.2122        KG FUEL WET/S
FUG                 MASS FLOW RATE OF REBURN FUEL                         0.0000        KG FUEL DRY/S
FUGW                MASS FLOW RATE OF REBURN FUEL                         0.0000        KG FUEL WET/S
FUGV                VOLUME FLOW RATE OF REBURN FUEL                       0.0000        M3N GAS DRY/S
FUGVW               VOLUME FLOW RATE OF REBURN FUEL                       0.0000        M3N GAS WET/S
DMA2                MASS FLOW RATE OF TOTAL OR SEC. AIR                  71.8788        KG AIR DRY/S
DMA2W               MASS FLOW RATE OF TOTAL OR SEC. AIR                  72.5921        KG AIR WET/S
DMA2V               VOLUME FLOW RATE OF TOTAL OR SEC. AIR                60.1576        M3N AIR DRY/S
DMA2VW              VOLUME FLOW RATE OF TOTAL OR SEC. AIR                61.1136        M3N AIR WET/S
DMCG                VOLUME FLOW RATE OF COMBUSTION GASES                 54.4635        M3N GAS DRY/S
DMCGW               VOLUME FLOW RATE OF COMBUSTION GASES                 67.1595        M3N GAS WET/S
HLS                 NET CAL. VALUE OF BURNER FUEL                     44303.0742        KJ/KG FUEL DRY
HUSW                GROSS CAL. VALUE OF BURNER FUEL                   49380.6992        KJ/KG FUEL WET
HLG                 NET CAL. VALUE OF REBURN FUEL                     44302.6992        KJ/KG REBURN-FUEL DRY
HUGW                GROSS CAL. VALUE OF REBURN FUEL                       0.0000        KJ/KG REBURN-FUEL WET
HLGV                NET CAL. VALUE OF REBURN FUEL                         0.0000        KJ/M3N GAS DRY
HUGVW               GROSS CAL. VALUE OF REBURN FUEL                       0.0000        KJ/M3N GAS WET

MASS CONCENTRATION OF GASEOUS SPECIES IN KG/KG WET
     CO2        H2O         N2         O2         VOL        SO2        ASH        CHAR       SOOT
  0.1442     0.1233     0.7201     0.0124     0.0000     0.0000     0.0000     0.0000     0.0000
CONCENTRATION OF GASEOUS SPECIES IN VOL.FRACTION WET
     CO2        H2O         N2         O2         VOL        SO2
  0.0905     0.1890     0.7098     0.0107     0.0000     0.0000
CONCENTRATION OF GASEOUS SPECIES IN VOL. FRACTION DRY
     CO2        H2O         N2         O2         VOL        SO2
  0.1116     0.0000     0.8753     0.0131     0.0000     0.0000
SO2 CONCENTRATION IN PPM MASS              0.
SO2 CONCENTRATION IN PPM VOL WET           0.
SO2 CONCENTRATION IN PPM VOL DRY           0.

HEAT CAPACITY OF COMBUSTION SPECIES (KJ/KG-K)
                          CO2        H2O        N2         O2         VOL        SO2        ASH        CHAR       SOOT
          AT  491.00K  0.9311159  1.9019108  1.0446855  0.9413832  2.5211427  0.6750727  0.8373600  1.0708083  0.9701869
          AT  298.25K  0.8434441  1.8582036  1.0395815  0.9173627  2.2140925  0.6205368  0.8373599  0.9184768  0.7111416
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AT 1800.00K	1.2005430	2.3140147	1.1634477	1.0747626	4.3484931	0.8270922	0.8373600	1.9863927 1.5045.61
AT 900.00K	1.0583812	2.0220246	1.0806181	1.0992388	3.2324159	0.7527937	0.9373600	1.9415941 1.3412576

MEAN HEAT CAPACITIES OF SOME INPUT/OUTPUT STREAMS

INPUT STREAM	TEMPERATURE (K)	MEAN Cp (KJ/KG-K)
AIR	298.15	1.0194378
AIR	491.00	1.0292838
FLUE GAS	900.00	1.1925124
FLUE GAS	1800.00	1.3096037

MASS BALANCE FOR VOLUME ZONES

NR	I	J	MCONIN KG/S	MCINNT KG/S	MDIFIN KG/S	MDFNT KG/S	MTOTIN KG/S	MTOTEX KG/S	MTOTNT KG/S
1	1		27.465	0.000	24.768	0.000	52.234	52.234	0.000
1	2		27.465	0.000	28.514	0.000	55.979	55.979	0.000
2	1		27.465	0.000	26.641	0.000	54.106	54.106	0.000
2	2		41.198	0.000	55.203	0.000	96.401	96.401	0.000
2	3		20.599	0.000	35.523	0.000	56.122	56.122	0.000
3	1		6.866	0.000	16.926	0.000	23.792	23.792	0.000
3	2		17.788	0.000	49.092	0.000	66.880	66.880	0.000
3	3		31.490	0.000	80.735	0.000	112.224	112.224	0.000
3	4		21.736	0.000	40.452	0.000	62.187	62.187	0.000
4	1		2.811	0.000	19.756	0.000	22.567	22.567	0.000
4	2		7.066	0.000	56.138	0.000	63.204	63.204	0.000
4	3		34.370	-0.008	71.004	0.000	105.374	105.367	-0.008
4	4		32.580	0.008	41.507	0.000	74.087	74.095	0.008
5	1		5.000	0.000	27.438	0.000	32.438	32.438	0.000
5	2		10.100	0.000	82.716	0.000	92.816	92.816	0.000
5	3		46.805	0.000	90.887	0.000	137.691	137.691	0.000
5	4		37.511	0.000	49.798	0.000	87.309	87.309	0.000
6	1		5.000	0.000	29.549	0.000	34.549	34.549	0.000
6	2		10.292	0.000	82.368	0.000	92.660	92.660	0.000
6	3		51.244	0.000	81.131	0.000	132.375	132.375	0.000
6	4		28.103	0.000	45.339	0.000	73.441	73.441	0.000
7	1		5.115	0.000	24.105	0.000	29.220	29.220	0.000
7	2		15.760	0.000	69.098	0.000	84.858	84.858	0.000
7	3		55.192	0.000	76.649	0.000	131.840	131.840	0.000
7	4		35.261	0.000	41.998	0.000	77.259	77.259	0.000
8	1		6.244	0.000	16.303	0.000	22.547	22.547	0.000
8	2		21.421	0.000	50.509	0.000	71.930	71.930	0.000
8	3		45.207	0.000	70.658	0.000	115.865	115.865	0.000
8	4		21.021	0.000	36.933	0.000	57.955	57.955	0.000
9	1		8.072	0.000	13.736	0.000	21.808	21.808	0.000
9	2		26.044	-0.008	42.302	0.000	68.346	68.339	-0.008
9	3		51.835	0.008	77.940	0.000	129.775	129.783	0.008
9	4		17.404	0.000	31.544	0.000	48.948	48.948	0.000
10	1		8.072	0.000	20.883	0.000	28.956	28.956	0.000
10	2		29.332	0.000	57.511	0.000	86.842	86.842	0.000
10	3		59.884	0.000	64.790	0.000	124.675	124.675	0.000
11	1		8.072	0.000	15.248	0.000	23.320	23.320	0.000
11	2		29.332	0.000	39.071	0.000	68.402	68.402	0.000
11	3		59.884	0.000	51.985	0.000	111.870	111.870	0.000
12	1		8.072	0.000	8.589	0.000	16.661	16.661	0.000
12	2		24.209	0.000	25.761	0.000	49.970	49.970	0.000
12	3		44.523	0.000	47.377	0.000	91.901	91.901	0.000
13	1		8.072	0.000	13.005	0.000	21.077	21.077	0.000
13	2		24.209	0.000	30.178	0.000	54.387	54.387	0.000
13	3		44.523	0.000	47.377	0.000	91.901	91.901	0.000
14	1		19.201	0.000	19.683	0.000	38.884	38.884	0.000
14	2		68.732	0.000	43.535	0.000	112.267	112.267	0.000
14	3		44.523	0.000	23.689	0.000	68.212	68.212	0.000
15	1		19.201	0.000	15.266	0.000	34.467	34.467	0.000
15	2		57.603	0.000	45.798	0.000	103.401	103.401	0.000
16	1		19.201	0.000	15.266	0.000	34.467	34.467	0.000
16	2		57.603	0.000	45.798	0.000	103.401	103.401	0.000
17	1		19.201	0.000	15.266	0.000	34.467	34.467	0.000
17	2		57.603	0.000	45.798	0.000	103.401	103.401	0.000
18	1		19.201	0.000	15.266	0.000	34.467	34.467	0.000
18	2		57.603	0.000	45.798	0.000	103.401	103.401	0.000
19	1		19.201	0.000	7.633	0.000	26.834	26.834	0.000
19	2		57.603	0.000	22.899	0.000	80.502	80.502	0.000
TOTAL MASS BALANCE FOR THE FURNACE VOLUME INCLUDING SYMMETRICAL FLUXES IF EXISTING:			1666.19	0.00	2370.73	0.00	4036.924	036.92	0.00

iter. no.=	1,	act.err.=	-80.8578 %,	avg.err.=	-80.8578 %,	20	it.err.=	-80.8578 %,	hb.err.=	6.5524 %
iter. no.=	2,	act.err.=	-30.6105 %,	avg.err.=	-55.7342 %,	20	it.err.=	-55.7342 %,	hb.err.=	6.7989 %
iter. no.=	3,	act.err.=	-20.6205 %,	avg.err.=	-44.0296 %,	20	it.err.=	-44.0296 %,	hb.err.=	3.2659 %
iter. no.=	4,	act.err.=	-13.6018 %,	avg.err.=	-36.4227 %,	20	it.err.=	-36.4227 %,	hb.err.=	0.6865 %
iter. no.=	5,	act.err.=	-10.8669 %,	avg.err.=	-31.3115 %,	20	it.err.=	-31.3115 %,	hb.err.=	0.2029 %
iter. no.=	6,	act.err.=	-4.8079 %,	avg.err.=	-26.8942 %,	20	it.err.=	-26.8942 %,	hb.err.=	-0.9795 %
iter. no.=	7,	act.err.=	-2.1221 %,	avg.err.=	-23.3554 %,	20	it.err.=	-23.3554 %,	hb.err.=	-1.8021 %
iter. no.=	8,	act.err.=	-0.4451 %,	avg.err.=	-20.4916 %,	20	it.err.=	-20.4916 %,	hb.err.=	-2.6670 %
iter. no.=	9,	act.err.=	0.5715 %,	avg.err.=	-18.1512 %,	20	it.err.=	-18.1512 %,	hb.err.=	-1.5340 %
iter. no.=	10,	act.err.=	2.5094 %,	avg.err.=	-16.0852 %,	20	it.err.=	-16.0852 %,	hb.err.=	-2.0460 %
iter. no.=	11,	act.err.=	3.2207 %,	avg.err.=	-14.3301 %,	20	it.err.=	-14.3301 %,	hb.err.=	-2.5599 %
iter. no.=	12,	act.err.=	2.2742 %,	avg.err.=	-12.9464 %,	20	it.err.=	-12.9464 %,	hb.err.=	-2.3243 %
iter. no.=	13,	act.err.=	2.9738 %,	avg.err.=	-11.7218 %,	20	it.err.=	-11.7218 %,	hb.err.=	-2.2777 %
iter. no.=	14,	act.err.=	3.3116 %,	avg.err.=	-10.6480 %,	20	it.err.=	-10.6480 %,	hb.err.=	-2.1576 %
iter. no.=	15,	act.err.=	1.8454 %,	avg.err.=	-9.8151 %,	20	it.err.=	-9.8151 %,	hb.err.=	-1.2990 %
iter. no.=	16,	act.err.=	2.8808 %,	avg.err.=	-9.0216 %,	20	it.err.=	-9.0216 %,	hb.err.=	-1.5182 %
iter. no.=	17,	act.err.=	2.8285 %,	avg.err.=	-8.3245 %,	20	it.err.=	-8.3245 %,	hb.err.=	-1.8809 %
iter. no.=	18,	act.err.=	2.0582 %,	avg.err.=	-7.7477 %,	20	it.err.=	-7.7477 %,	hb.err.=	-0.9716 %
iter. no.=	19,	act.err.=	3.1336 %,	avg.err.=	-7.1750 %,	20	it.err.=	-7.1750 %,	hb.err.=	-1.4214 %
iter. no.=	20,	act.err.=	2.9114 %,	avg.err.=	-6.6707 %,	20	it.err.=	-6.6707 %,	hb.err.=	-1.3536 %
iter. no.=	21,	act.err.=	2.0161 %,	avg.err.=	-6.2570 %,	20	it.err.=	-2.5270 %,	hb.err.=	-0.6951 %
iter. no.=	22,	act.err.=	1.1142 %,	avg.err.=	-5.9220 %,	20	it.err.=	-0.9407 %,	hb.err.=	-0.3988 %
iter. no.=	23,	act.err.=	1.6770 %,	avg.err.=	-5.5916 %,	20	it.err.=	0.1741 %,	hb.err.=	-1.2879 %
iter. no.=	24,	act.err.=	-0.7247 %,	avg.err.=	-5.3888 %,	20	it.err.=	0.8180 %,	hb.err.=	0.4126 %
iter. no.=	25,	act.err.=	1.3501 %,	avg.err.=	-5.1192 %,	20	it.err.=	1.4288 %,	hb.err.=	-1.1224 %
iter. no.=	26,	act.err.=	1.7584 %,	avg.err.=	-4.8547 %,	20	it.err.=	1.7572 %,	hb.err.=	-1.1913 %
iter. no.=	27,	act.err.=	-0.0783 %,	avg.err.=	-4.6778 %,	20	it.err.=	1.8593 %,	hb.err.=	0.2919 %
iter. no.=	28,	act.err.=	0.9483 %,	avg.err.=	-4.4769 %,	20	it.err.=	1.9290 %,	hb.err.=	-0.1811 %
iter. no.=	29,	act.err.=	0.0760 %,	avg.err.=	-4.3199 %,	20	it.err.=	1.9042 %,	hb.err.=	-0.4019 %
iter. no.=	30,	act.err.=	1.5794 %,	avg.err.=	-4.1232 %,	20	it.err.=	1.8577 %,	hb.err.=	-0.7999 %

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iter. no.= 31,  act.err.=  -1.2110 %,  avg.err.=  -4.0293 %,  20 it.err.=   1.6362 %,  hb.err.=   0.4625 %
iter. no.= 32,  act.err.=   2.6631 %,  avg.err.=  -3.8201 %,  20 it.err.=   1.6556 %,  hb.err.=  -1.4318 %
iter. no.= 33,  act.err.=  -0.7474 %,  avg.err.=  -3.7279 %,  20 it.err.=   1.4695 %,  hb.err.=   0.2727 %
iter. no.= 34,  act.err.=   0.6275 %,  avg.err.=  -3.5990 %,  20 it.err.=   1.3353 %,  hb.err.=  -0.1211 %
iter. no.= 35,  act.err.=   0.9412 %,  avg.err.=  -3.4692 %,  20 it.err.=   1.2901 %,  hb.err.=  -0.3175 %
iter. no.= 36,  act.err.=  -0.2355 %,  avg.err.=  -3.3794 %,  20 it.err.=   1.1343 %,  hb.err.=  -0.0221 %
iter. no.= 37,  act.err.=  -0.1038 %,  avg.err.=  -3.2909 %,  20 it.err.=   0.9877 %,  hb.err.=   0.5332 %
iter. no.= 38,  act.err.=   0.7972 %,  avg.err.=  -3.1833 %,  20 it.err.=   0.9246 %,  hb.err.=  -0.2585 %
iter. no.= 39,  act.err.=   0.0702 %,  avg.err.=  -3.0999 %,  20 it.err.=   0.7715 %,  hb.err.=  -0.4241 %
iter. no.= 40,  act.err.=   0.9185 %,  avg.err.=  -2.9994 %,  20 it.err.=   0.6718 %,  hb.err.=  -0.2075 %
iter. no.= 41,  act.err.=  -0.5946 %,  avg.err.=  -2.9408 %,  20 it.err.=   0.5413 %,  hb.err.=   0.8962 %
iter. no.= 42,  act.err.=   0.2670 %,  avg.err.=  -2.8644 %,  20 it.err.=   0.4989 %,  hb.err.=   0.0203 %
iter. no.= 43,  act.err.=  -1.1237 %,  avg.err.=  -2.8239 %,  20 it.err.=   0.3589 %,  hb.err.=   0.3844 %
iter. no.= 44,  act.err.=  -0.0021 %,  avg.err.=  -2.7598 %,  20 it.err.=   0.3950 %,  hb.err.=   0.0393 %
iter. no.= 45,  act.err.=  -0.0158 %,  avg.err.=  -2.6988 %,  20 it.err.=   0.3267 %,  hb.err.=  -0.1353 %
iter. no.= 46,  act.err.=  -1.3412 %,  avg.err.=  -2.6693 %,  20 it.err.=   0.1717 %,  hb.err.=   0.5586 %
iter. no.= 47,  act.err.=  -1.4075 %,  avg.err.=  -2.6424 %,  20 it.err.=   0.1053 %,  hb.err.=   0.2668 %
iter. no.= 48,  act.err.=   1.2937 %,  avg.err.=  -2.5604 %,  20 it.err.=   0.1226 %,  hb.err.=  -0.5039 %
iter. no.= 49,  act.err.=   0.5053 %,  avg.err.=  -2.4979 %,  20 it.err.=   0.1440 %,  hb.err.=  -0.0249 %
iter. no.= 50,  act.err.=   0.1257 %,  avg.err.=  -2.4454 %,  20 it.err.=   0.0713 %,  hb.err.=   0.1682 %
iter. no.= 51,  act.err.=  -0.2790 %,  avg.err.=  -2.4029 %,  20 it.err.=   0.1179 %,  hb.err.=  -0.2017 %
iter. no.= 52,  act.err.=   0.5963 %,  avg.err.=  -2.3452 %,  20 it.err.=   0.0146 %,  hb.err.=   0.3332 %
iter. no.= 53,  act.err.=   0.0063 %,  avg.err.=  -2.3009 %,  20 it.err.=   0.0523 %,  hb.err.=   0.0955 %
iter. no.= 54,  act.err.=  -1.4749 %,  avg.err.=  -2.2856 %,  20 it.err.=  -0.0528 %,  hb.err.=   0.4138 %
iter. no.= 55,  act.err.=  -0.7229 %,  avg.err.=  -2.2572 %,  20 it.err.=  -0.1360 %,  hb.err.=   0.5710 %
iter. no.= 56,  act.err.=  -0.2449 %,  avg.err.=  -2.2212 %,  20 it.err.=  -0.1365 %,  hb.err.=  -0.2512 %
iter. no.= 57,  act.err.=  -0.8854 %,  avg.err.=  -2.1978 %,  20 it.err.=  -0.1756 %,  hb.err.=  -0.1813 %
iter. no.= 58,  act.err.=   2.0436 %,  avg.err.=  -2.1247 %,  20 it.err.=  -0.1133 %,  hb.err.=  -1.1101 %
iter. no.= 59,  act.err.=  -0.0785 %,  avg.err.=  -2.0900 %,  20 it.err.=  -0.1207 %,  hb.err.=  -0.0401 %
iter. no.= 60,  act.err.=   0.3756 %,  avg.err.=  -2.0489 %,  20 it.err.=  -0.1479 %,  hb.err.=   0.3382 %
iter. no.= 61,  act.err.=  -0.4693 %,  avg.err.=  -2.0230 %,  20 it.err.=  -0.1416 %,  hb.err.=   0.1652 %
iter. no.= 62,  act.err.=   1.0345 %,  avg.err.=  -1.9737 %,  20 it.err.=  -0.1032 %,  hb.err.=  -1.1655 %
iter. no.= 63,  act.err.=   1.0989 %,  avg.err.=  -1.9249 %,  20 it.err.=   0.0079 %,  hb.err.=   0.0401 %
iter. no.= 64,  act.err.=   1.9063 %,  avg.err.=  -1.8651 %,  20 it.err.=   0.1033 %,  hb.err.=  -0.6764 %
iter. no.= 65,  act.err.=   0.9132 %,  avg.err.=  -1.8223 %,  20 it.err.=   0.1498 %,  hb.err.=  -0.6325 %
iter. no.= 66,  act.err.=  -0.7274 %,  avg.err.=  -1.8057 %,  20 it.err.=   0.1805 %,  hb.err.=   0.2833 %
iter. no.= 67,  act.err.=   0.8326 %,  avg.err.=  -1.7663 %,  20 it.err.=   0.2925 %,  hb.err.=  -0.6742 %
iter. no.= 68,  act.err.=  -0.5110 %,  avg.err.=  -1.7479 %,  20 it.err.=   0.2023 %,  hb.err.=   0.2378 %
iter. no.= 69,  act.err.=  -0.6177 %,  avg.err.=  -1.7315 %,  20 it.err.=   0.1461 %,  hb.err.=   0.4850 %
iter. no.= 70,  act.err.=   1.2242 %,  avg.err.=  -1.6893 %,  20 it.err.=   0.2010 %,  hb.err.=  -0.9455 %
iter. no.= 71,  act.err.=  -0.5358 %,  avg.err.=  -1.6730 %,  20 it.err.=   0.1882 %,  hb.err.=  -0.0441 %
iter. no.= 72,  act.err.=   0.1361 %,  avg.err.=  -1.6479 %,  20 it.err.=   0.1652 %,  hb.err.=  -0.1955 %
iter. no.= 73,  act.err.=   0.2192 %,  avg.err.=  -1.6223 %,  20 it.err.=   0.1758 %,  hb.err.=   0.0098 %
iter. no.= 74,  act.err.=   0.0138 %,  avg.err.=  -1.6002 %,  20 it.err.=   0.2502 %,  hb.err.=  -0.0423 %
iter. no.= 75,  act.err.=   0.2505 %,  avg.err.=  -1.5755 %,  20 it.err.=   0.2989 %,  hb.err.=  -0.2242 %
iter. no.= 76,  act.err.=   0.6688 %,  avg.err.=  -1.5460 %,  20 it.err.=   0.3446 %,  hb.err.=  -0.0748 %
iter. no.= 77,  act.err.=   0.9611 %,  avg.err.=  -1.5135 %,  20 it.err.=   0.4369 %,  hb.err.=  -0.0119 %
iter. no.= 78,  act.err.=   0.9449 %,  avg.err.=  -1.4819 %,  20 it.err.=   0.3820 %,  hb.err.=  -0.1040 %
iter. no.= 79,  act.err.=   0.9560 %,  avg.err.=  -1.4511 %,  20 it.err.=   0.4337 %,  hb.err.=  -0.0042 %
iter. no.= 80,  act.err.=   1.1499 %,  avg.err.=  -1.4186 %,  20 it.err.=   0.4724 %,  hb.err.=   0.1079 %
iter. no.= 81,  act.err.=   0.7570 %,  avg.err.=  -1.3917 %,  20 it.err.=   0.5337 %,  hb.err.=  -0.0242 %
iter. no.= 82,  act.err.=   0.7566 %,  avg.err.=  -1.3655 %,  20 it.err.=   0.5199 %,  hb.err.=  -0.0046 %
iter. no.= 83,  act.err.=   0.9738 %,  avg.err.=  -1.3373 %,  20 it.err.=   0.5136 %,  hb.err.=   0.1142 %
iter. no.= 84,  act.err.=   0.6646 %,  avg.err.=  -1.3135 %,  20 it.err.=   0.4515 %,  hb.err.=  -0.0057 %
iter. no.= 85,  act.err.=   0.3937 %,  avg.err.=  -1.2934 %,  20 it.err.=   0.4255 %,  hb.err.=  -0.0662 %
iter. no.= 86,  act.err.=   0.7212 %,  avg.err.=  -1.2700 %,  20 it.err.=   0.4980 %,  hb.err.=   0.0839 %
iter. no.= 87,  act.err.=   0.4687 %,  avg.err.=  -1.2500 %,  20 it.err.=   0.4798 %,  hb.err.=  -0.0483 %
iter. no.= 88,  act.err.=   0.3630 %,  avg.err.=  -1.2317 %,  20 it.err.=   0.5235 %,  hb.err.=  -0.0727 %
iter. no.= 89,  act.err.=   0.6319 %,  avg.err.=  -1.2107 %,  20 it.err.=   0.5860 %,  hb.err.=   0.0658 %
iter. no.= 90,  act.err.=   0.4312 %,  avg.err.=  -1.1925 %,  20 it.err.=   0.5463 %,  hb.err.=  -0.0585 %
iter. no.= 91,  act.err.=   0.3384 %,  avg.err.=  -1.1757 %,  20 it.err.=   0.5900 %,  hb.err.=  -0.1019 %
iter. no.= 92,  act.err.=   0.5227 %,  avg.err.=  -1.1572 %,  20 it.err.=   0.6093 %,  hb.err.=   0.0180 %
iter. no.= 93,  act.err.=   0.6280 %,  avg.err.=  -1.1380 %,  20 it.err.=   0.6298 %,  hb.err.=   0.0366 %
iter. no.= 94,  act.err.=   0.4450 %,  avg.err.=  -1.1212 %,  20 it.err.=   0.6513 %,  hb.err.=   0.0259 %
iter. no.= 95,  act.err.=   0.3920 %,  avg.err.=  -1.1052 %,  20 it.err.=   0.6584 %,  hb.err.=   0.0207 %
iter. no.= 96,  act.err.=   0.4941 %,  avg.err.=  -1.0886 %,  20 it.err.=   0.6497 %,  hb.err.=   0.1029 %
iter. no.= 97,  act.err.=   0.2516 %,  avg.err.=  -1.0748 %,  20 it.err.=   0.6142 %,  hb.err.=  -0.0590 %
iter. no.= 98,  act.err.=   0.1995 %,  avg.err.=  -1.0618 %,  20 it.err.=   0.5769 %,  hb.err.=  -0.0758 %
iter. no.= 99,  act.err.=   0.4958 %,  avg.err.=  -1.0460 %,  20 it.err.=   0.5539 %,  hb.err.=   0.0606 %
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THE DISTRIBUTION OF SPSU in m**2/kg AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	3.811E+01	3.786E+01	3.780E+01	3.242E+01	3.517E+01	3.092E+01	2.975E+01	0.000E-01
J= 3	0.000E-01	2.852E+01	3.120E+01	3.142E+01	3.135E+01	3.016E+01	3.035E+01	2.983E+01	2.950E+01	2.908E+01
J= 2	2.781E+01	2.838E+01	2.952E+01	2.973E+01	2.977E+01	2.971E+01	2.967E+01	2.950E+01	2.918E+01	2.879E+01
J= 1	2.811E+01	2.838E+01	2.908E+01	2.927E+01	2.937E+01	2.936E+01	2.935E+01	2.920E+01	2.890E+01	2.851E+01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	2.876E+01	2.832E+01	2.785E+01	2.745E+01	2.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	2.848E+01	2.801E+01	2.752E+01	2.719E+01	2.686E+01	2.652E+01	2.618E+01	2.588E+01	2.569E+01	
J= 1	2.820E+01	2.772E+01	2.731E+01	2.699E+01	2.666E+01	2.633E+01	2.600E+01	2.576E+01	2.569E+01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF UBRT in Fraction of Input fixed-C AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	4.000E-01	4.099E-01	4.080E-01	3.779E-01	3.834E-01	3.593E-01	3.437E-01	0.000E-01
J= 3	0.000E-01	3.053E-01	3.431E-01	3.606E-01	3.612E-01	3.555E-01	3.543E-01	3.459E-01	3.360E-01	3.251E-01
J= 2	2.959E-01	3.036E-01	3.282E-01	3.379E-01	3.412E-01	3.407E-01	3.401E-01	3.357E-01	3.275E-01	3.188E-01
J= 1	3.000E-01	3.041E-01	3.190E-01	3.259E-01	3.301E-01	3.308E-01	3.310E-01	3.278E-01	3.211E-01	3.136E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	3.184E-01	3.103E-01	3.031E-01	2.980E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	3.131E-01	3.053E-01	2.986E-01	2.947E-01	2.911E-01	2.876E-01	2.842E-01	2.810E-01	2.783E-01	
J= 1	3.083E-01	3.013E-01	2.960E-01	2.925E-01	2.890E-01	2.856E-01	2.824E-01	2.794E-01	2.767E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF PO2 in Vol. Fraction Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	3.179E-02	3.631E-02	5.125E-02	1.658E-02	3.906E-02	1.196E-02	1.046E-02	0.000E-01
J= 3	0.000E-01	1.087E-02	1.100E-02	1.120E-02	1.490E-02	1.109E-02	1.206E-02	1.097E-02	1.092E-02	1.087E-02
J= 2	1.091E-02	1.084E-02	1.093E-02	1.093E-02	1.112E-02	1.090E-02	1.085E-02	1.080E-02	1.079E-02	1.082E-02
J= 1	1.092E-02	1.090E-02	1.079E-02	1.078E-02	1.086E-02	1.081E-02	1.095E-02	1.097E-02	1.093E-02	1.089E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	1.085E-02	1.085E-02	1.084E-02	1.084E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	1.082E-02	1.083E-02	1.084E-02	1.084E-02	1.084E-02	1.084E-02	1.084E-02	1.084E-02	1.084E-02
J= 1	1.087E-02	1.086E-02	1.086E-02	1.085E-02	1.085E-02	1.084E-02	1.084E-02	1.084E-02	1.084E-02

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF FUL0 in Kg/(kg.mixture) AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	0.000E-01
J= 3	0.000E-01	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02
J= 2	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02
J= 1	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	5.484E-02	5.484E-02	5.484E-02	5.484E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02
J= 1	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02	5.484E-02

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOL0 in Number of Vol. Lumps Released AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.806E+03	2.810E+03	2.782E+03	3.300E-01	1.485E+03	1.100E+01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	1.900E+01	1.900E+01	2.400E+01	0.000E-01	1.100E+01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF SO2 in Vol. Fraction. Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	3.354E-09	2.630E-09	2.579E-09	3.122E-09	2.994E-09	3.571E-09	4.018E-09	0.000E-01
J= 3	0.000E-01	8.296E-09	5.779E-09	4.450E-09	4.279E-09	4.245E-09	4.135E-09	4.323E-09	4.609E-09	5.082E-09
J= 2	1.030E-08	9.182E-09	6.794E-09	5.839E-09	5.543E-09	5.282E-09	5.089E-09	5.079E-09	5.300E-09	5.727E-09
J= 1	1.046E-08	9.603E-09	7.666E-09	6.860E-09	6.491E-09	6.165E-09	5.893E-09	5.801E-09	5.941E-09	6.335E-09

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	5.227E-09	5.402E-09	5.532E-09	5.532E-09	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	5.834E-09	6.059E-09	6.282E-09	6.311E-09	6.490E-09	6.671E-09	6.844E-09	6.978E-09	6.978E-09
J= 1	6.457E-09	6.672E-09	6.830E-09	6.940E-09	7.138E-09	7.337E-09	7.527E-09	7.674E-09	7.674E-09

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

ATOM OUTFLUX IN KG/S :

C=	3.022676	H=	1.059995	N=	55.304085	O= 17.417131
S=	0.000001	A=	0.000421			
SUM=	76.804306					

ATOM INFLUX IN KG/S :

C=	3.022675	H=	1.059995	N=	55.307171	O= 17.414043
S=	0.000000	A=	0.000421			
SUM=	76.804306					

ATOM BALANCE -> (OUT-IN)/IN IN % :

C=	0.000024	H=	0.000022	N=	-0.005580	O= 0.017733
S=	0.000000	A=	0.000021			
SUM=	0.000000					

ENERGY BALANCE FOR VOLUME ZONES AND TOTAL FURNACE EFFICIENCY AFTER 100 ITERATIONS

I	J	TPSAD K	TEX K	RHOG OLD KG/M3	CP EX KJ/KGK	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QCHEIN KW	QCHENT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTNT KW	TNEW K
1	1	1584.6	1576.4	0.21348	1.28504	86414.	-518.	0.	0.	0.	0.	17121.	618.	103535.	103535.	0.	1576.
2	1	1604.3	1600.8	0.21022	1.28786	91044.	-274.	0.	0.	0.	0.	17882.	275.	108926.	108926.	0.	1601.
3	1	1687.7	1683.5	0.19989	1.29717	42902.	-145.	0.	0.	0.	0.	18784.	145.	61686.	61686.	0.	1684.
4	1	1728.3	1721.3	0.19550	1.30129	42003.	-209.	0.	0.	0.	-19.	18022.	228.	60026.	60044.	0.	1721.
5	1	1740.0	1735.5	0.19391	1.30281	60957.	-215.	0.	0.	0.	0.	11557.	216.	72514.	72515.	0.	1735.
6	1	1746.5	1737.7	0.19366	1.30304	65232.	-427.	0.	0.	0.	-19.	18013.	446.	83245.	83264.	0.	1738.
7	1	1741.8	1741.2	0.19328	1.30340	54986.	-29.	0.	0.	0.	0.	14210.	29.	69195.	69195.	0.	1741.
8	1	1727.2	1724.1	0.19519	1.30157	41948.	-101.	0.	0.	0.	0.	13971.	101.	55918.	55918.	0.	1724.
9	1	1682.9	1674.6	0.20095	1.29618	39170.	-261.	0.	0.	0.	0.	15258.	261.	54428.	54428.	0.	1675.
10	1	1611.4	1585.3	0.21228	1.28608	49018.	-1087.	0.	170.	0.	0.	10511.	917.	59530.	59530.	0.	1585.
11	1	1561.5	1537.1	0.21893	1.28043	37808.	-812.	0.	296.	0.	0.	11214.	515.	49021.	49021.	0.	1537.
12	1	1518.1	1486.5	0.22638	1.27436	25978.	-747.	0.	282.	0.	0.	10617.	465.	36595.	36595.	0.	1487.
13	1	1468.8	1463.0	0.23002	1.27148	31389.	-173.	0.	0.	0.	0.	10598.	173.	41987.	41987.	0.	1463.
14	1	1414.5	1414.2	0.23796	1.26540	54932.	-19.	0.	0.	0.	0.	10092.	19.	65024.	65024.	0.	1414.
15	1	1390.0	1362.1	0.24705	1.25875	47506.	-1345.	0.	637.	0.	0.	10632.	708.	58138.	58138.	0.	1362.
16	1	1331.6	1304.4	0.25799	1.25118	44694.	-1301.	0.	580.	0.	0.	9632.	722.	54327.	54327.	0.	1304.
17	1	1273.2	1223.1	0.27513	1.24017	41906.	-2369.	0.	1687.	0.	0.	8785.	682.	50691.	50691.	0.	1223.
18	1	1204.3	1162.2	0.28956	1.23163	38653.	-1975.	0.	1470.	0.	0.	7872.	505.	46526.	46526.	0.	1162.
19	1	1162.2	1137.8	0.29575	1.22817	28556.	-882.	0.	457.	0.	0.	10143.	425.	38699.	38699.	0.	1138
1	2	1579.0	1543.0	0.21810	1.28112	92158.	-2885.	0	667.	0.	0.	49222.	2218.	141380.	141380.	0.	1543

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 2  2 1591.8 1586.9 0.21206 1.28627 160484.   -679.      0.      0.      0.      0.   53081.    679. 213565. 213566.      0. 1587
 3  2 1705.4 1692.9 0.19878 1.29819 122240.  -1142.      0.      0.      0.    -75.   55981.   1217. 178221. 178296.      0. 1693.
 4  2 1755.9 1749.3 0.19238 1.30427 119991.   -369.      0.      0.      0.   -243.   55200.    612. 175191. 175434.      0. 1749
 5  2 1768.0 1764.0 0.19077 1.30587 177337.    331.      0.      0      0.   -858.   35415.    527. 212751. 213610.      0. 1764
 6  2 1770.9 1764.5 0.19072 1.30589 178074.   -645.      0.      0.     0    -205.   55505.    850. 233579. 233785.      0. 1764
 7  2 1762.1 1757.3 0.19149 1.30514 161811.   -205.      0.      0.      0.   -392.   42567.    597. 204378. 204770.      0. 1757
 8  2 1740.4 1732.8 0.19420 1.30252 135169.   -753.      0.      0      0     -37.   41681.    790. 176850. 176887.      0. 1733
 9  2 1692.7 1683.5 0.19989 1.29717 123727.   -908       0.      0.     0.      0.   45973.    908. 169701. 169700.      0. 1683
10  2 1625.5 1616.0 0.20824 1.28961 148782.  -1193       0.      0      0       0.   34087.   1192. 182869. 182869.      0. 1616
11  2 1583.4 1559.3 0.21581 1.28306 113047.  -2363       0.    615      0.      0.   34262.   1747. 147309  147308.      0. 1559
12  2 1536.9 1508.1 0.22315 1.27697  79255.  -2051       0.    585.     0.      0.   32615.   1466. 111870. 111870.      0. 1508.
13  2 1479.8 1471.9 0.22863 1.27258  81847.   -611       0.      0.     0       0.   32056.    611. 113903. 113903.      0. 1472.
14  2 1407.9 1403.8 0.23971 1.26409 157552.   -639       0.      0.     0.      0.   29265.    639. 186817. 186817.      0. 1404.
15  2 1380.7 1351.7 0.24896 1.25740 141166.  -4191       0.   1427.     0.      0.   30724.   2763. 171890. 171890.      0. 1352.
16  2 1324.9 1298.7 0.25912 1.25043 133117.  -3748.      0      1316.     0       0.   28338.   2432. 161455. 161455.      0. 1299.
17  2 1271.4 1229.7 0.27365 1.24108 125469.  -5919.      0      3692.     0.      0.   26535.   2227. 152003. 152003.      0. 1230
18  2 1212.0 1174.5 0.28653 1.23337 117035.  -5277.      0.     3269.     0.      0.   23778.   2007. 140814. 140814.      0. 1174.
19  2 1174.5 1149.0 0.29288 1.22976  87009.  -2776.      0      1282.     0       0.   30989.   1494. 117998. 117998.      0. 1149.
 2  3 1626.7 1566.3 0.21484 1.28387  96190.  -4812.      0.     1109.     0.    -56.   93131.   3759. 189321. 189377.      0. 1566
 3  3 1738.8 1719.1 0.19574 1.30109 198657.   8826.      0.      0.      0. -11961. 103933.   3135. 302590. 314552.      0. 1719.
 4  3 1820.6 1796.1 0.18735 1.30926 196423.  10239.      0.      0.      0. -13958. 101733.   3719. 298157. 312115.      0. 1796.
 5  3 1795.5 1782.7 0.18875 1.30825 257561.   9852.      0.      0.      0. -12390.  62990.   2538. 320550. 332941.      0. 1783.
 6  3 1814.8 1798.0 0.18717 1.30941 257033.   2935.      0.      0.      0.  -5617. 103030.   2682. 360063. 365680.      0. 1798.
 7  3 1790.0 1778.0 0.18927 1.30741 251036.   4036.      0.      0.      0.  -6344.  77678.   2309. 328714. 335059.      0. 1778.
 8  3 1759.7 1746.8 0.19265 1.30401 219809.   -931.      0.      0.      0.  -1306.  76611.   2237. 296420. 297726.      0. 1747
 9  3 1698.1 1686.6 0.19952 1.29750 235926.  -2130.      0.      0.      0.    -19.  84276.   2148. 320202. 320220.     -1. 1687.
10  3 1642.3 1625.9 0.20697 1.29073 216611.  -2949.      0.    493.      0.      0.   63000.   2455. 279610. 279610.     -1. 1626.
11  3 1596.9 1561.0 0.21558 1.28325 187045.  -5759.      0.   1464.      0.      0.   62038.   4295. 249083. 249083.     -1. 1561.
12  3 1526.8 1488.0 0.22616 1.27454 144434.  -5067.      0.   1349.      0.      0.   57525.   3717. 201959. 201958.      0. 1488.
13  3 1460.8 1427.4 0.23575 1.26707 135827.  -4328.      0.   1246.      0.      0.   53696.   3083. 189523. 189523.      0. 1427
14  3 1427.4 1382.0 0.24350 1.26131  97603.  -4353.      0.   1495.      0.      0.   50464.   2858. 148067. 148067.      0. 1382.
 3  4 1740.6 1689.4 0.19912 1.29944  78711.  33713       0.   1115.      0. -38106.  43882.   3278. 122593. 160699.      0. 1689.
 4  4 1737.2 1704.6 0.19733 1.30152 100698.  34924       0.    851.      0. -38348.  40994.   2573. 141692. 180040.      0. 1705
 5  4 1589.1 1579.5 0.21288 1.28840 128855.  15285       0.    477.      0. -16460.  21966.    698. 150821. 167282.      0. 1580
 6  4 1862.5 1797.2 0.18721 1.30998 129108.  15115.      0.    921.      0. -20358.  47475.   4322. 176582. 196941.      0. 1797.
 7  4 1704.0 1682.1 0.19998 1.29862 129763.   9086.      0.    638.      0. -11496.  32363.   1772. 162126. 173622.      0. 1682.
 8  4 1787.5 1748.4 0.19244 1.30445 105425.   4212.      0.    681.      0.   -7632.  36765.   2739. 142190. 149822.      0. 1748
 9  4 1731.7 1676.6 0.20070 1.29645  90694.  -3219.      0.    949.      0.    -690.  40380.   2960. 131074. 131765.      0. 1677.
                                                                                                                                 ----------
HEAT BALANCE FOR VOLUME ZONES:     6.64E+06 6.57E+04       0. 3.1E-04 0.0E-01-1.9E+05 2.2E+06 9.0E+04 8.9E+06 9.1E+06-2.6E+00
                                                                                                                                 ==========

 ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS
  I  J      DTMAX        I  J      RDTMAX      I  J      DQMAX        I  J     RDQMAX      DQTOTAL   RDQTOTAL
                K                     %                  KW                      %           KW         %
 10  2        0.00      10  1        0.000       9  3       -0.6       9  1      0.000         -2.6      0.000


HEAT FLUX TO ADDITIONAL HEAT SINKS IN KW
 CONVECTIVE FLUX  RADIATIVE FLUX      TOTAL FLUX
      19681.6602      27619.9629      47301.6250

SURFACE TEMPERATURES OF ADDITIONAL HEAT SINKS IN K  ---  represented by TWSINK(i,j)
TWSINK( 10, j  ) =              932.86            0.00            0.00
TWSINK( 11, j  ) =              866.86          863.24          840.06
TWSINK( 12, j  ) =              847.60          846.92          826.09
TWSINK( 13, j  ) =                0.00            0.00          820.76
TWSINK( 14, j  ) =                0.00            0.00          805.48
TWSINK( 15, j  ) =              858.73          865.94
TWSINK( 16, j  ) =              845.98          851.83
TWSINK( 17, j  ) =              817.33          819.87
TWSINK( 18, j  ) =              808.41          812.37
TWSINK( 19, j  ) =              812.23          807.48

MEAN FURNACE EXIT TEMPERATURE = 1146.22K  AFTER  100 ITERATIONS
TOTAL FURNACE EFFICIENCY =  60.1606 % WITH  186591. KW HEAT RELEASE AND   14409. KW SENSIBLE INPUT
                            --------

CHEM. HEAT OUTFLUX IN KW :
  FUEL=       4.0                        SULF.=       0.0   SUM =       4.0
SENS. HEAT OUTFLUX IN KW    :
  EXT.=   80074.8   REC. =       0.0                          SUM =   80074.8
OUTFLUX TO HEAT SINKS IN KW :
  RAD.=   89701.7   CONV.=   31221.2                          SUM =  120922.9
                                                                    201001.7 KW
TOTAL HEAT OUTFLUX :
CHEM. HEAT INFLUX IN KW :
  FUEL=  186613.4   EVAP.=       0.0   CALC.=       0.0
  SULF=       0.0                                          SUM =  186613.4
SENS. HEAT AIR INFLUX IN KW :
  SEC.=   14409.3   PRIM.=       0.0   TRANS.=       0.0
  REC.=       0.0                                          SUM =   14409.3
SENS. HEAT FUEL INFLUX IN KW :
  DRY =       0.0   H2OG =       0.0                        SUM =       0.0
SENS. HEAT SORBENT INFLUX IN KW :
  CAO =       0.0   H2OG =       0.0   CO2G =       0.0   SUM =       0.0
                                                                    201022.8 KW
TOTAL HEAT INFLUX :
GAS ZONE HEAT BALANCE :
HEAT BALANCE -> OUT - IN    :      -21.1 KW
HEAT BALANCE -> (OUT-IN)/IN :    -0.010501 %

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS
  I  J  M     TOLDW        QCONIN   QCONNT   QDIFIN   QDIFNT          QRADIN   QRADNT   QTOTIN   QTOTEX   QTOTN   TNEWW
                 K            KW       KW       KW       KW              KW       KW       KW       KW       KW       K
  1  2  1      673.6           0.    1253.     203.    -203.            1153.   -1050.    1355.    1355.      0.   673.6
  2  3  1      679.1           0.    2510.     381.    -381.            2324.   -2129.    2704.    2704.      0.   679.1
  3  4  1      688.6           0.    1445.     217.    -217.            1332.   -1228.    1549.    1549.      0.   688.6
                                                                                                                  ----------
 SURFACE ZONE HEAT BALANCE :    0.0E-01 5.2E+03 8.0E+02-8.0E+02          4.8E+03-4.4E+03 5.6E+03 5.6E+03-1.8E-03
                                                                                                                  ==========

 ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS
  I  J  M    DTMAX        I  J  M    RDTMAX      I  J  M    DQMAX        I  J  M    RDQMAX      DQTOTAL   RDQTOTAL
                K                      %                   KW                       %           KW         %
  3  4  1      0.00        3  4  1    0.000       2  3  1       0.0       2  3  1     0.000         0.0      0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS
  I  J  M     TOLDW        QCONIN   QCONNT   QDIFIN   QDIFNT          QRADIN   QRADNT   QTOTIN   QTOTEX   QTOTN   TNEWW
                 K            KW       KW       KW       KW              KW       KW       KW       KW       KW       K
 14  3  3      652.2           0.    1515.     313.    -313.            1368.   -1202.    1681.    1681.      0.   652.2
  9  4  3      687.8           0.    1430.     214.    -214.            1319.   -1216.    1534.    1534.      0.   687.8
                                                                                                                  ----------
```

SURFACE ZONE HEAT BALANCE : 0.0E-01 2.9E+03 5.3E-02-5.3E+02 2.7E+03-2.4E+03 3.2E+03 3.2E+03 7.7E-04

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX	I	J	M	RDTMAX	I	J	M	DQMAX	I	J	M	RDQMAX	DQTOTAL	RDQTOTAL
			K				%				KW				%	KW	%
9	4	3	0.00	9	4	3	0.000	14	3	3	0.0	14	3	3	0.000	0.0	0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS

I	J	M	TOLDW	QCONIN	QCONNT	QDIFIN	QDIFNT	QRADIN	QRADNT	QTOTIN	QTOTEX	QTOTN	TNEWW
			K	KW	KW	KW	KW	KW	KW	KW	KW	KW	K
1	2	4	671.7	0.	2776.	464.	-464.	2543.	-2311.	3007.	3007.	0.	671.7
2	3	4	679.6	0.	4843.	729.	-729.	4489.	-4115.	5217.	5217.	0.	679.6
3	4	4	700.2	0.	6958.	898.	-898.	6526.	-6060.	7424.	7424	0.	700.2
4	4	4	704.5	0.	6836.	851.	-851.	6432.	-5985.	7284.	7284.	0.	704.5
5	4	4	702.9	0.	4294.	477.	-477.	4101.	-3818.	4578.	4578.	0.	702.9
6	4	4	715.1	0.	7613.	921.	-921.	7167.	-6692.	8088.	8088.	0.	715.1
7	4	4	708.1	0.	5465.	638.	-638.	5179.	-4827.	5816.	5816	0.	708.1
8	4	4	708.4	0.	5484.	681.	-681.	5155.	-4803.	5836.	5836.	0.	708.4
9	4	4	695.9	0.	5466.	735.	-735.	5106.	-4731.	5841.	5841.	0.	695.9
10	3	4	685.5	0.	3357.	494.	-494.	3111.	-2864.	3605.	3605.	0.	685.5
11	3	4	662.9	0.	2520.	508.	-508.	2245.	-2012.	2753.	2753.	0.	662.9
12	3	4	654.0	0.	2087.	472.	-472.	1836.	-1616.	2308.	2308.	0.	654.0
13	3	4	647.8	0.	1785.	441.	-441.	1557.	-1344.	1998.	1998.	0.	647.8
14	3	4	644.1	0.	1608.	417.	-417.	1398.	-1190.	1815.	1815.	0.	644.1
15	2	4	625.9	0.	564.	321.	-321.	388.	-243.	709.	709.	0.	625.9
16	2	4	624.7	0.	520.	299.	-299.	365.	-221.	664.	664.	0.	624.7
17	2	4	621.4	0.	414.	285.	-285.	278.	-129.	563.	563.	0.	621.4
18	2	4	620.5	0.	377.	259.	-259.	266.	-118.	525.	525.	0.	620.5
19	2	4	630.3	0.	1027.	323.	-323.	914.	-704.	1236.	1236.	0.	630.3

SURFACE ZONE HEAT BALANCE : 0.0E-01 6.4E+04 1.0E-04-1.0E+04 5.9E-04-5.4E+04 6.9E+04 6.9E-04-2.5E-03

ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS

I	J	M	DTMAX	I	J	M	RDTMAX	I	J	M	DQMAX	I	J	M	RDQMAX	DQTOTAL	RDQTOTAL
			K				%				KW				%	KW	%
19	2	4	0.00	19	2	4	0.000	6	4	4	0.0	17	2	4	0.000	0.0	0.000

THE DISTRIBUTION OF T in K AFTER 100 ITERATIONS

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	1.689E+03	1.705E+03	1.580E+03	1.797E+03	1.682E+03	1.748E+03	1.677E+03	0.000E-01
J= 3	0.000E-01	1.566E+03	1.719E+03	1.796E+03	1.783E+03	1.798E+03	1.778E+03	1.747E+03	1.687E+03	1.626E+03
J= 2	1.543E+03	1.587E+03	1.693E+03	1.749E+03	1.764E+03	1.764E+03	1.757E+03	1.733E+03	1.683E+03	1.616E+03
J= 1	1.576E+03	1.601E+03	1.684E+03	1.721E+03	1.735E+03	1.738E+03	1.741E+03	1.724E+03	1.675E+03	1.585E+03

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	1.561E+03	1.488E+03	1.427E+03	1.382E+03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	1.559E+03	1.508E+03	1.472E+03	1.404E+03	1.352E+03	1.299E+03	1.230E+03	1.174E+03	1.149E+03	
J= 1	1.537E+03	1.487E+03	1.463E+03	1.414E+03	1.362E+03	1.304E+03	1.223E+03	1.162E+03	1.138E+03	

		I=11	I=12	I=13	I=14		I=15	I=16	I=17	I=18	I=19
I	J	CO2	H2O	N2	O2	VOL	SO2	ASH	CHAR	SOOT	
-	-	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	
1	1	0.1442	0.1233	0.7200	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
2	1	0.1442	0.1233	0.7200	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
3	1	0.1442	0.1233	0.7201	0.0123	0.0000	0.0000	0.0000	0.0000	0.0000	
4	1	0.1442	0.1233	0.7201	0.0123	0.0000	0.0000	0.0000	0.0000	0.0000	
5	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
6	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
7	1	0.1442	0.1233	0.7199	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
8	1	0.1442	0.1233	0.7199	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
9	1	0.1442	0.1233	0.7200	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
10	1	0.1442	0.1233	0.7200	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
11	1	0.1442	0.1233	0.7200	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
12	1	0.1442	0.1233	0.7200	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
13	1	0.1442	0.1233	0.7200	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
14	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
15	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
16	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
17	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
18	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
19	1	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
1	2	0.1442	0.1233	0.7200	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
2	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
3	2	0.1442	0.1233	0.7200	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
4	2	0.1442	0.1233	0.7200	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
5	2	0.1439	0.1231	0.7201	0.0127	0.0001	0.0000	0.0000	0.0000	0.0000	
6	2	0.1442	0.1233	0.7201	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
7	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
8	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
9	2	0.1442	0.1233	0.7201	0.0123	0.0000	0.0000	0.0000	0.0000	0.0000	
10	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
11	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
12	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
13	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
14	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
15	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
16	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
17	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
18	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
19	2	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
2	3	0.1442	0.1233	0.7200	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
3	3	0.1440	0.1232	0.7202	0.0126	0.0001	0.0000	0.0000	0.0000	0.0000	
4	3	0.1438	0.1230	0.7202	0.0128	0.0001	0.0000	0.0000	0.0000	0.0000	
5	3	0.1409	0.1207	0.7201	0.0170	0.0013	0.0000	0.0000	0.0000	0.0000	
6	3	0.1440	0.1232	0.7200	0.0127	0.0001	0.0000	0.0000	0.0000	0.0000	
7	3	0.1433	0.1226	0.7199	0.0138	0.0003	0.0000	0.0000	0.0000	0.0000	
8	3	0.1442	0.1233	0.7199	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
9	3	0.1442	0.1233	0.7200	0.0125	0.0000	0.0000	0.0000	0.0000	0.0000	
10	3	0.1442	0.1233	0.7200	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
11	3	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
12	3	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
13	3	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
14	3	0.1442	0.1233	0.7201	0.0124	0.0000	0.0000	0.0000	0.0000	0.0000	
3	4	0.1274	0.1100	0.7198	0.0364	0.0062	0.0000	0.0000	0.0002	0.0000	

4	4	0.1239	0.1073	0.7196	0.0415	0.0075	0.0000	0.0000	0.0002	0.0000
5	4	0.1115	0.0975	0.7199	0.0586	0.0121	0.0000	0.0000	0.0003	0.0000
6	4	0.1395	0.1196	0.7202	0.0190	0.0018	0.0000	0.0000	0.0000	0.0000
7	4	0.1286	0.1110	0.7201	0.0344	0.0058	0.0000	0.0000	0.0001	0.0000
8	4	0.1427	0.1222	0.7209	0.0137	0.0006	0.0000	0.0000	0.0000	0.0000
9	4	0.1442	0.1233	0.7205	0.0120	0.0000	0.0000	0.0000	0.0000	0.0000

THE DISTRIBUTION OF QG in kW/m**3 AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.465E+02	1.226E+02	5.209E+01	2.060E+02	1.098E+02	1.697E+02	1.602E+02	0.000E-01
J= 3	0.000E-01	8.251E+01	7.082E+01	8.961E+01	9.572E+01	6.461E+01	7.228E+01	7.004E+01	5.878E+01	8.437E+01
J= 2	8.952E+01	2.741E+01	5.055E+01	2.710E+01	3.658E+01	3.767E+01	3.438E+01	4.550E+01	4.567E+01	7.536E+01
J= 1	7.481E+01	3.325E+01	1.812E+01	3.033E+01	4.485E+01	5.930E+01	4.932E+00	1.742E-01	3.945E-01	1.738E+02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	1.370E+02	1.185E+02	9.830E+01	9.114E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	1.025E+02	8.600E+01	3.585E+01	3.746E+01	1.341E+02	1.181E+02	1.023E+02	9.222E+01	5.163E+01	
J= 1	9.065E+01	8.177E+01	3.037E+01	3.347E+00	1.031E+02	1.051E+02	9.399E+01	6.959E+01	4.403E+01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF TRES in sec AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	7.103E-02	6.030E-02	2.874E-02	5.714E-02	4.021E-02	5.591E-02	7.531E-02	0.000E-01
J= 3	0.000E-01	1.589E-01	7.857E-02	7.774E-02	4.101E-02	5.870E-02	4.845E-02	5.305E-02	5.652E-02	5.032E-02
J= 2	9.385E-02	5.521E-02	7.046E-02	6.690E-02	2.932E-02	4.559E-02	3.874E-02	4.651E-02	5.802E-02	3.772E-02
J= 1	3.448E-02	3.237E-02	6.704E-02	6.413E-02	2.827E-02	4.153E-02	3.794E-02	4.986E-02	6.072E-02	3.793E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	6.340E-02	8.045E-02	8.309E-02	1.084E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	5.375E-02	7.802E-02	7.516E-02	8.699E-02	5.162E-02	6.452E-02	6.032E-02	6.166E-02	1.030E-01	
J= 1	5.260E-02	7.848E-02	6.196E-02	6.504E-02	5.140E-02	6.481E-02	6.096E-02	6.226E-02	1.041E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOHR in kW AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	3.810E+04	3.835E+04	1.646E+04	2.036E+04	1.149E+04	7.632E+03	6.904E+02	0.000E-01
J= 3	0.000E-01	5.598E-01	1.196E+04	1.396E+04	1.239E+04	5.617E+03	6.344E+03	1.306E+03	1.866E+01	0.000E-01
J= 2	0.000E-01	0.000E-01	7.464E-01	2.426E+02	8.584E+02	2.053E+02	3.919E+02	3.732E+01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	1.866E+01	0.000E-01	1.866E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF VOL in kg/(kg.mixture) AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	6.210E-03	7.520E-03	1.214E-02	1.801E-03	5.789E-03	5.668E-04	8.604E-06	0.000E-01
J= 3	0.000E-01	0.000E-01	8.631E-05	1.399E-04	1.254E-03	6.363E-05	3.322E-04	3.635E-06	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	9.528E-05	1.363E-05	1.489E-05	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.298E-05	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

J= 4	6.886E+02
J= 3	6.791E+02
J= 2	6.736E+02
J= 1	3.500E+02

M1= 1

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

J= 4	1.632E+02
J= 3	1.440E+02
J= 2	1.313E+02
J= 1	1.368E+02

M1= 1

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

J= 4	-1.239E+02
J= 3	-1.088E+02
J= 2	-9.993E+01
J= 1	-1.359E+02

M1= 1

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

J= 4 6.878E+02
J= 3 6.522E+02
J= 2 8.000E+02
J= 1 8.000E+02

M3= 1

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

J= 4 1.617E+02
J= 3 8.474E+01
J= 2 5.030E+01
J= 1 5.077E+01

M3= 1

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

J= 4 -1.227E+02
J= 3 -6.571E+01
J= 2 -2.707E+01
J= 1 -2.755E+01

M3= 1

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

M4= 1	6.717E+02	6.796E+02	7.002E+02	7.045E+02	7.029E+02	7.151E+02	7.081E+02	7.084E+02	6.959E+02	6.855E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	6.629E+02	6.540E+02	6.478E+02	6.441E+02	6.259E+02	6.247E+02	6.214E+02	6.205E+02	6.303E+02	
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

M4= 1	1.268E+02	1.452E+02	1.910E+02	2.008E+02	2.004E+02	2.237E+02	2.101E+02	2.091E+02	1.810E+02	1.575E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	1.055E+02	8.628E+01	7.314E+01	6.569E+01	2.327E+01	2.192E+01	1.578E+01	1.509E+01	3.902E+01	
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

M4= 1	-9.691E+01	-1.096E+02	-1.425E+02	-1.494E+02	-1.469E+02	-1.664E+02	-1.552E+02	-1.557E+02	-1.356E+02	-1.190E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	-8.286E+01	-6.864E+01	-5.871E+01	-5.287E+01	-2.370E+01	-2.184E+01	-1.644E+01	-1.499E+01	-3.070E+01	
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	

iter. no.=100, acc.err.= 0.3730 %, avg.err.= -1.0318 %, 20 it.err.= 0.5151 %, hb.err.= -0.0105 %

BALANCE OF TOTAL RADIATIVE EXCHANGE

NUMBER OF BEAMS = 354960

SUM OF EMITTED RADIATION (KW) :

VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
2.325E+06	2.274E+04	4.050E+02	8.207E+03	6.572E+02	1.347E+04	2.348E+06

SUM OF ABSORBED RADIATION (KW) :

VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
2.280E+06	6.796E+04	5.380E+03	0.000E-01	5.530E+03	5.905E+04	2.348E+06

SUM OF NET EMITTED RADIATION (KW) :

VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
4.522E+04	-4.522E+04	-4.975E+03	8.207E+03	-2.873E+03	-4.558E+04	-1.850E+00

ERROR OF RADIATIVE ENERGY BALANCE =-7.877E-05 %

TOTAL HEAT BALANCE :

HEAT TO FURNACE WALLS IN KW :
RAD.= 60607.8 CONV.= 11539.8 SUM = 72147 6

HEAT TO FURNACE EXIT IN KW :
RAD.= 454.6 CONV.= 0.0 SUM = 454.6

HEAT TO FURNACE HOPPER IN KW :
RAD.= 568.0 CONV.= 0.0 SUM = 568 0

HEAT FLUXES TO ZONAL HEAT EXCHANGERS IN KW :

ZONE I	BY RADI.	BY CONV.	SUM
10	2044.1	169.6	2213.7
11	5148.5	1867.9	7016.4
12	4442.0	1744.9	6186 9
13	1868.4	804.7	2673 1
14	1503.0	764.7	2267.7
15	3709.5	1742.6	5452.1
16	2889.8	1597.3	4487 0
17	2905.6	5093 7	7999.3
18	2326.5	4480.3	6806.8

```
      19          782.5          1416.0          2198.5

CLOSURE OF TOTAL HEAT BALANCE :
  HEAT FLUX FROM FLUE GAS   :  120922.9 KW
  HEAT FLUX TO HEAT SINKS   :  120471.8 KW
  DIFFERENCE                :    -451.1 KW
  ACT. PERCENTAGE ERROR     :  0.373023 %
  AVG. PERCENTAGE ERRRR     : -1.031837 %
  AVG. ERROR OF LAST 20 IT. :  0.515083 %
```

I INDEX	X-CO-ORDINATE M	NET NORM. MASS FLUX -	MEAN TEMP. K	MEAN RES. TIME Sec	SUM OF RES. TIME Sec
1	0.988	0.3576	1542.97	0.2609	0.4795
2	2.964	0.6258	1586.05	0.3491	0.1745
3	4.912	0.6380	1700.23	0.3982	0.1991
4	6.772	0.6664	1759.08	0.3464	0.5714
5	8.247	0.9889	1707.57	0.1520	0.8206
6	9.722	0.9957	1790.82	0.2283	1.0107
7	11.314	1.0204	1747.15	0.1750	1.2124
8	12.700	1.0000	1741.92	0.1792	1.3895
9	14.185	1.0000	1684.38	0.2123	1.5852
10	15.608	1.0000	1622.54	0.1359	1.7593
11	16.919	1.0000	1557.94	0.1521	1.9033
12	18.279	1.0000	1494.17	0.1586	2.0587
13	19.640	1.0000	1445.23	0.1640	2.2201
14	21.000	1.0000	1406.42	0.1703	2.3872
15	22.501	1.0000	1354.29	0.1889	2.5168
16	24.144	1.0000	1300.13	0.0926	2.6075
17	25.834	1.0000	1228.08	0.1035	2.7056
18	27.570	1.0000	1171.39	0.1086	2.8116
19	29.592	1.0000	1146.22	0.1475	2.9396

MEAN GAS SPECIES CONCENTRATION ALONG FURNACE .

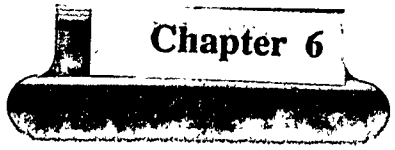
I	X-CO-ORD. M	CO2 VOL% WET	H2O VOL% WET	N2 VOL% WET	- VOL% WET	AR VOL% WET	SO2 VOL% WET
1	0.988	9.0475	18.9045	70.9711	1.0769	0.0000	0.0000
2	2.964	9.0474	18.9044	70.9737	1.0744	0.0000	0.0000
3	4.912	8.8081	18.4420	70.9729	1.5352	0.2419	0.0000
4	6.772	8.6414	18.1198	70.9626	1.8644	0.4117	0.0000
5	8.247	8.1588	17.1871	70.9556	2.7928	0.9057	0.0000
6	9.722	8.9490	18.7142	70.9763	1.2585	0.1020	0.0000
7	11.314	8.7549	18.3392	70.9644	1.6436	0.2979	0.0000
8	12.700	9.0256	18.8623	70.9890	1.1007	0.0224	0.0000
9	14.185	9.0474	18.9044	70.9747	1.0735	0.0000	0.0000
10	15.608	9.0474	18.9044	70.9766	1.0717	0.0000	0.0000
11	16.919	9.0474	18.9043	70.9778	1.0704	0.0000	0.0000
12	18.279	9.0474	18.9043	70.9781	1.0702	0.0000	0.0000
13	19.640	9.0474	18.9043	70.9783	1.0700	0.0000	0.0000
14	21.000	9.0474	18.9043	70.9783	1.0699	0.0000	0.0000
15	22.501	9.0474	18.9043	70.9783	1.0700	0.0000	0.0000
16	24.144	9.0474	18.9043	70.9783	1.0700	0.0000	0.0000
17	25.834	9.0474	18.9043	70.9784	1.0699	0.0000	0.0000
18	27.570	9.0474	18.9043	70.9784	1.0698	0.0000	0.0000
19	29.592	9.0474	18.9043	70.9784	1.0698	0.0000	0.0000

OTHER MEAN QUANTITIES ALONG FURNACE :

I	X-CO-ORD. M	CARBON IN ASH %	TOT. FUEL HEAT REL. %	VOLATILE HEAT REL. %	SO2 REDUCTION %	CAO UTIL. %
1	0.988	22.8277	0.0000	0.0000	0.0000	0.0000
2	2.964	23.3460	0.0301	0.0300	0.0000	0.0000
3	4.912	25.8182	26.8993	26.9000	0.0000	0.0000
4	6.772	27.0855	55.0685	55.0700	0.0000	0.0000
5	8.247	27.4290	70.9885	70.9900	0.0000	0.0000
6	9.722	26.4386	85.0276	85.0300	0.0000	0.0000
7	11.314	26.3912	94.7976	94.8000	0.0000	0.0000
8	12.700	25.6449	99.6073	99.6100	0.0000	0.0000
9	14.185	24.9065	99.9874	99.9900	0.0000	0.0000
10	15.608	24.4372	99.9875	99.9900	0.0000	0.0000
11	16.919	23.9874	99.9876	99.9900	0.0000	0.0000
12	18.279	23.5296	99.9876	99.9900	0.0000	0.0000
13	19.640	23.1275	99.9877	99.9900	0.0000	0.0000
14	21.000	22.7250	99.9877	99.9900	0.0000	0.0000
15	22.501	22.5088	99.9878	99.9900	0.0000	0.0000
16	24.144	22.3004	99.9878	99.9900	0.0000	0.0000
17	25.834	22.0963	99.9878	99.9900	0.0000	0.0000
18	27.570	21.9087	99.9878	99.9900	0.0000	0.0000
19	29.592	21.7409	99.9879	99.9900	0.0000	0.0000

Listing 5.7. Contents of file BOILER.DAT (Case 4).

```
0401100.0    100
                72147.55       0.00       0.00       0.00       0.00
                    0.00       0.00       0.00       0.00    2668.33
                 7016.43    6186.92    2673.14    2267.66    5452.11
                 4487.04    7999.33    6806.78    2198.47       0.00
                    0.00       0.00       0.00       0.00       0.00
                    0.00       0.00       0.00       0.00       0.00
               1542.97 1586.05 1700.23 1759.08 1707.57
               1790.82 1747.15 1741.92 1684.38 1622.54
               1557.94 1494.17 1445.23 1406.42 1354.29
               1300.13 1228.08 1171.39 1146.22    0.00
                  0.00    0.00    0.00    0.00    0.00
                  0.00    0.00    0.00    0.00    0.00
                0.0905  0.0905  0.0881  0.0864  0.0816
                0.0895  0.0875  0.0903  0.0905  0.0905
                0.0905  0.0905  0.0905  0.0905  0.0905
                0.0905  0.0905  0.0905  0.0905  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.1890  0.1890  0.1844  0.1812  0.1719
                0.1871  0.1834  0.1886  0.1890  0.1890
                0.1890  0.1890  0.1890  0.1890  0.1890
                0.1890  0.1890  0.1890  0.1890  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.7097  0.7097  0.7121  0.7137  0.7186
                0.7108  0.7126  0.7101  0.7097  0.7098
                0.7098  0.7098  0.7098  0.7098  0.7098
                0.7098  0.7098  0.7098  0.7098  1.0000
                1.0000  1.0000  1.0000  1.0000  1.0000
                1.0000  1.0000  1.0000  1.0000  1.0000
                0.0108  0.0107  0.0154  0.0186  0.0279
                0.0126  0.0164  0.0110  0.0107  0.0107
                0.0107  0.0107  0.0107  0.0107  0.0107
                0.0107  0.0107  0.0107  0.0107  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0000  0.0000  0.0000  0.0000
                0.0000  0.0156  0.7776  0.2067
                 76.8043
                 72.5921
                  4.2122
                0.0001  0.9998  0.0000  0.0001
                49380.70
                44303.07
               201000.11
```


Chapter 6

6.0 CASE 5 FILES

This chapter documents all the input and output files associated with the execution of the Case 5 example as defined in Chapter 1. Case 5 example demonstrates model set-up using the 2DINPT code, and the results obtained from the 2DHT code, for the tangentially-fired boiler (Boiler 2) which uses *coal* as fuel. This case does not include gaseous fuel reburning applications, therefore, the RBINPT and the RBNOX codes were not used. The user may refer to Figure 1.2 for the 2D boiler zone-arrangement. Files included in this chapter are as follows:

- The record of the 2DINPT interactive sessions (Listing 6.1). --- This record shows the procedures of creating an input data file step-by-step. The input file created for the 2DHT code has a file name as 2DIN0501.100. Note that the 2DINPT code was operated under the file "creation" mode, which means that the input data file had not existed and was created from scratch. The flow field was created by the option of "direct prescription" and much more key-strokes were needed to prescrib the flow field.

- The contents of the file 2DIN0501.100 (Listing 6.2).

- The contents of the computer-terminal output (Listing 6.3). --- This was the outputs directed to the computer terminal screen, showing the progress of the 2DHT code execution.

- The contents of file 2DOT0501.100 (Listing 6.4). --- File 2DOT0501.100 was created upon completion of the 2DHT furnace-code execution. This file contains the predicted boiler thermal-performance information as defined by the Case 5 boiler operating conditions.

- The content of file BOILER.DAT (Listing 6.5). --- Again, this file was created upon completion of the 2DHT code execution, and may be used for later boiler performance predictions by executing the BPM code. The user is suggested to save this file under a different name (e.g., BOIL0501.100) if he wishes to reproduce the results of this case, as this file will be over-written everytime the 2DHT code is executed. This case example does not include the demonstration of the BPM code execution. The user should refer to Case 2 example if he is interested in running the BPM code for this case.

Listing 6.1. Record of 2DINPT interactive session (Case 5).

```
2DINPT


-- This is an interactive program (2DINPT) to create
   or update a data file which is required to run the
   EER two-dimensional heat transfer code (2DHT).
-- Version 1.70, May, 1992


********************** Attention ********************
 This interactive program accepts inputs from keyboard
 in UPPER case only.
 -- Please set your keyboard to the UPPER case symbols
    (i.e., Caps Lock !).
 -- To continue, type C and press Return (or Enter).
*****************************************************

C

STATUS OF INPUT FILE:
---------------------
To Create an input file, Press: C
To Update an input file,        Return  C

You chose to create an input file.

Please wait, writing blank data file ...
Press Return to continue



 Chapter 1 :
-------------
INPUT/OUTPUT SPECIFICATIONS AND PARAMETERS WHICH
CONTROL THE EXTENT OF NUMERICAL CALCULATIONS

         Press: P to by-pass this chapter
                Return to proceed through

Specify the name (BOLNAM) of the boiler:
-- Maximum characters allowed: 24
-- Characters can be alphabetic or numeric

         Press: C to change
                Return to continue  C
BOILER 2

Specify a two-digit case number (NRCS) for
current run (e.g., 01, 02, or 03):
-- Case number can be used to distinguish the boiler operating
   conditions, or parametric parameters being studied

         Press: C to change
                Return to continue  C
05

Specify a two-digit version number (NRVS) for
current run (e.g., 01, 02, or 03):
-- Version number can be used to further document cases run
   under the same case number as specified above

         Press: C to change
                Return to continue  C
01
```

```
Specify boiler load (CLOAD) for current run:
-- Boiler load may be described as 60.5, 90.0, or 100.0,
   to show the % of current load relative to the boiler MCR

         Press: C to change
                Return to continue  C
100.0

Name of output file (FINPT) from this program:   2DINcsvs.111
-- Default file name is 2DINcsvs.LLL
-- csvs represents the case number and the version numbers
-- LLL shows the boiler load percentage

         Press: D for default values
                C to change
                Return to continue  D

Name of input array file (FINPTAR):
-- The default name has format as IARRcsvs.LLL
-- IARR denotes "input array" for the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output array file (FINPTAR):
-- The default name has format as OARRcsvs.LLL
-- OARR denotes "output array" from the 2DHT code

         Press: D for default values
                C to change
                Return to continue  D

Name of output file (FHDOPT) from the 2DHT code:
-- The default name has format as 2DOTcsvs.LLL
-- 2DOT denotes "output file" from the 2DHT code

         Press: D for the default file name
                C to change the file name
                B to direct the file to your monitor
                Return to continue  D

Specification of output level (LOUTPUT) :
Current output level is    1
-- DEFAULT setting is most useful and recommended.
-- In addition to the default setting, you can choose from
   four other output levels : 1, 2, 3, and 4.
-- Higher output levels give more comprehehsive information.

         Press: D for default values
                C to change
                Return to continue  D

You can include your comments on the front page
of the printout :
-- Comment block may consist of 10 lines
-- Each line may have a max. of 78 characters
To continue, press Return

Current comments are:
" Line  1 is blank "
" Line  2 is blank "
" Line  3 is blank "
" Line  4 is blank "
```

```
* Line  5 is blank *
* Line  6 is blank *
* Line  7 is blank *
* Line  8 is blank *
* Line  9 is blank *
* Line 10 is blank *

         Press: C to change
                Return to continue  C

* Line  1 is blank *

         Press: C to change
                Return to continue  C
TANGENTIALLY FIRED BOILER, USE COAL AS PRIMARY FUEL AT 100% LOAD

* Line  2 is blank *

         Press: C to change
                Return to continue

* Line  3 is blank *

         Press: C to change
                Return to continue

* Line  4 is blank *

         Press: C to change
                Return to continue

* Line  5 is blank *

         Press: C to change
                Return to continue

* Line  6 is blank *

         Press: C to change
                Return to continue

* Line  7 is blank *

         Press: C to change
                Return to continue

* Line  8 is blank *

         Press: C to change
                Return to continue

* Line  9 is blank *

         Press: C to change
                Return to continue

* Line 10 is blank *

         Press: C to change
                Return to continue

Maximum number of iterations for this run
NIMAX=  1
-- During the test phase, set NIMAX =1
```

```
-- For production runs, use NIMAX values between 30 and 100

         Press: C to change
                Return to continue  C
100

Number of iterations at which the averaging procedure
is initialized to smooth-out the Monte Carlo effects :
NITACC=  1
-- For runs without averaging, set NITACC = NIMAX.
-- For complete averaging, set NITACC =1.
-- For typical runs, set NITACC = NIMAX - 30.

         Press: C to change
                Return to continue  C
71

Number of sub-iterations for fixed carbon mass
balances per iteration of total heat balance :
NIMX=  1
-- During test phase, set NIMX=1
-- For coal combustion, set NIMX between 5 and 10
-- For gaseous and oil fuels, set NIMX=1

         Press: C to change
                Return to continue  C
5

(a) Number of divisions on the largest linear dimension
    of volume zones: NMAX= 1
(b) Divisions of polar angle: NPHI= 2
(c) Cut-off value for beam tracking: EXACT=0.001000
Default values are: NMAX  = 2
                    NPHI  = 4
                    EXACT = 0.0001
NMAX and NPHI must be even numbers

         Press: D for default values
                C to change
                Return to continue  D

Number of iterations after which field variables
of total heat balances are printed :
NPRIN=   1
-- Default value is NPRIN=NIMAX (recommended)

         Press: D for default values
                C to change
                Return to continue  D

Switches to print detailed outputs of:
-- total energy balance for volume and surface zones.
-- mass balance for volume zones
Currently, switches are NOT set to print the above information.

         Enter: C to change
                Return to continue  C

You chose to print the information
Press Return to continue

Switches to write or read files to/from hard disk :
NWRTE: Switch to save data file at the end of the 2DHT run
       Currently, NWRTE= 0
```

```
NREAD: Switch to read variable values from a restarting
       file at the beginning of the 2DHT run
       Currently, NREAD= 0
-- For trial runs     , set NWRTE=1 and NREAD=0.
-- For continued runs, set NWRTE=1 and NREAD=1.

         Press: C to change
                Return to continue  C
1 0

NWRTE= 1, NREAD= 0, Are these values O.K. ?

         Press: C to change
                Return to continue

 Chapter 2 :
-------------
BOILER FURNACE OPERATING DATA

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

FUEL TYPE:
For gaseous fuels, set NGAS= 1, NLIQ= 0, NSLL= 0.
For liquid  fuels, set NGAS= 0, NLIQ= 1, NSLL= 0.
For solid   fuels, set NGAS= 0, NLIQ= 0, NSLL= 1.
Currently, NGAS= 0 NLIQ= 0 NSLL= 0

         Press: C to change
                Return to continue  C
0 0 1

You chose coal as fuel
Press Return to continue

Proximate analysis of fuel in kg/kg wet
PCFX=0.0000  PVOL=0.0000  PMOI=0.0000  PASH=0.0000

         Press: C to change
                Return to continue  C
0.4189 0.3341 0.1375 0.1095

Ultimate analysis of fuel in kg/kg dry
UCAR=0.0000  UHYD=0.0000  UNIT=0.0000
UOXY=0.0000  USUL=0.0000  UASH=0.0000

         Press: C to change
                Return to continue  C
0.6920 0.0491 0.0124 0.0861 0.0335 0.1269

Inherent sulfur capture by ash:   0.0000 % of total sulfur
Default value is 0.0 % (i.e., all sulfur is converted to SO2)

         Press: D for default values
                C to change
                Return to continue

Gross (higher) heating value of fuel in kj/kg wet :
HUSW=     0.0

         Press: C to change
                Return to continue  C
24947.1
```

```
Fuel flow rate in kg wet / sec :
FUSW=  0.0000

         Press: C to change
                Return to continue  C
8.8879

Gross fuel heat input is   221727.3 kw

         Press: C to change
                Return to continue

Temperature of primary mixture in K :
TFS=    0.00

         Press: C to change
                Return to continue  C
339.54

Specific heat of fuel in kj/kg dry K :
CPFS=  0.0000
Default value is 1.1000 for coal

         Press: D for default values
                C to change
                Return to continue  D

Air Flow Rates and Properties
Current settings:
  Total air (wet, kg/sec) flow rate =   0.0000
  Total stochiometric air ratio =   0.0000
  O2 % (dry) in flue gas =   0.0000

You have three options to choose:
  Option A -- Specify total air flow rate (wet) in kg/sec
  Option B -- Specify total stochiometric air ratio
  Option C -- Specify O2 % (dry) in the flue gas

         Press: A, B, or C for your option
                Return to continue  C

Dry oxygen concentration in volume percent of flue gas
FLUO2D=  0.0000

         Press: C to change
                Return to continue  C
3.27

 DMA2W =   0.0000
 AIRNR =   0.0000
 FLUO2D=   3.2700
Are these final settings O.K. ?

         Press: C to change
                Return to continue

Water vapor content in air
(a) Relative humidity in % : RELHA2=  0.0000
(b) Saturation pressure in bar : PSH2A2=  0.0000
Default values are 50 % and 0.0317 bar at 298.15 K

         Press: D for default values
                C to change
                Return to continue  D
```

```
Temperature of secondary air in K :
TA2=    0.00

         Press: C to change
                Return to continue  C
545.47

Amount of primary air in % of stoichiometric air :
PASTCH= 0.0
Default value is 20%

         Press: D for default values
                C to change
                Return to continue  D


Specify how much fuel moisture is vaporized in
the mill : PCH2O=     0.0 %
Default value is 0.0, which means all fuel water vaporized
in the furnace.

         Press: D for default values
                C to change
                Return to continue  C
100

Convective heat transfer coefficient at furnace walls
in kw/m**2 K : ALPHA=  0.0000
Default value is 0.0116 kw/m**2 K

         Press: D for default values
                C to change
                Return to continue  D

Cool side temperature of furnace walls in K :
TOUT=  0.00
Default value is 750.0 K

         Press: D for default values
                C to change
                Return to continue  C
634.

 Chapter 3 :
-------------
INITIAL PARTICLE SIZE DISTRIBUTION

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Initial diameter XMN0(L) of particles (oil droplets or coal)
in 10 size classes, in microns :
       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
     0.0       0.0

         Press: D for default values
                C to change
                Return to continue  D

Default has been assigned
-------------------------
Initial diameter XMN0(L) of particles (oil droplets or coal)
in 10 size classes, in microns :
```

```
      1.8       4.4       11.1       27.8       69.9      150.0      250.0      350.0
   450.0      550.0

         Press: D for default values
                C to change
                Return to continue  C
3. 10.6 22.1 37.9 60.4 87.8 125.8 209.9 322.2 485.9

Initial diameter XMN0(L) of particles (oil droplets or coal)
in 10 size classes, in microns :
      3.0       10.6       22.1       37.9       60.4       87.8      125.8      209.9
   322.2      485.9

         Press: D for default values
                C to change
                Return to continue

Initial mass fraction CMFR(L) of particles (coal or oil droplets)
in 10 size classes :
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000

         Press: D for default values
                C to change
                Return to continue  D

Default has been assigned
-------------------------
Initial mass fraction CMFR(L) of particles (coal or oil droplets)
in 10 size classes :
  0.0250  0.0800  0.1750  0.3000  0.2000  0.1100  0.0680  0.0270
  0.0090  0.0060

         Press: D for default values
                C to change
                Return to continue  C
0.1 0.15 0.15 0.15 0.1498 0.1003 0.1 0.0849 0.0075 0.0075

Initial mass fraction CMFR(L) of particles (coal or oil droplets)
in 10 size classes :
  0.1000  0.1500  0.1500  0.1500  0.1498  0.1003  0.1000  0.0849
  0.0075  0.0075

         Press: D for default values
                C to change
                Return to continue

Initial mass mean diameter of particles is
XMEAN=   65.21 microns.

         Press: C to change
                Return to continue

 Chapter 4 :   -
-------------
PARAMETERS FOR CHAR AND VOLATILE BURN-OUT

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Density of coal particle in kg/m**3 :
RHOCOL=    0.00
```

```
         Press: D for default values
                C to change
                Return to continue  D

This is the default value :
Constants of Char Burn-Out Model
Current settings are :
(a) Activation energy in kj/kmole : ACENER=     0.0
(b) Frequency factor in kg/m**2 s bar O2 : FREQFC =     0.0
(c) Q factor : QFAC=    0.00

You have three options for the default :
Option A: Very high-volatile western coal
          ACENER=89890.6    FREQFC= 1200.0    QFAC  =    1.5
Option B: High-volatile coals
          ACENER=89890.6    FREQFC=  693.8    QFAC  =    1.0
Option C: Medium volatile coals
          ACENER=89890.6    FREQFC=  400.0    QFAC  =    1.0

         Press: D for default values
                C to change
                Return to continue  D

Which option ? Please press the corresponding key. B

This is only information :
Density of char particle is  537.03 kg/m**3 .
To continue, press Return

This is only information:
-- Program assumes that one coal particle generates
   one ash particle
-- The absorption efficiency of the ash particle is
   assumed to be 0.1
To continue, press Return

The following radiative properties of the ash cloud
were calculated :
-- Specific surface area of coal : SPECCL=  295.27 m**2/kg
-- Specific surface area of ash cloud : SPECAS=  430.57 m**2/kg
-- Mass mean diameter of ash particles : XASHMN= 26.06 microns
-- Radiation mean diameter of ash particles : XASHRA=  6.33 microns

Specific absorption coefficient of ash cloud : SKASH=  0.0000  1/((kg/m**3)m)
-- Default value is  10.7643  1/((kg/m**3)m)

         Press: D for default values
                C to change
                Return to continue  D

Fuel "Volatile" Burnout Characteristics
"Volatile" burnout time in sec : TLFMAX=  0.00
-- Default values are 0.7 sec
-- For highly swirling flow, set TLFMAX=0.4
-- For delayed mixing flame such for T-fired
   boiler, set TLFMAX=1.4

         Press: D for default values
                C to change
                Return to continue  C
0.78

Number of lumps used to represent fuel "volatile"
combustion : NVLTOT=      0.
```

```
-- Default value is 10000.

         Press: D for default values
                C to change
                Return to continue  D

Fractional conversion of "volatile" carbon to soot :
CMCVLS=  0.00
-- Default value is 0.1 (for high volatile bituminous flames)
-- For lignite flames, set to 0.05
-- For heavy oil flames, set to 0.2
-- For non-luminous gaseous flames, set to 0.0

         Press: D for default values
                C to change
                Return to continue  D

 Chapter 5 :
-------------
PARAMETERS FOR ASH REACTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Fraction of total sulfur as pyritic sulfur :
PRSULF=  0.0000
-- Default value is 0.0
-- For gas and oil firing, may set to 0.0

         Press: D for default values
                C to change
                Return to continue  C
0.3665

 Chapter 7 :
-------------
SPECIFICATION OF FURNACE MODEL GEOMETRY

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Number of volume zones in X-direction, NX=30

         Press: C to change
                Return to continue  C
22

Number of volume zones in Y-direction, NY=10

         Press: C to change
                Return to continue  C
4

Zone extension in X-direction DX(i) in m :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000

         Press: C to change
                Return to continue  C

DX( 1)=  0.0000
```

```
          Press: C to change
                 Return to continue  C
3.0260

DX( 2)=  0.0000

          Press: C to change
                 Return to continue  C
0.9075

DX( 3)=  0.0000

          Press: C to change
                 Return to continue  C
1.7385

DX( 4)=  0.0000

          Press: C to change
                 Return to continue  C
1.7384

DX( 5)=  0.0000

          Press: C to change
                 Return to continue  C
1.254

DX( 6)=  0.0000

          Press: C to change
                 Return to continue  C
1.254

DX( 7)=  0.0000

          Press: C to change
                 Return to continue  C
1.254

DX( 8)=  0.0000

          Press: C to change
                 Return to continue  C
2.0698

DX( 9)=  0.0000

          Press: C to change
                 Return to continue  C
1.0723

DX(10)=  0.0000

          Press: C to change
                 Return to continue  C
2.1018

DX(11)=  0.0000

          Press: C to change
                 Return to continue  C
0.855
```

```
DX(12)=  0.0000

         Press: C to change
                Return to continue  C
2.1161

DX(13)=  0.0000

         Press: C to change
                Return to continue  C
2.1161

DX(14)=  0.0000

         Press: C to change
                Return to continue  C
3.2217

DX(15)=  0.0000

         Press: C to change
                Return to continue  C
1.6

DX(16)=  0.0000

         Press: C to change
                Return to continue  C
2.9494

DX(17)=  0.0000

         Press: C to change
                Return to continue  C
2.9494

DX(18)=  0.0000

         Press: C to change
                Return to continue  C
2.9495

DX(19)=  0.0000

         Press: C to change
                Return to continue  C
1.9577

DX(20)=  0.0000

         Press: C to change
                Return to continue  C
1.9577

DX(21)=  0.0000

         Press: C to change
                Return to continue  C
2.4073

DX(22)=  0.0000

         Press: C to change
                Return to continue  C
```

```
2.3762

Furnace extension in X-direction in m : 43.8724

         Press: C to change
                Return to continue

Zone extension in Y-direction DY(j) in m :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue  C

DY( 1)=  0.0000

         Press: C to change
                Return to continue  C
2.1114

DY( 2)=  0.0000

         Press: C to change
                Return to continue  C
0.8745

DY( 3)=  0.0000

         Press: C to change
                Return to continue  C
0.5647

DY( 4)=  0.0000

         Press: C to change
                Return to continue  C
0.4865

Furnace extension in Y-direction in m :  4.0371

         Press: C to change
                Return to continue

Minimum I-indices :
  0   0   0   0

         Press: C to change
                Return to continue  C

IMI( 1)= 0

         Press: C to change
                Return to continue  C
1

IMI( 2)= 0

         Press: C to change
                Return to continue  C
1

IMI( 3)= 0

         Press: C to change
                Return to continue  C
```

```
2

IMI( 4)= 0

         Press: C to change
                Return to continue  C
3

Maximum I-indices :
  0    0    0    0

         Press: C to change
                Return to continue  C

IMX( 1)= 0

         Press: C to change
                Return to continue  C
22

IMX( 2)= 0

         Press: C to change
                Return to continue  C
22

IMX( 3)= 0

         Press: C to change
                Return to continue  C
13

IMX( 4)= 0

         Press: C to change
                Return to continue  C
13

All minimum J-indices, JMI(i), have been set to 1
Press Return to continue

Maximum J-indices :
  0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
  0    0

         Press: C to change
                Return to continue  C

JMX( 1)= 0

         Press: C to change
                Return to continue  C
2

JMX( 2)= 0

         Press: C to change
                Return to continue  C
3

JMX( 3)= 0

         Press: C to change
                Return to continue  C
```

```
4

JMX( 4)= 0

         Press: C to change
                Return to continue  C
4

JMX( 5)= 0

         Press: C to change
                Return to continue  C
4

JMX( 6)= 0

         Press: C to change
                Return to continue  C
4

JMX( 7)= 0

         Press: C to change
                Return to continue  C
4

JMX( 8)= 0

         Press: C to change
                Return to continue  C
4

JMX( 9)= 0

         Press: C to change
                Return to continue  C
4

JMX(10)= 0

         Press: C to change
                Return to continue  C
4

JMX(11)= 0

         Press: C to change
                Return to continue  C
4

JMX(12)= 0

         Press: C to change
               -Return to continue  C
4

JMX(13)= 0

         Press: C to change
                Return to continue  C
4

JMX(14)= 0
```

```
          Press: C to change
                 Return to continue  C
2

JMX(15)= 0

          Press: C to change
                 Return to continue  C
2

JMX(16)= 0

          Press: C to change
                 Return to continue  C
2

JMX(17)= 0

          Press: C to change
                 Return to continue  C
2

JMX(18)= 0

          Press: C to change
                 Return to continue  C
2

JMX(19)= 0

          Press: C to change
                 Return to continue  C
2

JMX(20)= 0

          Press: C to change
                 Return to continue  C
2

JMX(21)= 0

          Press: C to change
                 Return to continue  C
2

JMX(22)= 0

          Press: C to change
                 Return to continue  C
2

 Chapter 8 :
------------ -
PARAMETERS FOR REBURNING OR CO-FIRING

          Press: P to by-pass this chapter
                 R to save file and exit 2DINPT
                 Return to proceed through

Switch for reburning or co-firing
0: to turn-off, 1: to turn-on this option
Currently, NREB=    0
```

```
         Press: C to change
                Return to continue

 Chapter 9 :
-------------
SPECIFICATION OF HEAT EXTRACTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Heat Extraction by Heat Sinks
Option A: No additional surface area.
Option B: Cooled surface area located at
          circumferential walls (M=4) of
          a refractory covered furnace.
Option C: Simulation of radiant heat exchangers
          in upper furnace.

Currently option A is exercised.

         Press: C to change
                Return to continue  C

Please type A, B or C for your option  C

--- Simulation of Radiant Heat Exchangers ---

         Press: P to by-pass this section
                R to save file and exit 2DINPT
                Return to proceed through

(a) Lower index of I zone layers occupied by the
    simulated heat exchangers: ISHL= 0
(b) Upper index of I zone layers occupied by the
    simulated heat exchangers: ISHU= 0

         Press: C to change
                Return to continue  C
19 22

Heat exchanger geometric configurations

         Press: P to by-pass this subsection
                Return to proceed through


---------------- ZONE LAYER I =19 ---------------
Total heat sink surface area (m**2)
at I=19 is    0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
282.7989

Outer diameter of exchanger tubes (m)
at I = 19 is 0.000000

         Press: C to change
                Return to continue  C
0.054

Simulation of heat exchanger arrangement at I= 19
```

```
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=19 is    0

          Press: C to change
                 Return to continue  C
17

Equidistant radial panel spacing (m)
at I=19 is    0.0000

          Press: C to change
                 Return to continue  C
0.2838

At zone layer I= 19
Number of panels=  10
Distance between panels=  0.2838
Number of tubes per panel=  17

          Press: C to change
                 Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=19 is    0.4689

---------------- ZONE LAYER I =20 ---------------
Total heat sink surface area (m**2)
at I=20 is     0.0000
-- Set to 0.0 if it is a cavity.

          Press: C to change
                 Return to continue  C
237.6496

Outer diameter of exchanger tubes (m)
at I = 20 is 0.000000

          Press: C to change
                 Return to continue  C
0.054

Simulation of heat exchanger arrangement at I= 20
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B
```

```
You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=20 is    0

          Press: C to change
                 Return to continue  C
17

Equidistant radial panel spacing (m)
at I=20 is    0.0000

          Press: C to change
                 Return to continue  C
0.3643

At zone layer I= 20
Number of panels=    8
Distance between panels=  0.3643
Number of tubes per panel=  17

          Press: C to change
                 Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=20 is    0.4689

---------------- ZONE LAYER I =21 ---------------
Total heat sink surface area (m**2)
at I=21 is     0.0000
-- Set to 0.0 if it is a cavity.

          Press: C to change
                 Return to continue  C
434.9701

Outer diameter of exchanger tubes (m)
at I = 21 is 0.000000

          Press: C to change
                 Return to continue  C
0.054

Simulation of heat exchanger arrangement at I= 21
You have three options :
Option A: Specify number of cylindrical panels,
           and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
           and equi-distant radial spacing.
Option C: Computer-aided simulation.

          Press the corresponding key for your option
          To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=21 is    0

          Press: C to change
                 Return to continue  C
22
```

```
Equidistant radial panel spacing (m)
at I=21 is   0.0000

         Press: C to change
                Return to continue  C
0.2378

At zone layer I= 21
Number of panels=  12
Distance between panels=  0.2378
Number of tubes per panel=  22

         Press: C to change
                Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=21 is   0.4935

---------------- ZONE LAYER I =22 ---------------
Total heat sink surface area (m**2)
at I=22 is    0.0000
-- Set to 0.0 if it is a cavity.

         Press: C to change
                Return to continue  C
437.7991

Outer diameter of exchanger tubes (m)
at I = 22 is 0.000000

         Press: C to change
                Return to continue  C
0.054

Simulation of heat exchanger arrangement at I= 22
You have three options :
Option A: Specify number of cylindrical panels,
          and equi-distant radial spacing.
Option B: Specify number of tubes per cylindrical panel,
          and equi-distant radial spacing.
Option C: Computer-aided simulation.

         Press the corresponding key for your option
         To proceed without change, press Return  B

You chose option B
Press Return to continue

Number of tube per cylndrical panel
at I=22 is   0

         Press: C to change
                Return to continue  C
22

Equidistant radial panel spacing (m)
at I=22 is   0.0000

         Press: C to change
                Return to continue  C
0.2052

At zone layer I= 22
Number of panels=  13
```

```
Distance between panels=  0.2052
Number of tubes per panel=  22

          Press: C to change
                 Return to continue

Ratio of panel projected-area to zonal area (PROB)
at i=22 is   0.5000

Initial Values of Heat Exchanger Surface Temperatures (Gas Side, in K)
In volume zone layer I=19 :
  J= 1 TWSINK=    0.00; J= 2 TWSINK=    0.00
In volume zone layer I=20 :
  J= 1 TWSINK=    0.00; J= 2 TWSINK=    0.00
In volume zone layer I=21 :
  J= 1 TWSINK=    0.00; J= 2 TWSINK=    0.00
In volume zone layer I=22 :
  J= 1 TWSINK=    0.00; J= 2 TWSINK=    0.00
-- Default values are 800.00 K

          Press: D for default values
                 C to change
                 Return to continue  C

TWSINK(19, 1)=    0.00 K

          Press: C to change
                 Return to continue  C
814.1

TWSINK(19, 2)=    0.00 K

          Press: C to change
                 Return to continue  C
803.72

TWSINK(20, 1)=    0.00 K

          Press: C to change
                 Return to continue  C
864.97

TWSINK(20, 2)=    0.00 K

          Press: C to change
                 Return to continue  C
851.40

TWSINK(21, 1)=    0.00 K

          Press: C to change
                 Return to continue  C
829.27

TWSINK(21, 2)=    0.00 K

          Press: C to change
                 Return to continue  C
819.03

TWSINK(22, 1)=    0.00 K

          Press: C to change
                 Return to continue  C
```

```
737.89

TWSINK(22, 2)=     0.00 K

         Press: C to change
                Return to continue  C
731.41

Emissivities of heat exchanger surfaces
In volume zone layer I=19 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
In volume zone layer I=20 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
In volume zone layer I=21 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
In volume zone layer I=22 :
  J= 1 EWSINK=  0.0000; J= 2 EWSINK=  0.0000
-- Default values are 0.7

         Press: D for default values
                C to change
                Return to continue  D

Values of deposit conductivity/thickness ratios in kw/m**2 K
In volume zone layer I=19 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
In volume zone layer I=20 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
In volume zone layer I=21 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
In volume zone layer I=22 :
  J= 1 CSSINK=  0.0000; J= 2 CSSINK=  0.0000
-- Default values are 0.4, 0.6, and 1.0 for coal,
   oil, and gas-fired furnaces, respectively

         Press: D for default values
                C to change
                Return to continue  C

CSSINK(19, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.36

CSSINK(19, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.36

CSSINK(20, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.36

CSSINK(20, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.36

CSSINK(21, 1)=  0.0000 kw/m**2 K
```

```
         Press: C to change
                Return to continue  C
0.2

CSSINK(21, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.2

CSSINK(22, 1)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.2

CSSINK(22, 2)=  0.0000 kw/m**2 K

         Press: C to change
                Return to continue  C
0.2

Convective heat transfer coefficients (ALSH) at heat
exchanger surfaces in zone layers I=19 to 22,
in kw/m**2 K (total surface area) :
 0.0000  0.0000  0.0000  0.0000
-- Default values are 0.0500.

         Press: D for default values
                C to change
                Return to continue  C

At I = 19, ALSH(19) =   0.0000

         Press: C to change
                Return to continue  C
0.0482

At I = 20, ALSH(20) =   0.0000

         Press: C to change
                Return to continue  C
0.0482

At I = 21, ALSH(21) =   0.0000

         Press: C to change
                Return to continue  C
0.0804

At I = 22, ALSH(22) =   0.0000

         Press: C to change
                Return to continue  C
0.0807

Heat exchanger steam or water side temperatures
(TOUTSH) in zone layers I=19 to 22, in K
   0.00    0.00    0.00    0.00
-- Default values are 750.0 K.

         Press: D for default values
                C to change
                Return to continue  C
```

```
At I = 19, TOUTSH(19) =     0.00

         Press: C to change
                Return to continue  C
734.

At I = 20, TOUTSH(20) =     0.00

         Press: C to change
                Return to continue  C
815

At I = 21, TOUTSH(21) =     0.00

         Press: C to change
                Return to continue  C
784.

At I = 22, TOUTSH(22) =     0.00

         Press: C to change
                Return to continue  C
700

 Chapter 11 :
--------------
RELATIVE MASS FLOW RATE DISTRIBUTIONS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

--- Prescription of Relative Inlet Mass Flows ---
Relative inlet mass flow rates in positive X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative inlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000

         Press: C to change
                Return to continue  C

DM4( 1, 3) =   0.0000

         Press: C to change
                Return to continue

DM4( 2, 4) =   0.0000

         Press: C to change
                Return to continue

DM4( 3, 5) =   0.0000

         Press: C to change
                Return to continue

DM4( 4, 5) =   0.0000
```

```
          Press: C to change
                 Return to continue

DM4( 5, 5) =   0.0000

          Press: C to change
                 Return to continue  C
0.3333

DM4( 6, 5) =   0.0000

          Press: C to change
                 Return to continue  C
0.3333

DM4( 7, 5) =   0.0000

          Press: C to change
                 Return to continue  C
0.3334

DM4( 8, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4( 9, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4(10, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4(11, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4(12, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4(13, 5) =   0.0000

          Press: C to change
                 Return to continue

DM4(14, 3) =   0.0000

          Press:-C to change
                 Return to continue

DM4(15, 3) =   0.0000

          Press: C to change
                 Return to continue

DM4(16, 3) =   0.0000

          Press: C to change
```

```
                Return to continue

DM4(17, 3) =    0.0000

          Press: C to change
                 Return to continue

DM4(18, 3) =    0.0000

          Press: C to change
                 Return to continue

DM4(19, 3) =    0.0000

          Press: C to change
                 Return to continue

DM4(20, 3) =    0.0000

          Press: C to change
                 Return to continue

DM4(21, 3) =    0.0000

          Press: C to change
                 Return to continue

DM4(22, 3) =    0.0000

          Press: C to change
                 Return to continue


Note:
-- You changed the inlet mass fluxes.
-- Existing mass fluxes will be set to 0.0,
   except at the inlets and the outlets.
Press Return to continue.

--- Prescription of Relative Outlet Mass Flows ---
Relative outlet mass flow rates in negative X-direction :
 0.0000  0.0000  0.0000  0.0000

          Press: C to change
                 Return to continue

Relative outlet mass flow rates in positive X-direction :
 0.0000  0.0000

You have two options to modify outlet flow in the
positive X-direction:
   Option A -- Zonewise prescription
   Option B -- Use profile factors
-- Default is plug flow

          Press: A for option A
                 B for option B
                 D for the default
                 Return to continue  A

DM1(23, 1) =    0.0000

          Press: C to change
                 Return to continue  C
```

```
0.5

DM1(23, 2) =   0.0000

         Press: C to change
                Return to continue  C
0.5

Relative outlet mass flow rates in negative Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000

         Press: C to change
                Return to continue

Relative outlet mass flow rates in positive Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000

         Press: C to change
                Return to continue

--- Prescription of Relative Zonal Mass Flow Rates ---

You have two options.
-- Option A: Direct (i.e., zone by zone) prescription
-- Option B: Computer aided prescription (recommended)

         Press: A for option A
                B for option B
                Return to continue  A

You chose option A.

 Chapter 17 :
--------------
DIRECT PRESCRIPTION OF ZONAL MASS FLOWS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Relative mass flow rates DM1(i,j) in positive X-direction:
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.5000
J= 1     0.0000  0.0000  0.0000  0.0000  0.5000
         I=19    I=20    I=21    I=22    I=23

         Press: C to change
                Return to continue  C
```

```
I=  2 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 2
from J= 1 thru J= 2
0.05 0.0

I=  3 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 3
from J= 1 thru J= 3
0.2 0.0 0.0

I=  4 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 4
from J= 1 thru J= 4
0.245 0.1050 2*0.0

I=  5 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 5
from J= 1 thru J= 4
2*0.225 2*0.0

I=  6 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 6
from J= 1 thru J= 4
2*0.2412 2*0.0755

I=  7 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 7
from J= 1 thru J= 4
2*0.2573 2*0.151

I=  8 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 8
from J= 1 thru J= 4
0.5141 0.4061 0.0894 0.0404

I=  9 cross-section
```

```
         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I= 9
from J= 1 thru J= 4
0.3847 0.3366 0.1593 0.1195

I= 10 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I=10
from J= 1 thru J= 4
0.3847 0.3366 0.1593 0.1195

I= 11 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I=11
from J= 1 thru J= 4
0.3847 0.3366 0.1593 0.1195

I= 12 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I=12
from J= 1 thru J= 4
0.3847 0.3366 0.1593 0.1195

I= 13 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I=13
from J= 1 thru J= 4
0.3847 0.3366 0.1593 0.1195

I= 14 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I=14
from J= 1 thru J= 2
0.7143 0.2857

I= 15 cross-section

         Press: C to change DM1(i,j)
                Return to continue  C

Type values of DM1(i,j) for cross-section I=15
from J= 1 thru J= 2
0.6154 0.3846

I= 16 cross-section

         Press: C to change DM1(i,j)
```

```
                Return to continue  C

Type values of DM1(i,j) for cross-section I=16
from J= 1 thru J= 2
0.6154 0.3846

I= 17 cross-section

          Press: C to change DM1(i,j)
                 Return to continue  C

Type values of DM1(i,j) for cross-section I=17
from J= 1 thru J= 2
0.6154 0.3846

I= 18 cross-section

          Press: C to change DM1(i,j)
                 Return to continue  C

Type values of DM1(i,j) for cross-section I=18
from J= 1 thru J= 2
0.6154 0.3846

I= 19 cross-section

          Press: C to change DM1(i,j)
                 Return to continue  C

Type values of DM1(i,j) for cross-section I=19
from J= 1 thru J= 2
0.6154 0.3846

I= 20 cross-section

          Press: C to change DM1(i,j)
                 Return to continue  C

Type values of DM1(i,j) for cross-section I=20
from J= 1 thru J= 2
0.6154 0.3846

I= 21 cross-section

          Press: C to change DM1(i,j)
                 Return to continue  C

Type values of DM1(i,j) for cross-section I=21
from J= 1 thru J= 2
0.5385 0.4615

I= 22 cross-section

          Press: C to change DM1(i,j)
                 Return to continue  C

Type values of DM1(i,j) for cross-section I=22
from J= 1 thru J= 2
0.5385 0.4615

Relative mass flow rates DM3(i,j) in neg. X-direction:
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22    I=23

         Press: C to change
                Return to continue  C

I=  2 cross-section

         Press: C to change DM3(i,j)
                Return to continue  C

Type values of DM3(i,j) for cross-section I= 2
from J= 1 thru J= 2
0.0 0.05

I=  3 cross-section

         Press: C to change DM3(i,j)
                Return to continue  C

Type values of DM3(i,j) for cross-section I= 3
from J= 1 thru J= 3
0.0 0.0464 0.1536

I=  4 cross-section

         Press: C to change DM3(i,j)
                Return to continue  C

Type values of DM3(i,j) for cross-section I= 4
from J= 1 thru J= 4
2*0.0 2*0.175

I=  5 cross-section

         Press: C to change DM3(i,j)
                Return to continue  C

Type values of DM3(i,j) for cross-section I= 5
from J= 1 thru J= 4
2*0.0 2*0.225

I=  6 cross-section

         Press: C to change DM3(i,j)
                Return to continue  C

Type values of DM3(i,j) for cross-section I= 6
from J= 1 thru J= 4
2*0.0 2*0.15

I=  7 cross-section

         Press: C to change DM3(i,j)
```

```
                Return to continue  C

Type values of DM3(i,j) for cross-section I= 7
from J= 1 thru J= 4
2*0.0 2*0.075

I=  8 cross-section

          Press: C to change DM3(i,j)
                 Return to continue  C

Type values of DM3(i,j) for cross-section I= 8
from J= 1 thru J= 4
3*0.0 0.05

I=  9 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 10 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 11 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 12 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 13 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 14 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 15 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 16 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 17 cross-section

          Press: C to change DM3(i,j)
                 Return to continue

I= 18 cross-section

          Press: C to change DM3(i,j)
                 Return to continue
```

```
I= 19 cross-section

         Press: C to change DM3(i,j)
                Return to continue

I= 20 cross-section

         Press: C to change DM3(i,j)
                Return to continue

I= 21 cross-section

         Press: C to change DM3(i,j)
                Return to continue

I= 22 cross-section

         Press: C to change DM3(i,j)
                Return to continue

Relative mass flow rates DM2(i,j) in positive Y-direction
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22

         Press: C to change
                Return to continue  C

J=  2 cross-section

         Press: C to change DM2(i,j)
                Return to continue  C

Type values of DM2(i,j) for cross-section J= 2
from I= 1 thru I=22
3*0.0 0.02 0.075 0.075 0.0491 0.1294 5*0.0 0.0989 5*0.0 0.0769 0.0 0.0385

J=  3 cross-section

         Press: C to change DM2(i,j)
                Return to continue  C

Type values of DM2(i,j) for cross-section J= 3
from I= 2 thru I=13
3*0.0 0.15 0.15 0.1086 0.1989 0.0 0.0 0.0 0.0 0.0

J=  4 cross-section

         Press: C to change DM2(i,j)
```

```
                Return to continue  C

Type values of DM2(i,j) for cross-section J= 4
from I= 3 thru I=13
2*0.0 0.075 0.075 0.025 0.129 0.0 4*0.0

Relative mass flow rates DM4(i,j) in neg. Y-direction
J= 5     0.0000  0.0000  0.0000  0.0000  0.3333  0.3333  0.3334  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22

         Press: C to change
                Return to continue  C

J=  2 Cross-section

         Press: C to change DM4(i,j)
                Return to continue  C

Type values of DM4(i,j) for cross-section J= 2
from I= 1 thru I=22
0.05 0.15 0.045 0.0 0.0912 0.0911 0.3059 0.0 0.0 3*0.0 0.3296 9*0.0

J=  3 Cross-section

         Press: C to change DM4(i,j)
                Return to continue  C

Type values of DM4(i,j) for cross-section J= 3
from I= 2 thru I=13
0.1536 0.1964 0.1 0.1824 0.1822 0.5142 0.0 0.0 3*0.0 0.2787

J=  4 Cross-section

         Press: C to change DM4(i,j)
                Return to continue  C

Type values of DM4(i,j) for cross-section J= 4
from I= 3 thru I=13
0.1750 0.05 0.2579 0.2577 0.444 0.0 0.0 0.0 0.0 0.0 0.1195

Residual of total mass balance for volume zones
as fraction of total input mass flow :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0001 -0.0001  0.0000  0.0001  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
```

```
J= 3     0.0000  0.0000  0.0000 -0.0001  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22
To continue, press Return

 Chapter 12 :
--------------
PRESCRIPTION OF RECIRCULATING FLOW FIELD

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Recirculating flow over cross-section I= 2
is    5.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 3
is   20.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 4
is   35.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 5
is   45.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 6
is   30.01 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 7
is   15.00 % of total inlet mass flow.

         Press: C to change
               -Return to continue

Recirculating flow over cross-section I= 8
is    5.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I= 9
is    0.01 % of total inlet mass flow.
```

```
         Press: C to change
                Return to continue

Recirculating flow over cross-section I=10
is    0.01 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=11
is    0.01 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=12
is    0.01 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=13
is    0.01 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=14
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=15
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=16
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=17
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=18
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=19
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=20
```

```
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=21
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Recirculating flow over cross-section I=22
is    0.00 % of total inlet mass flow.

         Press: C to change
                Return to continue

Normalized velocities in Y-direction
J= 5     0.0000  0.0000  0.0000  0.0000 -0.5367 -0.5363 -0.5367 -0.0001  0.0000
J= 4     0.0000  0.0000 -0.2310 -0.0660 -0.3348 -0.3344 -0.7669  0.1430  0.0000
J= 3     0.0000 -0.4619 -0.3083 -0.1570 -0.0705 -0.0701 -0.8827  0.2623  0.0000
J= 2    -0.0638 -0.6379 -0.0999  0.0444 -0.0499 -0.0496 -0.7904  0.2413  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0001  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000 -0.1295  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000 -0.3594  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000 -0.6012  0.1185  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.1516  0.0000  0.0625
J= 1     0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22    I=
To continue, press Return

 Chapter 13 :
--------------
PRESCRIPTION OF TURBULENT MASS FLUX VECTORS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

This is the current relative turbulent mass flux
field with respect to the X-direction :
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0755  0.0750  0.0404  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0755  0.0750  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22    I=23    I=
To continue, press Return
```

```
This is the current turbulent mass flux field
with respect to the Y-direction :
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0001  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000  0.0750  0.0750  0.0250  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.1500  0.1500  0.1086  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0750  0.0750  0.0491  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 5     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0001  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 5     0.0000  0.0000  0.0000  0.0000
J= 4     0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22    I=
To continue, press Return

You have three options to modify the turbulent field.
Option A : Default distribution calculated by the
           2DHT program (recommended).
Option B : No turbulence at all.
Option C : Column- and row-wise prescriptions.

         Press: a corresponding key for your option
                Return to continue  A

You chose option A.

         Press: C to clear existing turbulence (if any),
                Return to continue

You have to prescribe two constants, CTUR1 and CTUR2,
so that the 2DHT program can calculate default turbulent fluxes.
Current values are : CTUR1=  0.00 %
                     CTUR3=  0.00 %
-- Defaults are     : CTUR1= 10.00 %
                     CTUR3=  5.00 %
-- CTUR1 is a proportionality constant for a turbulent
   velocity component calculated from the local velocity
   vector.
-- CTUR3 is another proportionality constant for a
   turbulent velocity component calculated from the mean
   velocity over the largest furnace cross-section.

         Press: D for default values
                C to change
                Return to continue  D

Fractional reduction of turbulence in furnace zones
with heat exchangers:
Current reduction =   1.0000
-- Default reduction is 0.5

         Press: D for default values
                C to change
                Return to continue  D

Residual of total mass balance for volume zones
as fraction of total input mass flow :
```

```
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
         I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4     0.0000  0.0000  0.0000  0.0000
J= 3     0.0000  0.0000  0.0000  0.0000
J= 2     0.0000  0.0000  0.0000  0.0000
J= 1     0.0000  0.0000  0.0000  0.0000
         I=19    I=20    I=21    I=22
To continue, press Return

 Chapter 14 :
--------------
FUEL INLET FLOWS

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through

Relative Fuel Inlet Flow Rates :
Default distribution assumes fuel inlet flows are
proportional to total mass flow rates, i.e., burners
are fired at same stoichiometry.

         Press: D for default distribution
                Return to continue

Prescription of Relative Fuel Inlet Flow Rates

Relative fuel inlet flow rates in pos. X-direction :
 0.0000  0.0000  0.0000  0.0000

         Press: C to change
                Return to continue

Relative fuel inlet flow rates in neg. Y-direction :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000

         Press: C to change
                Return to continue  C

In neg. Y-direction, I =  1 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  2 FU2 =   0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  3 FU2 =   0.0000

         Press: C to change
                Return to continue
```

```
In neg. Y-direction, I =  4 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  5 FU2 =    0.0000

         Press: C to change
                Return to continue  C
0.3333

In neg. Y-direction, I =  6 FU2 =    0.0000

         Press: C to change
                Return to continue  C
0.3333

In neg. Y-direction, I =  7 FU2 =    0.0000

         Press: C to change
                Return to continue  C
0.3334

In neg. Y-direction, I =  8 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I =  9 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 10 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 11 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 12 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 13 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 14 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 15 FU2 =    0.0000

         Press: C to change
                Return to continue

In neg. Y-direction, I = 16 FU2 =    0.0000
```

```
          Press: C to change
                 Return to continue

 In neg. Y-direction, I = 17 FU2 =   0.0000

          Press: C to change
                 Return to continue

 In neg. Y-direction, I = 18 FU2 =   0.0000

          Press: C to change
                 Return to continue

 In neg. Y-direction, I = 19 FU2 =   0.0000

          Press: C to change
                 Return to continue

 In neg. Y-direction, I = 20 FU2 =   0.0000

          Press: C to change
                 Return to continue

 In neg. Y-direction, I = 21 FU2 =   0.0000

          Press: C to change
                 Return to continue

 In neg. Y-direction, I = 22 FU2 =   0.0000

          Press: C to change
                 Return to continue

  Chapter 15 :
 --------------
 DATA FOR INITIAL VOLUME AND SURFACE ZONE TEMPERATURES

          Press: P to by-pass this chapter
                 R to save file and exit 2DINPT
                 Return to proceed through


 --- Specification of Initial Volume-Zone Temperatures ---

          Press: P to by-pass this subsection
                 Return to proceed through

 Initial temperature T(i,j) for volume zones
 in degree K :
 -- Default values are T(i,j)=1600 K
 -- If you intend to read these data from disk (i.e.,NREAD=1),
    initial data of T(i,j) can be arbitrary

          Press: D for default values
                 C to prescribe a constant value for all zones
          Press: Return to prescribe zonal values, or to continue
                 without change  D

 Initial data for volume zone temperatures T(i,j)
 in degree K :
 J= 4       1.00    1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
 J= 3       1.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
 J= 2    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
 J= 1    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
```

```
          I= 1     I= 2     I= 3     I= 4     I= 5     I= 6     I= 7     I= 8     I= 9
J= 4    1600.00 1600.00 1600.00 1600.00    1.00     1.00     1.00     1.00     1.00
J= 3    1600.00 1600.00 1600.00 1600.00    1.00     1.00     1.00     1.00     1.00
J= 2    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
J= 1    1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
          I=10     I=11     I=12     I=13     I=14     I=15     I=16     I=17     I=18
J= 4       1.00     1.00     1.00     1.00
J= 3       1.00     1.00     1.00     1.00
J= 2    1600.00 1600.00 1600.00 1600.00
J= 1    1600.00 1600.00 1600.00 1600.00
          I=19     I=20     I=21     I=22

          To change the inital data column by column
          press C; else press Return  C

Initial volume zone temperatures T(i,j) in K
at J= 1, from I= 1 thru I=22 :
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00

          Press: C to change
                 Return to continue  C

T( 1, 1) =  1600.00

          Press: C to change
                 Return to continue  C
1308

T( 2, 1) =  1600.00

          Press: C to change
                 Return to continue  C
1485

T( 3, 1) =  1600.00

          Press: C to change
                 Return to continue  C
1525

T( 4, 1) =  1600.00

          Press: C to change
                 Return to continue  C
1575

T( 5, 1) =  1600.00

          Press: C to change
                 Return to continue  C
1612

T( 6, 1) =  1600.00

          Press: C to change
                 Return to continue  C
1647

T( 7, 1) =  1600.00

          Press: C to change
                 Return to continue  C
```

```
1673

T( 8, 1) =  1600.00

         Press: C to change
                Return to continue  C
1690

T( 9, 1) =  1600.00

         Press: C to change
                Return to continue  C
1685

T(10, 1) =  1600.00

         Press: C to change
                Return to continue  C
1675

T(11, 1) =  1600.00

         Press: C to change
                Return to continue  C
1654

T(12, 1) =  1600.00

         Press: C to change
                Return to continue  C
1629

T(13, 1) =  1600.00

         Press: C to change
                Return to continue  C
1584

T(14, 1) =  1600.00

         Press: C to change
                Return to continue  C
1555

T(15, 1) =  1600.00

         Press: C to change
                Return to continue  C
1535

T(16, 1) =  1600.00

         Press: C to change
                Return to continue  C
1500

T(17, 1) =  1600.00

         Press: C to change
                Return to continue  C
1462

T(18, 1) =  1600.00
```

```
         Press: C to change
                Return to continue  C
1422

T(19, 1) =  1600.00

         Press: C to change
                Return to continue  C
1322

T(20, 1) =  1600.00

         Press: C to change
                Return to continue  C
1257

T(21, 1) =  1600.00

         Press: C to change
                Return to continue  C
1136

T(22, 1) =  1600.00

         Press: C to change
                Return to continue  C
1028

Initial volume zone temperatures T(i,j) in K
at J= 2, from I= 1 thru I=22 :
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00

         Press: C to change
                Return to continue  C

T( 1, 2) =  1600.00

         Press: C to change
                Return to continue  C
1317

T( 2, 2) =  1600.00

         Press: C to change
                Return to continue  C
1558

T( 3, 2) =  1600.00

         Press: C to change
                Return to continue  C
1636

T( 4, 2) =  1600.00

         Press: C to change
                Return to continue  C
1651

T( 5, 2) =  1600.00

         Press: C to change
```

```
                Return to continue  C
1640

T( 6, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1658

T( 7, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1675

T( 8, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1718

T( 9, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1720

T(10, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1703

T(11, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1680

T(12, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1637

T(13, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1571

T(14, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1525

T(15, 2) =  1600.00

          Press: C to change
                 Return to continue  C
1492

T(16, 2) =  1600.00
```

```
         Press: C to change
                Return to continue  C
1447

T(17, 2) =  1600.00

         Press: C to change
                Return to continue  C
1404

T(18, 2) =  1600.00

         Press: C to change
                Return to continue  C
1364

T(19, 2) =  1600.00

         Press: C to change
                Return to continue  C
1274

T(20, 2) =  1600.00

         Press: C to change
                Return to continue  C
1196

T(21, 2) =  1600.00

         Press: C to change
                Return to continue  C
1079

T(22, 2) =  1600.00

         Press: C to change
                Return to continue  C
980.5

Initial volume zone temperatures T(i,j) in K
at J= 3, from I= 2 thru I=13 :
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00 1600.00

         Press: C to change
                Return to continue  C

T( 2, 3) =  1600.00

         Press: C to change
                Return to continue  C
1586

T( 3, 3) =  1600.00

         Press: C to change
                Return to continue  C
1664

T( 4, 3) =  1600.00

         Press: C to change
                Return to continue  C
```

```
1664

T( 5, 3) =  1600.00

         Press: C to change
         ,      Return to continue  C
1566

T( 6, 3) =  1600.00

         Press: C to change
                Return to continue  C
1571

T( 7, 3) =  1600.00

         Press: C to change
                Return to continue  C
1582

T( 8, 3) =  1600.00

         Press: C to change
                Return to continue  C
1695

T( 9, 3) =  1600.00

         Press: C to change
                Return to continue  C
1718

T(10, 3) =  1600.00

         Press: C to change
                Return to continue  C
1713

T(11, 3) =  1600.00

         Press: C to change
                Return to continue  C
1679

T(12, 3) =  1600.00

         Press: C to change
                Return to continue  C
1623

T(13, 3) =  1600.00

         Press: C to change
              - Return to continue  C
1545

Initial volume zone temperatures T(i,j) in K
at J= 4, from I= 3 thru I=13 :
1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00 1600.00
1600.00

         Press: C to change
                Return to continue  C
```

```
T( 3, 4) =  1600.00

         Press: C to change
                Return to continue  C
1667

T( 4, 4) =  1600.00

         Press: C to change
                Return to continue  C
1613

T( 5, 4) =  1600.00

         Press: C to change
                Return to continue  C
1275

T( 6, 4) =  1600.00

         Press: C to change
                Return to continue  C
1255

T( 7, 4) =  1600.00

         Press: C to change
                Return to continue  C
1289

T( 8, 4) =  1600.00

         Press: C to change
                Return to continue  C
1642

T( 9, 4) =  1600.00

         Press: C to change
                Return to continue  C
1705

T(10, 4) =  1600.00

         Press: C to change
                Return to continue  C
1691

T(11, 4) =  1600.00

         Press: C to change
                Return to continue  C
1649

T(12, 4) =  1600.00

         Press: C to change
                Return to continue  C
1588

T(13, 4) =  1600.00

         Press: C to change
                Return to continue  C
```

```
1518

         Press: C to check initial volume-zone temperatures one more time
                Return to continue without checking  C

Initial data for volume zone temperatures T(i,j)
in degree K :
J= 4       1.00    1.00 1667.00 1613.00 1275.00 1255.00 1289.00 1642.00 1705.00
J= 3       1.00 1586.00 1664.00 1664.00 1566.00 1571.00 1582.00 1695.00 1718.00
J= 2    1317.00 1558.00 1636.00 1651.00 1640.00 1658.00 1675.00 1718.00 1720.00
J= 1    1308.00 1485.00 1525.00 1575.00 1612.00 1647.00 1673.00 1690.00 1685.00
          I= 1    I= 2    I= 3    I= 4    I= 5    I= 6    I= 7    I= 8    I= 9
J= 4    1691.00 1649.00 1588.00 1518.00    1.00    1.00    1.00    1.00    1.00
J= 3    1713.00 1679.00 1623.00 1545.00    1.00    1.00    1.00    1.00    1.00
J= 2    1703.00 1680.00 1637.00 1571.00 1525.00 1492.00 1447.00 1404.00 1364.00
J= 1    1675.00 1654.00 1629.00 1584.00 1555.00 1535.00 1500.00 1462.00 1422.00
          I=10    I=11    I=12    I=13    I=14    I=15    I=16    I=17    I=18
J= 4       1.00    1.00    1.00    1.00
J= 3       1.00    1.00    1.00    1.00
J= 2    1274.00 1196.00 1079.00  980.50
J= 1    1322.00 1257.00 1136.00 1028.00
          I=19    I=20    I=21    I=22

         To change the inital data column by column
         press C; else press Return


--- Specification of Initial Surface-Zone Temperatures ---

         Press: P to by-pass this subsection
                Return to proceed through

Initial temperature TW(i,j) for surface zones
in degree K :
-- Default values are TW(*,*)=1200. K, except at outlets,
   where you have to specify equivalent surface temperatures.

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  D

Surface temperatures TW(*,1) in K :
1200.00 1200.00 1200.00 1200.00

         Press: C to change
                Return to continue  C

At J =  1, TW(J,1) =  1200.00

         Press: C to change
                Return to continue  C
400

At J =  2, TW(J,1) =  1200.00

         Press: C to change
                Return to continue  C
748.1

At J =  3, TW(J,1) =  1200.00

         Press: C to change
                Return to continue  C
```

```
887.3

At J =  4, TW(J,1) =  1200.00

         Press: C to change
                Return to continue  C
1065.

Surface temperatures TW(*,3) in K :
   0.00    0.00 1200.00 1200.00

         Press: C to change
                Return to continue  C

At J =  1, TW(J,3) =     0.00

         Press: C to change
                Return to continue  C
782.

At J =  2, TW(J,3) =     0.00

         Press: C to change
                Return to continue  C
782.

At J =  3, TW(J,3) =  1200.00

         Press: C to change
                Return to continue  C
799.80

At J =  4, TW(J,3) =  1200.00

         Press: C to change
                Return to continue  C
795.1

Surface temperatures TW(*,2) in K :
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00

         Press: C to change
                Return to continue

Surface temperatures TW(*,4) in K :
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00
1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00 1200.00
1200.00 1200.00

         Press: C to change
                Return to continue  C

At I =  1, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
744.8

At I =  2, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
```

```
864.3

At I =  3, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
1062.

At I =  4, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
1155

At I =  5, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
968.3

At I =  6, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
927.

At I =  7, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
1018.

At I =  8, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
1387

At I =  9, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
1345

At I = 10, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
1277

At I = 11, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
1080

At I = 12, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
891.

At I = 13, TW(I,4) =  1200.00
```

```
         Press: C to change
                Return to continue  C
793.4

At I = 14, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
786.7

At I = 15, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
765.9

At I = 16, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
757.7

At I = 17, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
736.6

At I = 18, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
721.9

At I = 19, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
675.9

At I = 20, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
669.5

At I = 21, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
662.2

At I = 22, TW(I,4) =  1200.00

         Press: C to change
                Return to continue  C
649.6

         Press: C to check initial surface-zone temperatures one more time
                Return to continue without checking  C

Surface temperatures TW(*,1) in K :
 400.00  748.10  887.30 1065.00
```

```
         Press: C to change
                Return to continue

Surface temperatures TW(*,3) in K :
 782.00  782.00  799.80  795.10

         Press: C to change
                Return to continue

Surface temperatures TW(*,2) in K :
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00

         Press: C to change
                Return to continue

Surface temperatures TW(*,4) in K :
 744.80  864.30 1062.00 1155.00  968.30  927.00 1018.00 1387.00 1345.00 1277.00
1080.00  891.00  793.40  786.70  765.90  757.70  736.60  721.90  675.90  669.50
 662.20  649.60

         Press: C to change
                Return to continue


--- Specification of Equivalent Surface Temperatures for Furnace Outlets ---

         Press: P to by-pass this subsection
                Return to proceed through

Equivalent surface temperature (K) at outlet
J= 1, I=22 : TW(*,*)=  782.00

         Press: C to change
                Return to continue

Equivalent surface temperature (K) at outlet
J= 2, I=22 : TW(*,*)=  782.00

         Press: C to change
                Return to continue

         Press: C to check outlet-zone surface temperatures one more time
                Return to continue without checking

 Chapter 16 :
--------------
DATA FOR EMISSIVITIES AND DEPOSIT CONDUCTIVITIES

         Press: P to by-pass this chapter
                R to save file and exit 2DINPT
                Return to proceed through


--- Specification of Surface Zone Emissivities ---

         Press: P to by-pass this subsection
                Return to proceed through

Emissivity EW(*,*) for various furnace wall sections :
-- Default values are EW(*,*)=0.7, except at outlets,
   where EW(*,*)=1.0
```

```
         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  D

Surface emissivities EW(*,1) :
 0.7000  0.7000  0.7000  0.7000

         Press: C to change
                Return to continue  C

At J =  1, EW(J,1) =   0.7000

         Press: C to change
                Return to continue  C
1.0

At J =  2, EW(J,1) =   0.7000

         Press: C to change
                Return to continue

At J =  3, EW(J,1) =   0.7000

         Press: C to change
                Return to continue

At J =  4, EW(J,1) =   0.7000

         Press: C to change
                Return to continue

Surface emissivities EW(*,3) :
 1.0000  1.0000  0.7000  0.7000

         Press: C to change
                Return to continue

Surface emissivities EW(*,2) :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000

         Press: C to change
                Return to continue

Surface emissivities EW(*,4) :
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000  0.7000
 0.7000  0.7000

         Press: C to change
                Return to continue

         Press: C to check surface-zone EW(*,*) values one more time
                Return to continue without checking


--- Specification of Surface Emissivity for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through

Emissivities at outlet
```

```
J= 1, I=22 : EW(*,*)=  1.0000

         Press: C to change
                Return to continue

Emissivities at outlet
J= 2, I=22 : EW(*,*)=  1.0000

         Press: C to change
                Return to continue

         Press: C to check outlet-zone EW(*,*) values one more time
                Return to continue without checking


--- Specification of Deposit Conductivity/Thickness Ratios ---

         Press: P to by-pass this subsection
                Return to proceed through

Deposit thermal-conductivity/thickness ratios
CS(*,*) for surface zones in kw/m**2 K :
-- Default values for non-outlet zones are: 0.4, 0.8 and 1.0
   for coal, oil and gas fired furnaces, respectively
-- Default values for outlet zones are 0.0

         Press: D for default values
                C to prescribe a constant value for all zones
         Press: Return to prescribe zonal values, or to continue
                without change  C

Uniform value of deposit thermal conductivity to
thickness ratios CS(*,*) : 0.2

Deposit thermal conductivity to thickness ratios
CS(*,1) in kw/m**2 K :
 0.2000  0.2000  0.2000  0.2000

         Press: C to change
                Return to continue  C

For clean surfaces with constant temperatures
set CS(*,*)=0.
At J =  1, CS(J,1) =   0.2000

         Press: C to change
                Return to continue  C
0.0

At J =  2, CS(J,1) =   0.2000

         Press: C to change
                Return to continue  C
0.29

At J =  3, CS(J,1) =   0.2000

         Press: C to change
                Return to continue  C
0.26

At J =  4, CS(J,1) =   0.2000

         Press: C to change
```

```
                Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,3) in kw/m**2 K :
 0.0000  0.0000  0.2000  0.2000

          Press: C to change
                 Return to continue  C

For clean surfaces with constant temperatures
set CS(*,*)=0.
At J =  1, CS(J,3) =   0.0000

          Press: C to change
                 Return to continue

At J =  2, CS(J,3) =   0.0000

          Press: C to change
                 Return to continue

At J =  3, CS(J,3) =   0.2000

          Press: C to change
                 Return to continue  C
0.19

At J =  4, CS(J,3) =   0.2000

          Press: C to change
                 Return to continue  C
0.19

Deposit thermal conductivity to thickness ratios
CS(*,2) in kw/m**2 K :
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000

          Press: C to change
                 Return to continue

Deposit thermal conductivity to thickness ratios
CS(*,4) in kw/m**2 K :
 0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000
 0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000  0.2000
 0.2000  0.2000

          Press: C to change
                 Return to continue  C

For clean surfaces with constant temperatures
set CS(*,*)=0.
At I =  1, CS(I,4) =   0.2000

          Press: C to change
                 Return to continue  C
0.29

At I =  2, CS(I,4) =   0.2000

          Press: C to change
                 Return to continue  C
0.26
```

```
At I =  3, CS(I,4) =   0.2000

         Press: C to change
                Return to continue

At I =  4, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.17

At I =  5, CS(I,4) =   0.2000

         Press: C to change
                Return to continue

At I =  6, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.22

At I =  7, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.17

At I =  8, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.14

At I =  9, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.15

At I = 10, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.16

At I = 11, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.17

At I = 12, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.18

At I = 13, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.19
```

```
At I = 14, CS(I,4) =   0.2000

         Press: C to change
                Return to continue

At I = 15, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.22

At I = 16, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.24

At I = 17, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.27

At I = 18, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.3

At I = 19, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.36

At I = 20, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.36

At I = 21, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.36

At I = 22, CS(I,4) =   0.2000

         Press: C to change
                Return to continue  C
0.36

         Press:- C to check surface-zone CS(*,*) values one more time
                 Return to continue without checking


--- Specification of Deposit Conductivity/Thickness Ratios for Outlet Zones ---

         Press: P to by-pass this subsection
                Return to proceed through

Deposit thermal conductivity/thickness ratios
for furnace outlet surfaces
```

```
-- Default is CS(*,*)= 0.0 (recommended)

         Press: D for default values
                C to change
                Return to continue

NOTE:
-- Output file was saved as file 2DIN0501.100
-- To update 2DIN0501.100 further, you have to copy file 2DIN0501.100
   to file INPUT.DAT under DOS, then rerun 2DINPT.EXE
-- If you want to save the original contents of file
   INPUT.DAT, make sure you save it with a different name
```

Listing 6.2. Contents of file 2DIN0501.100 (Case 5).

```
BOILER 2
05
01
100.0   100
2DIN0501.100
IARR0501.100
OARR0501.100
GRAF
2DOT0501.100
   4   1
c TANGENTIALLY FIRED BOILER, USE COAL AS PRIMARY FUEL AT 100% LOAD
c
c
c
c
c
c
c
c
c
 100
    09999.000009999.00000
  71
   5
   2   40.000100
 100
   0
   1   1
   1   0
   0
   0   0   1
  0.4189  0.3341  0.1375  0.1095
  0.6920  0.0491  0.0124  0.0861  0.0335  0.1269
  0.0000
 24947.1
  8.8879
  339.54
  1.1000
    0.0000
  0.0000
  3.2700
 50.0000  0.0317
  545.47
 20.0000   100.0
  0.0116
  634.00
0.0000030 0.0000106 0.0000221 0.0000379 0.0000604 0.0000878 0.0001258 0.0002099
0.0003222 0.0004859
  0.1000  0.1500  0.1500  0.1500  0.1498  0.1003  0.1000  0.0849  0.0075  0.0075
   1282.00    537.03
  89890.60    693.80      1.00
 10.7643  430.57
  0.7800  10000.
  0.1000
  0.100000  0.050000  0.000977  0.000488
   0
   0   1   0   0
    0.0000
   0    0.000000    0.000000   74.094742    0.366500    0.000000
    0.000000    0.000000    0.000000    0.000000
   5
0.00000000000.00000000000.00000000000.00000000000.0000000000
  0.000000  0.000000  0.000000  0.000000  0.000000
    0.00    0.00    0.00    0.00    0.00
    0.00    0.00    0.00
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
       0       0       0       0       0       0       0       0       0       0
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0
```

```
0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000 0.0000000
0.0000000 0.0000000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
   0.0000
  0
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000000
0.1000000
 22   4
  1  19  22
   0.0000  0.0000
 0.0000
   0.00
  0
 3.0260  0.9075  1.7385  1.7384  1.2540  1.2540  1.2540  2.0698  1.0723  2.1018
 0.8550  2.1161  2.1161  3.2217  1.6000  2.9494  2.9494  2.9495  1.9577  1.9577
 2.4073  2.3762
 2.1114  0.8745  0.5647  0.4865
  1   1   2   3
 22  22  13  13
  1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
  1   1
  2   3   4   4   4   4   4   4   4   4   4   4   2   2   2   2   2   2   2   2
  2   2
  0   0   0
 0.0000  300.00
 0.0000
 300.00
 0.0000
    0.0
 0.0000
 0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
 0.000000  0.000000  0.000000
0.0000000 0.0000000
 0.0000       0.
 0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000
  0   0
300.00000   0.00000   0.00000
  0.00000   0.00000   0.00000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  5.2509  3.6115
 5.9545  7.9510
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  5.0639  5.0566
 6.9476  5.2048
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  814.10  864.97
 829.27  737.89
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00  803.72  851.40
 819.03  731.41
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00    0.00
   0.00    0.00
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.7000  0.7000
 0.7000  0.7000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
 0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.7000  0.7000
```

```
0.7000    0.7000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.3600    0.3600
0.2000    0.2000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.3600    0.3600
0.2000    0.2000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000
 0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0   10   8
12  13
 0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0    0   0   17  17
22  22
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0540    0.0540
0.0540    0.0540
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.2838    0.3643
0.2378    0.2052
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.4689    0.4689
0.4935    0.5000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0482    0.0482
0.0804    0.0807
  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00
  0.00      0.00      0.00      0.00      0.00      0.00      0.00      0.00    734.00    815.00
784.00    700.00
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000
0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000    1.0000    1.0000
1.0000    1.0000
 0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0       0.0
   0.0       0.0
0.0000    0.0000    0.0000    0.0000
0.0500    0.0000    0.0000    0.0000
0.2000    0.0000    0.0000    0.0000
0.2450    0.1050    0.0000    0.0000
0.2250    0.2250    0.0000    0.0000
0.2412    0.2412    0.0755    0.0755
0.2573    0.2573    0.1510    0.1510
0.5141    0.4061    0.0894    0.0404
0.3847    0.3366    0.1593    0.1195
0.3847    0.3366    0.1593    0.1195
0.3847    0.3366    0.1593    0.1195
0.3847    0.3366    0.1593    0.1195
```

```
0.3847  0.3366  0.1593  0.1195
0.7143  0.2857  0.0000  0.0000
0.6154  0.3846  0.0000  0.0000
0.6154  0.3846  0.0000  0.0000
0.6154  0.3846  0.0000  0.0000
0.6154  0.3846  0.0000  0.0000
0.6154  0.3846  0.0000  0.0000
0.6154  0.3846  0.0000  0.0000
0.5385  0.4615  0.0000  0.0000
0.5385  0.4615  0.0000  0.0000
0.5000  0.5000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0500  0.0000  0.0000
0.0000  0.0464  0.1536  0.0000
0.0000  0.0000  0.1750  0.1750
0.0000  0.0000  0.2250  0.2250
0.0000  0.0000  0.1500  0.1500
0.0000  0.0000  0.0750  0.0750
0.0000  0.0000  0.0000  0.0500
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.0000  0.0000  0.0200  0.0750  0.0750  0.0491  0.1294  0.0000  0.0000
0.0000  0.0000  0.0000  0.0989  0.0000  0.0000  0.0000  0.0000  0.0000  0.0769
0.0000  0.0385
0.0000  0.0000  0.0000  0.0000  0.1500  0.1500  0.1086  0.1989  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0750  0.0750  0.0250  0.1290  0.0000  0.0000
0.0000  0.0000  0.0001  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0001  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0001  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0500  0.1500  0.0450  0.0000  0.0912  0.0911  0.3059  0.0000  0.0000  0.0000
0.0000  0.0000  0.3296  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.1536  0.1964  0.1000  0.1824  0.1822  0.5142  0.0000  0.0000  0.0000
0.0000  0.0000  0.2787  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.0000  0.1750  0.0500  0.2579  0.2577  0.4440  0.0000  0.0000  0.0000
0.0000  0.0000- 0.1195  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.3334  0.3333  0.3334  0.0001  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000  0.0000
0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
0.0000  0.0000  0.0000  0.0000
```

```
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000  -0.3333  -0.3333  -0.3334   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000
 1308.00  1485.00  1525.00  1575.00  1612.00  1647.00  1673.00  1690.00  1685.00  1675.00
 1654.00  1629.00  1584.00  1555.00  1535.00  1500.00  1462.00  1422.00  1322.00  1257.00
 1136.00  1028.00
 1317.00  1558.00  1636.00  1651.00  1640.00  1658.00  1675.00  1718.00  1720.00  1703.00
 1680.00  1637.00  1571.00  1525.00  1492.00  1447.00  1404.00  1364.00  1274.00  1196.00
 1079.00   980.50
    1.00  1586.00  1664.00  1664.00  1566.00  1571.00  1582.00  1695.00  1718.00  1713.00
 1679.00  1623.00  1545.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
    1.00     1.00
    1.00     1.00  1667.00  1613.00  1275.00  1255.00  1289.00  1642.00  1705.00  1691.00
 1649.00  1588.00  1518.00     1.00     1.00     1.00     1.00     1.00     1.00     1.00
    1.00     1.00
  400.00   748.10   887.30  1065.00
  782.00   782.00   799.80   795.10
    0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
    0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00     0.00
    0.00     0.00
  744.80   864.30  1062.00  1155.00   968.30   927.00  1018.00  1387.00  1345.00  1277.00
 1080.00   891.00   793.40   786.70   765.90   757.70   736.60   721.90   675.90   669.50
  662.20   649.60
  1.0000   0.7000   0.7000   0.7000
  1.0000   1.0000   0.7000   0.7000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000
  0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000
  0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000   0.7000
  0.7000   0.7000
  0.0000   0.2900   0.2600   0.2000
  0.0000   0.0000   0.1900   0.1900
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
  0.0000   0.0000
  0.2900   0.2600   0.2000   0.1700   0.2000   0.2200   0.1700   0.1400   0.1500   0.1600
  0.1700   0.1800   0.1900   0.2000   0.2200   0.2400   0.2700   0.3000   0.3600   0.3600
  0.3600   0.3600
  100.00   100.00
```

Listing 6.3. Screen output from the 2DHT code (Case 5).

2DHT

```
iter.no.=  1, act.err.=  21.778 %, avg.err.=  21.778 %, 20 it.err.=  21.778 %,
              hb. err.=  -0.901 %
iter.no.=  2, act.err.=  13.678 %, avg.err.=  17.728 %, 20 it.err.=  17.728 %,
              hb. err.=  -4.088 %
iter.no.=  3, act.err.=  11.111 %, avg.err.=  15.523 %, 20 it.err.=  15.523 %,
              hb. err.=  -3.237 %
iter.no.=  4, act.err.=  10.109 %, avg.err.=  14.169 %, 20 it.err.=  14.169 %,
              hb. err.=  -3.755 %
iter.no.=  5, act.err.=   9.089 %, avg.err.=  13.153 %, 20 it.err.=  13.153 %,
              hb. err.=  -3.323 %
iter.no.=  6, act.err.=   7.987 %, avg.err.=  12.292 %, 20 it.err.=  12.292 %,
              hb. err.=  -2.133 %
iter.no.=  7, act.err.=   7.753 %, avg.err.=  11.644 %, 20 it.err.=  11.644 %,
              hb. err.=  -3.148 %
iter.no.=  8, act.err.=   7.245 %, avg.err.=  11.094 %, 20 it.err.=  11.094 %,
              hb. err.=  -2.186 %
iter.no.=  9, act.err.=   6.225 %, avg.err.=  10.553 %, 20 it.err.=  10.553 %,
              hb. err.=  -2.390 %
iter.no.= 10, act.err.=   5.605 %, avg.err.=  10.058 %, 20 it.err.=  10.058 %,
              hb. err.=  -1.864 %
iter.no.= 11, act.err.=   6.057 %, avg.err.=   9.694 %, 20 it.err.=   9.694 %,
              hb. err.=  -1.960 %
iter.no.= 12, act.err.=   4.060 %, avg.err.=   9.225 %, 20 it.err.=   9.225 %,
              hb. err.=  -2.133 %
iter.no.= 13, act.err.=   5.664 %, avg.err.=   8.951 %, 20 it.err.=   8.951 %,
              hb. err.=  -2.074 %
iter.no.= 14, act.err.=   4.817 %, avg.err.=   8.655 %, 20 it.err.=   8.655 %,
              hb. err.=  -1.606 %
iter.no.= 15, act.err.=   4.517 %, avg.err.=   8.380 %, 20 it.err.=   8.380 %,
              hb. err.=  -0.794 %
iter.no.= 16, act.err.=   3.182 %, avg.err.=   8.055 %, 20 it.err.=   8.055 %,
              hb. err.=  -1.105 %
iter.no.= 17, act.err.=   3.312 %, avg.err.=   7.717 %, 20 it.err.=   7.717 %,
              hb. err.=  -1.912 %
iter.no.= 18, act.err.=   3.141 %, avg.err.=   7.463 %, 20 it.err.=   7.463 %,
              hb. err.=  -0.172 %
iter.no.= 19, act.err.=   1.885 %, avg.err.=   7.169 %, 20 it.err.=   7.169 %,
              hb. err.=  -0.818 %
iter.no.= 20, act.err.=   1.859 %, avg.err.=   6.904 %, 20 it.err.=   6.904 %,
              hb. err.=  -0.285 %
iter.no.= 21, act.err.=   1.667 %, avg.err.=   6.654 %, 20 it.err.=   5.898 %,
              hb. err.=  -1.538 %
iter.no.= 22, act.err.=   2.706 %, avg.err.=   6.475 %, 20 it.err.=   5.349 %,
              hb. err.=  -0.695 %
iter.no.= 23, act.err.=   2.157 %, avg.err.=   6.287 %, 20 it.err.=   4.902 %,
              hb. err.=  -0.665 %
iter.no.= 24, act.err.=   2.453 %, avg.err.=   6.127 %, 20 it.err.=   4.519 %,
              hb. err.=  -0.564 %
iter.no.= 25, act.err.=   1.524 %, avg.err.=   5.943 %, 20 it.err.=   4.141 %,
              hb. err.=  -1.139 %
iter.no.= 26, act.err.=   3.059 %, avg.err.=   5.832 %, 20 it.err.=   3.894 %,
              hb. err.=  -0.209 %
iter.no.= 27, act.err.=   0.688 %, avg.err.=   5.642 %, 20 it.err.=   3.541 %,
              hb. err.=  -0.155 %
iter.no.= 28, act.err.=   0.696 %, avg.err.=   5.465 %, 20 it.err.=   3.214 %,
              hb. err.=  -0.961 %
iter.no.= 29, act.err.=   1.927 %, avg.err.=   5.343 %, 20 it.err.=   2.999 %,
              hb. err.=  -0.642 %
iter.no.= 30, act.err.=  -0.184 %, avg.err.=   5.159 %, 20 it.err.=   2.709 %,
              hb. err.=  -0.384 %
iter.no.= 31, act.err.=   1.582 %, avg.err.=   5.043 %, 20 it.err.=   2.486 %,
              hb. err.=  -0.903 %
iter.no.= 32, act.err.=   2.131 %, avg.err.=   4.952 %, 20 it.err.=   2.389 %,
              hb. err.=   0.508 %
iter.no.= 33, act.err.=  -0.718 %, avg.err.=   4.781 %, 20 it.err.=   2.070 %,
              hb. err.=  -0.078 %
iter.no.= 34, act.err.=   1.213 %, avg.err.=   4.676 %, 20 it.err.=   1.890 %,
              hb. err.=  -0.175 %
iter.no.= 35, act.err.=   0.867 %, avg.err.=   4.567 %, 20 it.err.=   1.707 %,
              hb. err.=  -0.017 %
```

```
iter.no.= 36, act.err.=   1.054 %, avg.err.=   4.469 %, 20 it.err.=   1.601 %,
              hb. err.=  -0.594 %
iter.no.= 37, act.err.=   1.129 %, avg.err.=   4.379 %, 20 it.err.=   1.542 %,
              hb. err.=   0.123 %
iter.no.= 38, act.err.=   0.261 %, avg.err.=   4.271 %, 20 it.err.=   1.398 %,
              hb. err.=  -0.417 %
iter.no.= 39, act.err.=  -0.175 %, avg.err.=   4.157 %, 20 it.err.=   1.295 %,
              hb. err.=   0.605 %
iter.no.= 40, act.err.=  -0.766 %, avg.err.=   4.034 %, 20 it.err.=   1.164 %,
              hb. err.=  -0.501 %
iter.no.= 41, act.err.=   0.898 %, avg.err.=   3.957 %, 20 it.err.=   1.125 %,
              hb. err.=  -0.242 %
iter.no.= 42, act.err.=   0.678 %, avg.err.=   3.879 %, 20 it.err.=   1.024 %,
              hb. err.=   1.187 %
iter.no.= 43, act.err.=  -2.490 %, avg.err.=   3.731 %, 20 it.err.=   0.791 %,
              hb. err.=  -0.085 %
iter.no.= 44, act.err.=  -0.145 %, avg.err.=   3.643 %, 20 it.err.=   0.662 %,
              hb. err.=   0.387 %
iter.no.= 45, act.err.=   0.630 %, avg.err.=   3.576 %, 20 it.err.=   0.617 %,
              hb. err.=  -0.580 %
iter.no.= 46, act.err.=   0.592 %, avg.err.=   3.511 %, 20 it.err.=   0.493 %,
              hb. err.=  -0.489 %
iter.no.= 47, act.err.=   0.555 %, avg.err.=   3.448 %, 20 it.err.=   0.487 %,
              hb. err.=   0.189 %
iter.no.= 48, act.err.=  -1.235 %, avg.err.=   3.351 %, 20 it.err.=   0.390 %,
              hb. err.=  -0.624 %
iter.no.= 49, act.err.=  -0.195 %, avg.err.=   3.278 %, 20 it.err.=   0.284 %,
              hb. err.=   0.671 %
iter.no.= 50, act.err.=   0.624 %, avg.err.=   3.225 %, 20 it.err.=   0.325 %,
              hb. err.=  -0.375 %
iter.no.= 51, act.err.=   0.962 %, avg.err.=   3.181 %, 20 it.err.=   0.293 %,
              hb. err.=  -0.124 %
iter.no.= 52, act.err.=   0.493 %, avg.err.=   3.129 %, 20 it.err.=   0.211 %,
              hb. err.=  -1.325 %
iter.no.= 53, act.err.=   1.041 %, avg.err.=   3.089 %, 20 it.err.=   0.299 %,
              hb. err.=   1.210 %
iter.no.= 54, act.err.=  -0.190 %, avg.err.=   3.029 %, 20 it.err.=   0.229 %,
              hb. err.=  -0.889 %
iter.no.= 55, act.err.=   0.703 %, avg.err.=   2.986 %, 20 it.err.=   0.221 %,
              hb. err.=   0.201 %
iter.no.= 56, act.err.=   0.526 %, avg.err.=   2.943 %, 20 it.err.=   0.194 %,
              hb. err.=   0.101 %
iter.no.= 57, act.err.=   0.124 %, avg.err.=   2.893 %, 20 it.err.=   0.144 %,
              hb. err.=   0.006 %
iter.no.= 58, act.err.=   0.517 %, avg.err.=   2.852 %, 20 it.err.=   0.157 %,
              hb. err.=  -1.038 %
iter.no.= 59, act.err.=   1.067 %, avg.err.=   2.822 %, 20 it.err.=   0.219 %,
              hb. err.=   0.684 %
iter.no.= 60, act.err.=  -0.093 %, avg.err.=   2.773 %, 20 it.err.=   0.253 %,
              hb. err.=   0.077 %
iter.no.= 61, act.err.=  -0.818 %, avg.err.=   2.714 %, 20 it.err.=   0.167 %,
              hb. err.=  -0.250 %
iter.no.= 62, act.err.=  -0.145 %, avg.err.=   2.668 %, 20 it.err.=   0.126 %,
              hb. err.=   0.467 %
iter.no.= 63, act.err.=   0.018 %, avg.err.=   2.626 %, 20 it.err.=   0.251 %,
              hb. err.=   0.066 %
iter.no.= 64, act.err.=  -0.182 %, avg.err.=   2.582 %, 20 it.err.=   0.249 %,
              hb. err.=  -0.372 %
iter.no.= 65, act.err.=   0.339 %, avg.err.=   2.548 %, 20 it.err.=   0.235 %,
              hb. err.=   0.002 %
iter.no.= 66, act.err.=   0.820 %, avg.err.=   2.522 %, 20 it.err.=   0.246 %,
              hb. err.=   0.296 %
iter.no.= 67, act.err.=  -1.458 %, avg.err.=   2.462 %, 20 it.err.=   0.145 %,
              hb. err.=  -0.146 %
iter.no.= 68, act.err.=  -0.205 %, avg.err.=   2.423 %, 20 it.err.=   0.197 %,
              hb. err.=  -0.236 %
iter.no.= 69, act.err.=   0.664 %, avg.err.=   2.398 %, 20 it.err.=   0.240 %,
              hb. err.=  -0.799 %
iter.no.= 70, act.err.=   1.084 %, avg.err.=   2.379 %, 20 it.err.=   0.263 %,
              hb. err.=   0.625 %
iter.no.= 71, act.err.=   0.370 %, avg.err.=   2.350 %, 20 it.err.=   0.234 %,
              hb. err.=   0.185 %
```

```
iter.no.= 72, act.err.=   0.216 %, avg.err.=   2.331 %, 20 it.err.=   0.000 %,
              hb. err.=  -0.297 %
iter.no.= 73, act.err.=   0.432 %, avg.err.=   2.295 %, 20 it.err.=   0.189 %,
              hb. err.=   0.004 %
iter.no.= 74, act.err.=   0.208 %, avg.err.=   2.267 %, 20 it.err.=   0.209 %,
              hb. err.=   0.088 %
iter.no.= 75, act.err.=  -0.019 %, avg.err.=   2.236 %, 20 it.err.=   0.173 %,
              hb. err.=  -0.092 %
iter.no.= 76, act.err.=   0.016 %, avg.err.=   2.207 %, 20 it.err.=   0.148 %,
              hb. err.=   0.011 %
iter.no.= 77, act.err.=  -0.054 %, avg.err.=   2.178 %, 20 it.err.=   0.139 %,
              hb. err.=  -0.013 %
iter.no.= 78, act.err.=  -0.044 %, avg.err.=   2.149 %, 20 it.err.=   0.111 %,
              hb. err.=   0.033 %
iter.no.= 79, act.err.=  -0.209 %, avg.err.=   2.119 %, 20 it.err.=   0.047 %,
              hb. err.=  -0.065 %
iter.no.= 80, act.err.=  -0.172 %, avg.err.=   2.091 %, 20 it.err.=   0.043 %,
              hb. err.=   0.046 %
iter.no.= 81, act.err.=  -0.245 %, avg.err.=   2.062 %, 20 it.err.=   0.072 %,
              hb. err.=   0.015 %
iter.no.= 82, act.err.=  -0.196 %, avg.err.=   2.034 %, 20 it.err.=   0.069 %,
              hb. err.=   0.002 %
iter.no.= 83, act.err.=  -0.101 %, avg.err.=   2.009 %, 20 it.err.=   0.063 %,
              hb. err.=   0.054 %
iter.no.= 84, act.err.=  -0.233 %, avg.err.=   1.982 %, 20 it.err.=   0.061 %,
              hb. err.=   0.010 %
iter.no.= 85, act.err.=  -0.103 %, avg.err.=   1.957 %, 20 it.err.=   0.039 %,
              hb. err.=   0.048 %
iter.no.= 86, act.err.=  -0.147 %, avg.err.=   1.933 %, 20 it.err.=  -0.010 %,
              hb. err.=   0.013 %
iter.no.= 87, act.err.=  -0.178 %, avg.err.=   1.909 %, 20 it.err.=   0.054 %,
              hb. err.=  -0.008 %
iter.no.= 88, act.err.=  -0.115 %, avg.err.=   1.886 %, 20 it.err.=   0.059 %,
              hb. err.=   0.044 %
iter.no.= 89, act.err.=  -0.149 %, avg.err.=   1.863 %, 20 it.err.=   0.018 %,
              hb. err.=   0.036 %
iter.no.= 90, act.err.=  -0.237 %, avg.err.=   1.839 %, 20 it.err.=  -0.048 %,
              hb. err.=   0.025 %
iter.no.= 91, act.err.=  -0.347 %, avg.err.=   1.815 %, 20 it.err.=  -0.084 %,
              hb. err.=  -0.085 %
iter.no.= 92, act.err.=  -0.211 %, avg.err.=   1.793 %, 20 it.err.=  -0.105 %,
              hb. err.=   0.030 %
iter.no.= 93, act.err.=  -0.154 %, avg.err.=   1.772 %, 20 it.err.=  -0.134 %,
              hb. err.=   0.043 %
iter.no.= 94, act.err.=  -0.081 %, avg.err.=   1.753 %, 20 it.err.=  -0.149 %,
              hb. err.=   0.089 %
iter.no.= 95, act.err.=  -0.208 %, avg.err.=   1.732 %, 20 it.err.=  -0.158 %,
              hb. err.=  -0.006 %
iter.no.= 96, act.err.=  -0.189 %, avg.err.=   1.712 %, 20 it.err.=  -0.169 %,
              hb. err.=   0.018 %
iter.no.= 97, act.err.=  -0.221 %, avg.err.=   1.692 %, 20 it.err.=  -0.177 %,
              hb. err.=  -0.009 %
iter.no.= 98, act.err.=  -0.260 %, avg.err.=   1.672 %, 20 it.err.=  -0.189 %,
              hb. err.=  -0.044 %
iter.no.= 99, act.err.=  -0.119 %, avg.err.=   1.654 %, 20 it.err.=  -0.184 %,
              hb. err.=   0.035 %
iter.no.=100, act.err.=  -0.123 %, avg.err.=   1.636 %, 20 it.err.=  -0.182 %,
              hb. err.=   0.000 %
```

Listing 6.4. Contents of file 2DOT0501.100 (Case 5).

```
**********************
*                    *
* GENERAL INFORMATION *
*                    *
**********************

                        BOILER NAME:        BOILER 2
                        CASE NUMBER:        05
                        VERSION NUMBER:     01
                        THERMAL LOAD:       100.0    % OF FULL LOAD
***************
*             *
* INPUT/OUTPUT *
*             *
***************

                        NREAD:                0
                        NWRTE:                1

                        NAME OF INPUT DATA FILE:              2DIN0501.100 (copied to 2DINPT.DAT)
                        NAME OF INPUT ARRAY FILE:             IARR0501.100
                        NAME OF OUTPUT ARRAY FILE:            OARR0501.100
                        NAME OF GRAPHICS OUTPUT FILE          GRAF
                        NAME OF OUTPUT DATA FILE:             2DOT0501.100
                        OUTPUT LEVEL:                         DEFAULT
*****************
*               *
* USER'S COMMENTS *
*               *
*****************

c TANGENTIALLY FIRED BOILER. USE COAL AS PRIMARY FUEL AT 100% LOAD
c
c
c
c
c
c
c
c
c
```

```
*****************************
*                           *
* SUMMARY OF INPUT PARAMETERS *
*                           *
*****************************

              FUEL TYPE:                                    SOLID
              TOTAL FUEL FLOW:                              8.8879    KG WET/S
              TOTAL AIR FLOW:                               85.4743   KG WET/S
              EXCESS AIR:                                   17.9295   %
              O2-CONTENT OF FLUE GAS:                       3.2700    VOL  % DRY
              SEC. AIR TEMPERATURE:                         545.4700  K
              PRIM. MIXTURE TEMPERATURE:                    339.5400  K
              AMOUNT OF PRIM. AIR: IN % OF STOICH. AIR:     20.0000   %

FUEL PROPERTY -
**************
              PROXIMATE: CFIX              0.4189     KG/KG WET
                         VOL               0.3341     KG/KG WET
                         MOI               0.1375     KG/KG WET
                         ASH               0.1095     KG/KG WET

              ULTIMATE:    C               0.6920     KG/KG DRY
                           H               0.0491     KG/KG DRY
                           N               0.0124     KG/KG DRY
                           O               0.0861     KG/KG DRY
                           S               0.0335     KG/KG DRY
                         ASH               0.1269     KG/KG DRY

              UPPER HEATING VALUE:       24947.0996   KJ/KG WET
              LOWER HEATING VALUE:       27852.7891   KJ/KG DRY

ASH RADIATION -
**************
              CLOUD SPECIFIC ABSORPTION COEFFICIENT:                10.7643     1/((KG/M**3)M)
              CLOUD SPECIFIC SURFACE AREA:                          430.5700    M**2/KG
              SCATTERING.                                           NO
              ABSORPTION EFFICIENCY:                                0.1000
              SCATTERING EFFICIENCY:                                0.0000

NUMERICAL PARAMETERS -
**********************
              NMAX:                        2
              NPHI:                        4
              EXACT:                       0.00010
              NO. OF ITERATIONS:           100
              NO. OF AVERAGED ITERATIONS:  30
              WEIGHTING FACTOR FOR HEAT FLUXES OF A PREVIOUS RUN:   0

STOICHIOMETRIC CALCULATIONS AT COMPLETE COMBUSTION

NAME OF VARIABLE    MEANING OF VARIABLE                                  VALUE          UNITS
----------------    -------------------                                  -----          -----
O2MINT              STOICHIOMETRIC O2                                    2.1806         KG O2/KG FUEL DRY
AIRMNT              STOICHIOMETRIC AIR                                   9.3620         KG AIR DRY/KG FUEL DRY
AIRNR               TOTAL AIR NUMBER                                     1.1793         -
H2OFUT              HUMIDITY OF FUEL                                     0.1594         KG H2O/KG FUEL DRY
H2OA2               HUMIDITY OF AIR                                      0.0099         KG H2O/KG  AIR DRY
FUTOT               FLOW RATE OF DRY FUEL                                7.6658         KG FUEL DRY/S
DMA                 FLOW RATE OF DRY AIR                                 84.6344        KG  AIR DRY/S
DMH2O               FLOW RATE OF H2O                                     2.0619         KG  H2O    /S
DMTOT               TOTAL INPUT MASS FLOW RATE                           94.3622        KG         /S
HL                  TOT.NET CAL. VALUE OF DRY FUEL                       27852.7891     KJ/KG FUEL DRY

O2MINV              STOICHIOMETRIC O2 FOR VOLATILE FUELS                 0.8744         KG O2/KG FUEL DRY
AIRMINV             STOICHIOMETRIC AIR FOR VOLATILE FUELS                3.7542         KG AIR DRY/KG FUEL DRY
FUS                 MASS FLOW RATE OF BURNER FUEL                        7.6658         KG FUEL DRY/S
FUSW                MASS FLOW RATE OF BURNER FUEL                        8.8879         KG FUEL WET/S
FUG                 MASS FLOW RATE OF REBURN FUEL                        0.0000         KG FUEL DRY/S
FUGW                MASS FLOW RATE OF REBURN FUEL                        0.0000         KG FUEL WET/S
FUGV                VOLUME FLOW RATE OF REBURN FUEL                      0.0000         M3N GAS DRY/S
FUGVW               VOLUME FLOW RATE OF REBURN FUEL                      0.0000         M3N GAS WET/S
DMA2                MASS FLOW RATE OF TOTAL OR SEC. AIR                  84.6344        KG AIR DRY/S
DMA2W               MASS FLOW RATE OF TOTAL OR SEC. AIR                  85.4743        KG AIR WET/S
DMA2V               VOLUME FLOW RATE OF TOTAL OR SEC. AIR                70.8331        M3N AIR DRY/S
DMA2VW              VOLUME FLOW RATE OF TOTAL OR SEC. AIR                71.9588        M3N AIR WET/S
DMCG                VOLUME FLOW RATE OF COMBUSTION GASES                 69.1590        M3N GAS DRY/S
DMCGW               VOLUME FLOW RATE OF COMBUSTION GASES                 76.4308        M3N GAS WET/S
HLS                 NET CAL. VALUE OF BURNER FUEL                        27852.7891     KJ/KG FUEL DRY
HUSW                GROSS CAL. VALUE OF BURNER FUEL                      24947.0996     KJ/KG FUEL WET
HLG                 NET CAL. VALUE OF REBURN FUEL                        0.0000         KJ/KG REBURN-FUEL DRY
HUGW                GROSS CAL. VALUE OF REBURN FUEL                      0.0000         KJ/KG REBURN-FUEL WET
HLGV                NET CAL. VALUE OF REBURN FUEL                        0.0000         KJ/M3N GAS DRY
HUGVW               GROSS CAL. VALUE OF REBURN FUEL                      0.0000         KJ/M3N GAS WET

MASS CONCENTRATION OF GASEOUS SPECIES IN KG/KG WET
     CO2        H2O        N2         O2         VOL        SO2        ASH        CHAR       SOOT
  0.2060     0.0575     0.6890     0.0318     0.0000     0.0054     0.0103     0.0000     0.0000
CONCENTRATION OF GASEOUS SPECIES IN VOL.FRACTION WET
     CO2        H2O        N2         O2         VOL        SO2
  0.1395     0.0951     0.7332     0.0296     0.0000     0.0025
CONCENTRATION OF GASEOUS SPECIES IN VOL. FRACTION DRY
     CO2        H2O        N2         O2         VOL        SO2
  0.1542     0.0000     0.8103     0.0327     0.0000     0.0028
SO2 CONCENTRATION IN PPM MASS          5437.
SO2 CONCENTRATION IN PPM VOL WET       2530.
SO2 CONCENTRATION IN PPM VOL DRY       2796.

HEAT CAPACITY OF COMBUSTION SPECIES (KJ/KG-K)
                    CO2        H2O        N2         O2         VOL        SO2        ASH        CHAR       SOOT
  AT  545.47K   0.9520193  1.9157062  1.0478872  0.9492909  2.6162302  0.6881223  0.8373600  1.1109865  1.0334244
  AT  339.54K   0.8649599  1.8697426  1.0397632  0.9217071  2.2751725  0.6344374  0.8373600  0.9524412  0.7711034
```

AT 300.00K	0.8455777	1.8630723	1.0395783	0.9175348	2.2181914	0.6227968	0.8373600	3.9199310	3.7197299
AT 1800.00K	1.2005430	2.3140147	1.1634477	1.0747626	4.3484931	0.8270922	0.8373600	1.6863927	1.5045161
AT 900.00K	1.0583812	2.0220246	1.0806181	0.9992388	3.2324150	0.7527937	0.8373600	2.3415941	2.3412676

MEAN HEAT CAPACITIES OF SOME INPUT/OUTPUT STREAMS

INPUT STREAM	TEMPERATURE (K)	MEAN Cp (KJ/KG-K)
AIR	339.54	1.0206912
AIR	545.47	1.0336750
FLUE GAS	900.00	1.1232907
FLUE GAS	1800.00	1.2292355

MASS BALANCE FOR VOLUME ZONES

NR	I	J	MCONIN KG/S	MCONNT KG/S	MDIFIN KG/S	MDFNT KG/S	MTOTIN KG/S	MTOTEX KG/S	MTOTNT KG/S
1	1		4.718	0.000	10.928	0.000	15.646	15.646	0.000
1	2		4.718	0.000	10.928	0.000	15.646	15.646	0.000
2	1		18.872	0.000	11.159	0.000	30.031	30.031	0.000
2	2		18.872	0.000	14.298	0.000	33.170	33.170	0.000
2	3		14.494	0.000	8.176	0.000	22.670	22.670	0.000
3	1		23.119	0.000	14.041	0.000	37.160	37.160	0.000
3	2		18.533	0.000	19.137	0.000	37.670	37.670	0.000
3	3		33.027	0.000	24.047	0.000	57.073	57.073	0.000
3	4		16.513	0.000	12.592	0.000	29.106	29.106	0.000
4	1		23.119	0.000	14.041	0.000	37.159	37.159	0.000
4	2		21.231	0.000	19.676	0.000	40.908	40.908	0.000
4	3		25.950	0.000	22.630	0.000	48.580	48.580	0.000
4	4		21.231	0.000	15.674	0.000	36.905	36.905	0.000
5	1		22.760	0.000	21.277	0.000	44.037	44.037	0.000
5	2		24.289	0.000	42.905	0.000	67.194	67.194	0.000
5	3		24.289	0.000	52.657	0.000	76.946	76.946	0.000
5	4		38.490	0.000	31.029	0.000	69.519	69.519	0.000
6	1		24.279	0.000	21.581	0.000	45.860	45.860	0.000
6	2		25.799	0.000	43.207	0.000	69.006	69.006	0.000
6	3		17.240	0.000	59.740	0.000	76.980	76.980	0.000
6	4		31.441	0.000	38.123	0.000	69.564	69.564	0.000
7	1		48.512	0.000	23.494	0.000	72.006	72.006	0.000
7	2		62.553	0.000	42.937	0.000	105.490	105.490	0.000
7	3		46.709	0.000	46.735	0.000	93.444	93.444	0.000
7	4		39.538	0.000	30.094	0.000	69.632	69.632	0.000
8	1		48.512	0.000	19.930	0.000	68.442	68.442	0.000
8	2		50.531	0.000	27.493	0.000	78.024	78.024	0.000
8	3		27.205	0.000	25.391	0.000	52.596	52.596	0.000
8	4		12.182	0.000	19.801	0.000	31.983	31.983	0.000
9	1		36.301	0.000	15.048	0.000	51.349	51.349	0.000
9	2		31.762	0.000	17.849	0.000	49.611	49.611	0.000
9	3		15.032	0.000	15.403	0.000	30.435	30.435	0.000
9	4		11.276	0.000	10.943	0.000	22.219	22.219	0.000
10	1		36.301	0.000	17.566	0.000	53.867	53.867	0.000
10	2		31.762	0.000	23.928	0.000	55.691	55.691	0.000
10	3		15.032	0.000	23.199	0.000	38.231	38.231	0.000
10	4		11.276	0.000	15.177	0.000	26.454	26.454	0.000
11	1		36.301	0.000	14.516	0.000	50.817	50.817	0.000
11	2		31.762	0.000	16.566	0.000	48.328	48.328	0.000
11	3		15.032	0.000	13.757	0.000	28.789	28.789	0.000
11	4		11.276	0.000	10.049	0.000	21.325	21.325	0.000
12	1		36.301	0.000	17.601	0.000	53.902	53.902	0.000
12	2		31.762	0.000	24.013	0.000	55.775	55.775	0.000
12	3		15.032	0.000	23.307	0.000	38.339	38.339	0.000
12	4		11.276	0.000	15.236	0.000	26.513	26.513	0.000
13	1		67.403	0.000	23.821	0.000	91.224	91.224	0.000
13	2		58.061	0.000	29.273	0.000	87.334	87.334	0.000
13	3		26.299	0.000	23.434	0.000	49.732	49.732	0.000
13	4		11.276	0.000	13.108	0.000	24.385	24.385	0.000
14	1		67.403	0.000	26.526	0.000	93.929	93.929	0.000
14	2		36.292	0.000	20.303	0.000	56.595	56.595	0.000
15	1		58.070	0.000	20.693	0.000	78.763	78.763	0.000
15	2		36.292	0.000	16.336	0.000	52.628	52.628	0.000
16	1		58.070	0.000	23.993	0.000	82.064	82.064	0.000
16	2		36.292	0.000	19.637	0.000	55.929	55.929	0.000
17	1		58.070	0.000	23.993	0.000	82.064	82.064	0.000
17	2		36.292	0.000	19.637	0.000	55.929	55.929	0.000
18	1		58.070	0.000	19.798	0.000	77.868	77.868	0.000
18	2		36.292	0.000	16.530	0.000	52.822	52.822	0.000
19	1		58.070	0.000	8.387	0.000	66.457	66.457	0.000
19	2		36.292	0.000	6.209	0.000	42.500	42.500	0.000
20	1		58.070	0.000	8.024	0.000	66.094	66.094	0.000
20	2		43.548	0.000	6.571	0.000	50.120	50.120	0.000
21	1		50.814	0.000	7.661	0.000	58.475	58.475	0.000
21	2		43.548	0.000	6.934	0.000	50.482	50.482	0.000
22	1		50.814	0.000	3.831	0.000	54.645	54.645	0.000
22	2		47.181	0.000	3.467	0.000	50.648	50.648	0.000
TOTAL MASS BALANCE FOR THE FURNACE VOLUME INCLUDING SYMMETRICAL FLUXES IF EXISTING:			2198.73	0.00	1366.04	0.00	3564.78	3564.78	0.00

iter. no.=	1.	act.err.=	21.7779	%.	avg.err.=	21.7779	%	20	it.err.=	21.7779	%.	hb.err.=	-0.9007	%
iter. no.=	2.	act.err.=	13.6785	%.	avg.err.=	17.7282	%	20	it.err.=	17.7282	%.	hb.err.=	-4.0882	%
iter. no.=	3.	act.err.=	11.1112	%.	avg.err.=	15.5225	%	20	it.err.=	15.5225	%.	hb.err.=	-3.2375	%
iter. no.=	4.	act.err.=	10.1087	%.	avg.err.=	14.1691	%.	20	it.err.=	14.1691	%.	hb.err.=	-3.7553	%
iter. no.=	5.	act.err.=	9.0889	%.	avg.err.=	13.1530	%.	20	it.err.=	13.1530	%.	hb.err.=	-3.3233	%
iter. no.=	6.	act.err.=	7.9865	%.	avg.err.=	12.2919	%.	20	it.err.=	12.2919	%.	hb.err.=	-2.1333	%
iter. no.=	7.	act.err.=	7.7529	%.	avg.err.=	11.6435	%.	20	it.err.=	11.6435	%.	hb.err.=	-3.1479	%
iter. no.=	8.	act.err.=	7.2446	%.	avg.err.=	11.0936	%.	20	it.err.=	11.0936	%.	hb.err.=	-2.1858	%
iter. no.=	9.	act.err.=	6.2250	%.	avg.err.=	10.5527	%.	20	it.err.=	10.5527	%.	hb.err.=	-2.3902	%
iter. no.=	10.	act.err.=	5.6047	%.	avg.err.=	10.0579	%.	20	it.err.=	10.0579	%.	hb.err.=	-1.8638	%
iter. no.=	11.	act.err.=	6.0566	%.	avg.err.=	9.6941	%.	20	it.err.=	9.6941	%.	hb.err.=	-1.9601	%
iter. no.=	12.	act.err.=	4.0602	%.	avg.err.=	9.2246	%.	20	it.err.=	9.2246	%.	hb.err.=	-2.1325	%
iter. no.=	13.	act.err.=	5.6636	%.	avg.err.=	8.9507	%.	20	it.err.=	8.9507	%.	hb.err.=	-2.0739	%
iter. no.=	14.	act.err.=	4.8174	%.	avg.err.=	8.6555	%.	20	it.err.=	8.6555	%.	hb.err.=	-1.6059	%
iter. no.=	15.	act.err.=	4.5166	%.	avg.err.=	8.3795	%.	20	it.err.=	8.3795	%.	hb.err.=	-0.7937	%
iter. no.=	16.	act.err.=	3.1816	%.	avg.err.=	8.0547	%.	20	it.err.=	8.0547	%.	hb.err.=	-1.1049	%
iter. no.=	17.	act.err.=	2.3119	%.	avg.err.=	7.7169	%.	20	it.err.=	7.7169	%.	hb.err.=	-1.9117	%
iter. no.=	18.	act.err.=	3.1408	%.	avg.err.=	7.4626	%.	20	it.err.=	7.4626	%.	hb.err.=	-0.1717	%
iter. no.=	19.	act.err.=	1.8851	%.	avg.err.=	7.1691	%.	20	it.err.=	7.1691	%.	hb.err.=	-0.8177	%
iter. no.=	20.	act.err.=	1.8590	%.	avg.err.=	6.9036	%.	20	it.err.=	6.9036	%.	hb.err.=	-0.2849	%

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iter. no.= 21,  act.err.=   1.6673 %,  avg.err.=   6.6542 %,  20 it.err.=   5.8981 %,  hb.err.=  -1.5380 %
iter. no.= 22,  act.err.=   2.7060 %,  avg.err.=   6.4748 %,  20 it.err.=   5.3494 %,  hb.err.=  -0.6954 %
iter. no.= 23,  act.err.=   2.1575 %,  avg.err.=   6.2871 %,  20 it.err.=   4.9017 %,  hb.err.=  -0.6647 %
iter. no.= 24,  act.err.=   2.4525 %,  avg.err.=   6.1273 %,  20 it.err.=   4.5189 %,  hb.err.=  -0.5636 %
iter. no.= 25,  act.err.=   1.5242 %,  avg.err.=   5.9432 %,  20 it.err.=   4.1407 %,  hb.err.=  -1.1387 %
iter. no.= 26,  act.err.=   3.0595 %,  avg.err.=   5.8323 %,  20 it.err.=   3.8943 %,  hb.err.=  -0.2089 %
iter. no.= 27,  act.err.=   0.6883 %,  avg.err.=   5.6417 %,  20 it.err.=   3.5411 %,  hb.err.=  -0.1547 %
iter. no.= 28,  act.err.=   0.6961 %,  avg.err.=   5.4651 %,  20 it.err.=   3.2137 %,  hb.err.=  -0.9613 %
iter. no.= 29,  act.err.=   1.9268 %,  avg.err.=   5.3431 %,  20 it.err.=   2.9988 %,  hb.err.=  -0.6419 %
iter. no.= 30,  act.err.=  -0.1840 %,  avg.err.=   5.1589 %,  20 it.err.=   2.7093 %,  hb.err.=  -0.3845 %
iter. no.= 31,  act.err.=   1.5824 %,  avg.err.=   5.0435 %,  20 it.err.=   2.4856 %,  hb.err.=  -0.9034 %
iter. no.= 32,  act.err.=   2.1314 %,  avg.err.=   4.9525 %,  20 it.err.=   2.3892 %,  hb.err.=   0.5080 %
iter. no.= 33,  act.err.=  -0.7178 %,  avg.err.=   4.7807 %,  20 it.err.=   2.0701 %,  hb.err.=  -0.0776 %
iter. no.= 34,  act.err.=   1.2127 %,  avg.err.=   4.6757 %,  20 it.err.=   1.8899 %,  hb.err.=  -0.1750 %
iter. no.= 35,  act.err.=   0.8669 %,  avg.err.=   4.5669 %,  20 it.err.=   1.7074 %,  hb.err.=  -0.0167 %
iter. no.= 36,  act.err.=   1.0539 %,  avg.err.=   4.4693 %,  20 it.err.=   1.6010 %,  hb.err.=  -0.5939 %
iter. no.= 37,  act.err.=   1.1292 %,  avg.err.=   4.3790 %,  20 it.err.=   1.5419 %,  hb.err.=   0.1229 %
iter. no.= 38,  act.err.=   0.2606 %,  avg.err.=   4.2707 %,  20 it.err.=   1.3979 %,  hb.err.=  -0.4171 %
iter. no.= 39,  act.err.=  -0.1749 %,  avg.err.=   4.1567 %,  20 it.err.=   1.2949 %,  hb.err.=   0.6051 %
iter. no.= 40,  act.err.=  -0.7656 %,  avg.err.=   4.0336 %,  20 it.err.=   1.1637 %,  hb.err.=  -0.5012 %
iter. no.= 41,  act.err.=   0.8980 %,  avg.err.=   3.9571 %,  20 it.err.=   1.1252 %,  hb.err.=  -0.2421 %
iter. no.= 42,  act.err.=   0.6783 %,  avg.err.=   3.8791 %,  20 it.err.=   1.0238 %,  hb.err.=   1.1869 %
iter. no.= 43,  act.err.=  -2.4900 %,  avg.err.=   3.7310 %,  20 it.err.=   0.7914 %,  hb.err.=  -0.0848 %
iter. no.= 44,  act.err.=  -0.1449 %,  avg.err.=   3.6429 %,  20 it.err.=   0.6616 %,  hb.err.=   0.3867 %
iter. no.= 45,  act.err.=   0.6295 %,  avg.err.=   3.5759 %,  20 it.err.=   0.6168 %,  hb.err.=  -0.5800 %
iter. no.= 46,  act.err.=   0.5923 %,  avg.err.=   3.5110 %,  20 it.err.=   0.4935 %,  hb.err.=  -0.4889 %
iter. no.= 47,  act.err.=   0.5550 %,  avg.err.=   3.4481 %,  20 it.err.=   0.4868 %,  hb.err.=   0.1890 %
iter. no.= 48,  act.err.=  -1.2348 %,  avg.err.=   3.3506 %,  20 it.err.=   0.3903 %,  hb.err.=  -0.6238 %
iter. no.= 49,  act.err.=  -0.1953 %,  avg.err.=   3.2782 %,  20 it.err.=   0.2842 %,  hb.err.=   0.6711 %
iter. no.= 50,  act.err.=   0.6240 %,  avg.err.=   3.2251 %,  20 it.err.=   0.3246 %,  hb.err.=  -0.3747 %
iter. no.= 51,  act.err.=   0.9524 %,  avg.err.=   3.1806 %,  20 it.err.=   0.2931 %,  hb.err.=  -0.1235 %
iter. no.= 52,  act.err.=   0.4930 %,  avg.err.=   3.1289 %,  20 it.err.=   0.2111 %,  hb.err.=  -1.3253 %
iter. no.= 53,  act.err.=   1.0412 %,  avg.err.=   3.0895 %,  20 it.err.=   0.2991 %,  hb.err.=   1.2103 %
iter. no.= 54,  act.err.=  -0.1904 %,  avg.err.=   3.0288 %,  20 it.err.=   0.2289 %,  hb.err.=  -0.8891 %
iter. no.= 55,  act.err.=   0.7032 %,  avg.err.=   2.9865 %,  20 it.err.=   0.2207 %,  hb.err.=   0.2009 %
iter. no.= 56,  act.err.=   0.5260 %,  avg.err.=   2.9425 %,  20 it.err.=   0.1943 %,  hb.err.=   0.1008 %
iter. no.= 57,  act.err.=   0.1239 %,  avg.err.=   2.8931 %,  20 it.err.=   0.1441 %,  hb.err.=   0.0062 %
iter. no.= 58,  act.err.=   0.5170 %,  avg.err.=   2.8521 %,  20 it.err.=   0.1569 %,  hb.err.=  -1.0379 %
iter. no.= 59,  act.err.=   1.0668 %,  avg.err.=   2.8219 %,  20 it.err.=   0.2190 %,  hb.err.=   0.6839 %
iter. no.= 60,  act.err.=  -0.0931 %,  avg.err.=   2.7733 %,  20 it.err.=   0.2526 %,  hb.err.=   0.0773 %
iter. no.= 61,  act.err.=  -0.8184 %,  avg.err.=   2.7144 %,  20 it.err.=   0.1668 %,  hb.err.=  -0.2505 %
iter. no.= 62,  act.err.=  -0.1451 %,  avg.err.=   2.6683 %,  20 it.err.=   0.1256 %,  hb.err.=   0.4674 %
iter. no.= 63,  act.err.=   0.0181 %,  avg.err.=   2.6262 %,  20 it.err.=   0.2510 %,  hb.err.=   0.0663 %
iter. no.= 64,  act.err.=  -0.1823 %,  avg.err.=   2.5823 %,  20 it.err.=   0.2492 %,  hb.err.=  -0.3715 %
iter. no.= 65,  act.err.=   0.3392 %,  avg.err.=   2.5478 %,  20 it.err.=   0.2346 %,  hb.err.=   0.0018 %
iter. no.= 66,  act.err.=   0.8200 %,  avg.err.=   2.5216 %,  20 it.err.=   0.2460 %,  hb.err.=   0.2956 %
iter. no.= 67,  act.err.=  -1.4578 %,  avg.err.=   2.4622 %,  20 it.err.=   0.1454 %,  hb.err.=  -0.1464 %
iter. no.= 68,  act.err.=  -0.2054 %,  avg.err.=   2.4230 %,  20 it.err.=   0.1969 %,  hb.err.=  -0.2357 %
iter. no.= 69,  act.err.=   0.6641 %,  avg.err.=   2.3975 %,  20 it.err.=   0.2398 %,  hb.err.=  -0.7992 %
iter. no.= 70,  act.err.=   1.0843 %,  avg.err.=   2.3788 %,  20 it.err.=   0.2628 %,  hb.err.=   0.6246 %
iter. no.= 71,  act.err.=   0.3696 %,  avg.err.=   2.3505 %,  20 it.err.=   0.2337 %,  hb.err.=   0.1848 %
iter. no.= 72,  act.err.=   0.2160 %,  avg.err.=   2.3208 %,  20 it.err.=   0.2198 %,  hb.err.=  -0.2974 %
iter. no.= 73,  act.err.=   0.4323 %,  avg.err.=   2.2950 %,  20 it.err.=   0.1894 %,  hb.err.=   0.0041 %
iter. no.= 74,  act.err.=   0.2083 %,  avg.err.=   2.2668 %,  20 it.err.=   0.2093 %,  hb.err.=   0.0884 %
iter. no.= 75,  act.err.=  -0.0191 %,  avg.err.=   2.2363 %,  20 it.err.=   0.1732 %,  hb.err.=  -0.0924 %
iter. no.= 76,  act.err.=   0.0159 %,  avg.err.=   2.2071 %,  20 it.err.=   0.1477 %,  hb.err.=   0.0109 %
iter. no.= 77,  act.err.=  -0.0538 %,  avg.err.=   2.1777 %,  20 it.err.=   0.1388 %,  hb.err.=  -0.0134 %
iter. no.= 78,  act.err.=  -0.0436 %,  avg.err.=   2.1492 %,  20 it.err.=   0.1108 %,  hb.err.=   0.0334 %
iter. no.= 79,  act.err.=  -0.2093 %,  avg.err.=   2.1194 %,  20 it.err.=   0.0470 %,  hb.err.=  -0.0654 %
iter. no.= 80,  act.err.=  -0.1720 %,  avg.err.=   2.0907 %,  20 it.err.=   0.0430 %,  hb.err.=   0.0462 %
iter. no.= 81,  act.err.=  -0.2447 %,  avg.err.=   2.0619 %,  20 it.err.=   0.0717 %,  hb.err.=   0.0152 %
iter. no.= 82,  act.err.=  -0.1963 %,  avg.err.=   2.0344 %,  20 it.err.=   0.0692 %,  hb.err.=   0.0017 %
iter. no.= 83,  act.err.=  -0.1012 %,  avg.err.=   2.0086 %,  20 it.err.=   0.0632 %,  hb.err.=   0.0538 %
iter. no.= 84,  act.err.=  -0.2328 %,  avg.err.=   1.9819 %,  20 it.err.=   0.0607 %,  hb.err.=   0.0101 %
iter. no.= 85,  act.err.=  -0.1030 %,  avg.err.=   1.9574 %,  20 it.err.=   0.0386 %,  hb.err.=   0.0480 %
iter. no.= 86,  act.err.=  -0.1472 %,  avg.err.=   1.9329 %,  20 it.err.=  -0.0098 %,  hb.err.=   0.0133 %
iter. no.= 87,  act.err.=  -0.1781 %,  avg.err.=   1.9087 %,  20 it.err.=   0.0542 %,  hb.err.=  -0.0080 %
iter. no.= 88,  act.err.=  -0.1152 %,  avg.err.=   1.8857 %,  20 it.err.=   0.0587 %,  hb.err.=   0.0444 %
iter. no.= 89,  act.err.=  -0.1490 %,  avg.err.=   1.8628 %,  20 it.err.=   0.0180 %,  hb.err.=   0.0356 %
iter. no.= 90,  act.err.=  -0.2367 %,  avg.err.=   1.8395 %,  20 it.err.=  -0.0480 %,  hb.err.=   0.0254 %
iter. no.= 91,  act.err.=  -0.3465 %,  avg.err.=   1.8155 %,  20 it.err.=  -0.0838 %,  hb.err.=  -0.0850 %
iter. no.= 92,  act.err.=  -0.2115 %,  avg.err.=   1.7934 %,  20 it.err.=  -0.1052 %,  hb.err.=   0.0296 %
iter. no.= 93,  act.err.=  -0.1539 %,  avg.err.=   1.7725 %,  20 it.err.=  -0.1345 %,  hb.err.=   0.0426 %
iter. no.= 94,  act.err.=  -0.0814 %,  avg.err.=   1.7528 %,  20 it.err.=  -0.1490 %,  hb.err.=   0.0895 %
iter. no.= 95,  act.err.=  -0.2082 %,  avg.err.=   1.7321 %,  20 it.err.=  -0.1584 %,  hb.err.=  -0.0059 %
iter. no.= 96,  act.err.=  -0.1888 %,  avg.err.=   1.7121 %,  20 it.err.=  -0.1687 %,  hb.err.=   0.0180 %
iter. no.= 97,  act.err.=  -0.2206 %,  avg.err.=   1.6922 %,  20 it.err.=  -0.1770 %,  hb.err.=  -0.0087 %
iter. no.= 98,  act.err.=  -0.2799 %,  avg.err.=   1.6721 %,  20 it.err.=  -0.1888 %,  hb.err.=  -0.0437 %
iter. no.= 99,  act.err.=  -0.1187 %,  avg.err.=   1.6540 %,  20 it.err.=  -0.1843 %,  hb.err.=   0.0348 %
UNBURN FIXED CARBON AT FURNACE EXIT =          0.53% AFTER 100 ITERATIONS
UNBURN FIXED CARBON AT FURNACE EXIT =          0.52% AFTER 100 ITERATIONS
UNBURN FIXED CARBON AT FURNACE EXIT =          0.52% AFTER 100 ITERATIONS
UNBURN FIXED CARBON AT FURNACE EXIT =          0.52% AFTER 100 ITERATIONS

     THE DISTRIBUTION OF SPSU in m**2/kg AFTER  100 ITERATIONS

J= 4  0.000E-01  0.000E-01  1.327E+02  2.072E+02  4.071E+02  4.101E+02  4.103E+02  1.893E+02  1.174E+02  9.480E+01
J= 3  0.000E-01  1.015E+02  1.160E+02  1.551E+02  2.403E+02  2.383E+02  2.454E+02  1.460E+02  1.101E+02  9.412E+01
J= 2  9.862E+01  9.618E+01  1.005E+02  1.189E+02  1.734E+02  1.678E+02  1.812E+02  1.342E+02  1.115E+02  9.697E+01
J= 1  9.677E+01  9.582E+01  9.390E+01  9.705E+01  1.292E+02  1.289E+02  1.453E+02  1.158E+02  1.027E+02  9.285E+01

         I= 1       I= 2       I= 3       I= 4       I= 5       I= 6       I= 7       I= 8       I= 9       I=10

J= 4  8.974E+01  8.861E+01  8.763E+01  0.000E-01  0.000E-01  0.000E-01  0.000E-01  0.000E-01  0.000E-01  0.000E-01
J= 3  8.963E+01  8.846E+01  8.821E+01  0.000E-01  0.000E-01  0.000E-01  0.000E-01  0.000E-01  0.000E-01  0.000E-01
J= 2  9.180E+01  8.876E+01  8.897E+01  8.765E+01  8.634E+01  8.340E+01  7.988E+01  7.668E+01  7.510E+01  7.453E+01
J= 1  8.914E+01  8.699E+01  8.776E+01  8.784E+01  8.747E+01  8.580E+01  8.308E+01  7.991E+01  7.807E+01  7.666E+01

         I=11       I=12       I=13       I=14       I=15       I=16       I=17       I=18       I=19       I=20

J= 4  0.000E-01  0.000E-01
J= 3  0.000E-01  0.000E-01
J= 2  7.406E+01  7.394E+01
J= 1  7.563E+01  7.519E+01
```

	I=21	I=22

THE DISTRIBUTION OF UBRT in Fraction of Input fixed-? AFTER [illegible] ITERATIONS

J= 4	0.000E-01	0.000E-01	5.926E-02	1.212E-01	[illegible]	3.899E-01	3.988E-01	5.138E-02	3.111E-02	1.917E-02
J= 3	0.000E-01	3.488E-02	4.649E-02	7.198E-02	1.410E-01	1.516E-01	1.754E-01	4.939E-02	3.289E-02	2.116E-02
J= 2	1.221E-02	2.642E-02	3.086E-02	3.416E-02	5.428E-02	6.398E-02	9.374E-02	5.037E-02	3.693E-02	2.532E-02
J= 1	9.414E-03	1.849E-02	1.768E-02	1.664E-02	2.341E-02	2.953E-02	4.834E-02	3.547E-02	2.905E-02	2.225E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	1.538E-02	1.096E-02	8.523E-03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	1.725E-02	1.243E-02	9.384E-03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	2.126E-02	1.567E-02	1.119E-02	8.723E-03	7.786E-03	6.717E-03	5.984E-03	5.506E-03	5.271E-03	5.185E-03
J= 1	1.957E-02	1.543E-02	1.187E-02	9.986E-03	8.973E-03	7.679E-03	6.737E-03	6.084E-03	5.794E-03	5.582E-03

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20

J= 4	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01
J= 2	5.104E-03	5.081E-03
J= 1	5.413E-03	5.333E-03

	I=21	I=22

THE DISTRIBUTION OF PO2 in Vol. Fraction. Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	4.105E-02	6.132E-02	1.114E-01	1.148E-01	1.118E-01	4.211E-02	3.480E-02	3.186E-02
J= 3	0.000E-01	3.379E-02	3.758E-02	4.831E-02	6.802E-02	7.113E-02	7.807E-02	4.223E-02	3.613E-02	3.262E-02
J= 2	3.004E-02	3.196E-02	3.304E-02	3.537E-02	4.263E-02	4.754E-02	5.803E-02	4.326E-02	3.785E-02	3.358E-02
J= 1	2.974E-02	3.075E-02	3.086E-02	3.119E-02	3.698E-02	4.585E-02	4.282E-02	3.805E-02	3.551E-02	3.289E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	3.143E-02	3.099E-02	3.078E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	3.192E-02	3.127E-02	3.091E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	3.263E-02	3.170E-02	3.117E-02	3.090E-02	3.081E-02	3.071E-02	3.064E-02	3.060E-02	3.058E-02	3.057E-02
J= 1	3.226E-02	3.151E-02	3.122E-02	3.104E-02	3.094E-02	3.082E-02	3.073E-02	3.066E-02	3.064E-02	3.062E-02

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20

J= 4	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01
J= 2	3.057E-02	3.056E-02
J= 1	3.060E-02	3.059E-02

	I=21	I=22

THE DISTRIBUTION OF FUL0 in kg/(kg.mixture) AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	8.122E-02	8.122E-02	8.122E-02	8.123E-02	8.123E-02	8.120E-02	8.120E-02	8.121E-02
J= 3	0.000E-01	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.123E-02	8.123E-02	8.122E-02	8.122E-02	8.122E-02
J= 2	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.123E-02	8.123E-02	8.123E-02	8.123E-02	8.122E-02
J= 1	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.123E-02	8.123E-02	8.123E-02	8.123E-02

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	8.121E-02	8.121E-02	8.121E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	8.122E-02	8.122E-02	8.122E-02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02
J= 1	8.123E-02	8.123E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02	8.122E-02

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20

J= 4	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01
J= 2	8.122E-02	8.122E-02
J= 1	8.122E-02	8.122E-02

	I=21	I=22

THE DISTRIBUTION OF VOL0 in Number of Vol. Lumps Released AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	1.000E+00	1.120E+02	3.114E+03	3.096E+03	3.113E+03	3.000E+01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	3.000E+00	1.410E+02	1.550E+02	2.200E+02	2.000E+00	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	2.000E+00	2.000E+00	8.000E+00	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20

J= 4	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01
J= 2	0.000E-01	0.000E-01
J= 1	0.000E-01	0.000E-01

	I=21	I=22

THE DISTRIBUTION OF SO2 in Vol. Fraction. Wet AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.379E-03	1.967E-03	1.107E-03	1.051E-03	1.092E-03	2.341E-03	2.493E-03	2.547E-03
J= 3	0.000E-01	2.522E-03	2.445E-03	2.216E-03	1.830E-03	1.767E-03	1.631E-03	2.335E-03	2.462E-03	2.532E-03
J= 2	2.581E-03	2.555E-03	2.535E-03	2.482E-03	2.307E-03	2.224E-03	2.008E-03	2.310E-03	2.424E-03	2.514E-03
J= 1	2.584E-03	2.573E-03	2.569E-03	2.562E-03	2.508E-03	2.463E-03	2.318E-03	2.417E-03	2.471E-03	2.526E-03
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	2.552E-03	2.556E-03	2.558E-03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	2.543E-03	2.552E-03	2.556E-03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	2.531E-03	2.546E-03	2.552E-03	2.555E-03	2.556E-03	2.557E-03	2.557E-03	2.558E-03	2.558E-03	2.558E-03
J= 1	2.538E-03	2.550E-03	2.552E-03	2.554E-03	2.554E-03	2.556E-03	2.556E-03	2.557E-03	2.557E-03	2.557E-03
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	0.000E-01	0.000E-01								
J= 3	0.000E-01	0.000E-01								
J= 2	2.558E-03	2.558E-03								
J= 1	2.557E-03	2.557E-03								
	I=21	I=22								

UNBURN FIXED CARBON AT FURNACE EXIT = 0.52% AFTER 100 ITERATIONS

ATOM OUTFLUX IN KG/S :

C= 5.303685 H= 0.607024 N= 65.014198 O= 22.207973

S= 0.256676 A= 0.972598

SUM= 94.362152

ATOM INFLUX IN KG/S :

C= 5.304743 H= 0.607124 N= 65.016632 O= 22.204060

S= 0.256805 A= 0.972792

SUM= 94.362152

ATOM BALANCE -> (OUT-IN)/IN IN % :

C= -0.019946 H= -0.016552 N= -0.003743 O= 0.017627

S= -0.050180 A= -0.019962

SUM= 0.000000

ENERGY BALANCE FOR VOLUME ZONES AND TOTAL FURNACE EFFICIENCY AFTER 100 ITERATIONS

I	J	TPSAD K	TEX K	RHOG OLD KG/M3	CP EX KJ/KGK	QCONIN KW	QCONNT KW	QDIFIN KW	QDIFNT KW	QCHEIN KW	QCHENT KW	QRADIN KW	QRADNT KW	QTOTIN KW	QTOTEX KW	QTOTNT KW	TNEW K
1	1	1446.6	1404.0	0.25596	1.18934	21373.	-795.	0.	0.	0.	-84.	63084.	879.	84456.	84540.		0. 1404.
2	1	1588.1	1575.7	0.22798	1.20790	46675.	-333.	0.	0.	0.	-168.	22984.	501.	69659.	69827.		0. 1576.
3	1	1622.4	1614.4	0.22253	1.21180	59433.	-164.	0.	0.	0.	-237.	46305.	401.	105739.	105975.		0. 1614.
4	1	1641.7	1637.1	0.21945	1.21409	60306.	100.	0.	0.	0.	-334.	47468.	235.	107774.	108108.		0. 1637.
5	1	1683.0	1669.9	0.21500	1.21825	73384.	210.	0.	0.	0.	-1032.	34723.	823.	108107.	109140.		0. 1670.
6	1	1718.8	1705.7	0.21035	1.22281	78110.	325.	0.	0.	0.	-1793.	35813.	968.	113923.	115716.		0. 1706.
7	1	1758.1	1740.0	0.20576	1.22958	125176.	2480.	0.	0.	0.	-4122.	36874.	1642.	162050.	166172.		0. 1740.
8	1	1786.8	1772.8	0.20226	1.23519	121909.	2247.	0.	0.	0.	-3915.	62533.	1668.	184441.	188356.		0. 1773.
9	1	1804.4	1777.4	0.20190	1.22912	93245.	120.	0.	0.	0.	-1357.	31819.	1237.	125064.	126421.		0. 1777.
10	1	1814.3	1780.1	0.20176	1.22804	97685.	146.	0.	0.	0.	-1529.	63004.	1383.	160889.	162418.		0. 1780.
11	1	1779.2	1772.2	0.20270	1.22708	92104.	-189.	0.	0.	0.	-314.	25524.	503.	117629.	117943.		0. 1772.
12	1	1761.9	1743.8	0.20606	1.22419	96308.	-917.	0.	0.	0.	-426.	61798.	1343.	158107.	158532.		0. 1744.
13	1	1691.0	1679.1	0.21402	1.21803	154764.	-1217.	0.	0.	0.	-143.	58745.	1459.	213509.	213651.		0. 1679.
14	1	1667.7	1645.9	0.21836	1.21478	156373.	-2589.	0.	0.	0.	-167.	86443.	2756.	242816.	242983.		0. 1646.
15	1	1636.2	1620.4	0.22181	1.21225	127859.	-1613.	0.	0.	0.	-69.	41636.	1682.	169495.	169564.		0. 1620
16	1	1604.6	1586.1	0.22662	1.20878	129698.	-1938.	0.	0.	0.	-95.	75296.	2033.	204995.	205090.		0. 1586.
17	1	1569.4	1545.9	0.23252	1.20463	125854.	-2508.	0.	0.	0.	-69.	71657.	2577.	197511.	197580.		0. 1546.
18	1	1529.0	1509.9	0.23806	1.20084	115240.	-1929.	0.	0.	0.	-51.	69384.	1980.	184624.	184675.		0. 1510.
19	1	1500.9	1421.4	0.25290	1.19118	95882.	-6964.	0.	3753.	0.	-23.	39189.	3234.	135071.	135094.		0. 1421.
20	1	1411.9	1360.8	0.26415	1.18429	87592.	-4410.	0.	2069.	0.	-17.	36547.	2358.	124140.	124156.		0. 1361.
21	1	1346.6	1253.1	0.28687	1.17140	72491.	-7082.	0.	4860.	0.	-12.	37763.	2234.	110254.	110266.		0. 1253.
22	1	1253.1	1137.5	0.31601	1.15669	61125.	-8069.	0.	6147.	0.	-6.	29379.	1928.	90504.	90510.		0. 1138.
1	2	1536.6	1409.9	0.25485	1.19003	23167.	-2467.	0.	362.	0.	-162.	62171.	2267.	85338.	85500.		0. 1410.
2	2	1669.0	1653.8	0.21713	1.21597	54942.	-265.	0.	0.	0.	-425.	24527.	690.	79470.	79895.		0. 1654.
3	2	1752.1	1715.4	0.20927	1.22224	65672.	-419.	0.	0.	0.	-1567.	48826.	1986.	114498.	116065.		0. 1715.
4	2	1747.7	1725.7	0.20790	1.22436	70700.	800.	0.	0.	0.	-2659.	49726.	1859.	120425.	123085.		0. 1726.
5	2	1731.8	1705.9	0.20983	1.22631	114094.	1904.	0.	0.	0.	-4032.	35341.	2128.	149435.	153467.		0. 1706.
6	2	1736.7	1716.4	0.20828	1.22949	117030.	3300.	0.	0.	0.	-5386.	36127.	2086.	153157.	158543.		0. 1716.
7	2	1729.0	1705.8	0.20888	1.23379	177379.	5832.	0.	0.	0.	-8425.	36282.	2594.	213661.	222086.		0. 1706.
8	2	1790.8	1773.5	0.20184	1.23294	138181.	3744.	0.	0.	0.	-7259.	61780.	3515.	199961.	207220.		0. 1773.
9	2	1812.3	1789.3	0.20038	1.23165	90232.	885.	0.	0.	0.	-2292.	32208.	1406.	122440.	124732.		0. 1789.
10	2	1802.8	1778.6	0.20188	1.22821	101389.	-128.	0.	0.	0.	-1991.	62293.	2119.	163681.	165672.		0. 1779.
11	2	1772.6	1757.6	0.20436	1.22582	87084.	-624.	0.	0.	0.	-385.	24767.	1008.	111852.	112236.		0. 1758.
12	2	1735.8	1715.5	0.20945	1.22157	97737.	-1165.	0.	0.	0.	-378.	60329.	1543.	158066.	158444.		0. 1716.
13	2	1653.5	1641.7	0.21891	1.21439	143738.	-1247.	0.	0.	0.	-145.	56960.	1392.	200698.	200843.		0. 1642.
14	2	1636.7	1598.4	0.22487	1.21003	91809.	-2767.	0.	300.	0.	-147.	82831.	2614.	174639.	174786.		0. 1598.
15	2	1591.1	1565.9	0.22955	1.20671	82237.	-1730.	0.	156.	0.	-51.	39479.	1624.	121716.	121767.		0. 1566.
16	2	1559.4	1516.6	0.23701	1.20156	85013.	-3130.	0.	305.	0.	-64.	68998.	2889.	154011.	154075.		0. 1517.
17	2	1511.5	1476.5	0.24346	1.19725	81454.	-2551.	0.	324.	0.	-45.	66321.	2272.	147775.	147820.		0. 1476.
18	2	1471.8	1430.2	0.25134	1.19217	74159.	-2869.	0.	339.	0.	-32.	62114.	2561.	136274.	136305.		0. 1430.
19	2	1416.3	1309.3	0.27456	1.17822	56566.	-5935.	0.	3363.	0.	-12.	33273.	2584.	89839.	89851.		0. 1309.
20	2	1304.4	1234.0	0.29132	1.16904	59382.	-4551.	0.	2525.	0.	-8.	29362.	2034.	88743.	88752.		0. 1234.
21	2	1221.5	1126.2	0.31919	1.15519	54414.	-6126.	0.	4488.	0.	-5.	29282.	1643.	83696.	83701.		0. 1126.
22	2	1127.1	1048.9	0.34271	1.14472	48500.	-4971.	0.	3285.	0.	-3.	23681.	1689.	72181.	72184.		0. 1049.
2	3	1755.4	1692.7	0.21201	1.22041	39747.	-1165.	0.	190.	0.	-822.	19799.	1798.	59546.	60368.		0. 1693.
3	3	1784.1	1748.3	0.20504	1.22743	100341.	1244.	0.	0.	0.	-3540.	41274.	2296.	141615.	145155.		0. 1748.
4	3	1785.2	1731.4	0.20634	1.23165	82186.	3569.	0.	0.	0.	-7363.	40707.	3794.	122892.	130255.		0. 1731.
5	3	1662.8	1637.8	0.21676	1.23116	117365.	9543.	0.	0.	0.	-11823.	28400.	2279.	145766.	157589.		0. 1638.
6	3	1660.4	1630.2	0.21748	1.23241	116102.	10272.	0.	0.	0.	-13106.	27796.	2834.	143898.	157004.		0. 1630.
7	3	1624.2	1610.8	0.21968	1.23281	137886.	13327.	0.	0.	0.	-14937.	28595.	1610.	166480.	181417.		0. 1611.
8	3	1814.5	1768.2	0.20252	1.23162	92946.	2284.	0.	0.	0.	-5747.	50153.	3463.	143099.	148846.		0. 1768.
9	3	1805.6	1776.9	0.20191	1.22932	54857.	468.	0.	0.	0.	-1403.	26453.	935.	81311.	82713.		0. 1777.
10	3	1768.5	1738.5	0.20660	1.22409	68129.	-722.	0.	0.	0.	-876.	50189.	1598.	118318.	119194.		0. 1739.
11	3	1722.9	1712.3	0.20981	1.22141	49993.	-266.	0.	0.	0.	-151.	20241.	417.	70233.	70384.		0. 1712.
12	3	1677.9	1653.1	0.21738	1.21553	64264.	-1120.	0.	0.	0.	-164.	47497.	1284.	111761.	111925.		0. 1653
13	3	1604.4	1588.1	0.22632	1.20900	78552.	-993.	0.	50.	0.	-93.	44968.	1037.	123520.	123613.		0. 1588.
3	4	1878.1	1738.6	0.20599	1.22771	50693.	867	0	274.	0.	-5276.	39393	4135.	89996.	95272.		0. 1739
4	4	1797.5	1692.8	0.21013	1.23379	63172.	10331	.	159.	0.	-15154.	39701.	4664.	92873.	108027.		0. 1693
5	4	1333.7	1367.2	0.25594	1.21147	62388	27644.	.	57.	0.	-24661.	25256.	-3040.	87644.	112304.		0. 1367
6	4	1313.6	1343.7	0.26009	1.20932	61060.	26900	.	68.	0.	-24208.	24078.	-2760.	85138.	109346.		0. 1344.
7	4	1324.0	1365.4	0.25631	1.21123	62828.	27181.	0	38.	0.	-23485.	25906.	-3734.	88735.	112220.		0. 1365.
8	4	1860.2	1742.2	0.20553	1.22916	54243	-525	0	167	0.	-6276.	49094.	3584.	103337.	109612.		0 1742
9	4	1673.0	1743.7	0.20581	1.22564	39373.	-8.	0.	92	0.	-1417.	25321.	1333.	64694.	66112.		0. 1744.
10	4	1748.8	1690.3	0.21253	1.21931	46376.	-1473.	0.	186.	0.	-658.	47955.	1945.	94330.	94988.		0. 1690.
11	4	1682.5	1650.4	0.21770	1.21535	35883.	-835.	0.	79.	0.	-89.	18810.	845.	54693.	54782.		0. 1650

```
 12  4 1640.9 1595.2 0.22529 1.20973  43120.  -1521.      0.    200.      0.   -110.  44870.   1430.  87990.  88100.      0. 1595
 13  4 1594.1 1540.0 0.23339 1.20404  38167.  -1706.      0.    261.      0.    -59.  42298.   1503.  80465.  80524.      0. 1540
                                                                                                                                 -----------------------------------------------------------------------------------------------------------------------------------

 HEAT BALANCE FOR VOLUME ZONES:     5.56E+06 6.72E+04       0  3.4E-04  0  0E-11-2.1E-05 2.9E-06 1.1E+05 8.5E-06 8.7E-06-2.3E-01
                                                                                                                                 ===================================================================================================================================

  ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS
   I  J      DTMAX       I  J      RDTMAX       I  J      DQMAX       I  J     RDQMAX      DQTOTAL  RDQTOTAL
                K                     %                    KW                    %           KW         %
   2  1       0.00       2  1       0.000      14  1       -0.2       2  1      0.000         -0.3      0.000


HEAT FLUX TO ADDITIONAL HEAT SINKS IN KW
 CONVECTIVE FLUX  RADIATIVE FLUX       TOTAL FLUX
      29610.7070       15636.5098       45247.2187

SURFACE TEMPERATURES OF ADDITIONAL HEAT SINKS IN K  ---  represented by TWSINK 1,j)
TWSINK( 19, j  ) =              880.61          842.65
TWSINK( 20, j  ) =              927.41          889.14
TWSINK( 21, j  ) =              951.94          899.55
TWSINK( 22, j  ) =              849.70          827.97

MEAN FURNACE EXIT TEMPERATURE = 1093.54K  AFTER  100 ITERATIONS
TOTAL FURNACE EFFICIENCY =  62.7747 % WITH  212852. KW HEAT RELEASE AND   19206. KW SENSIBLE INPUT
                            --------
CHEM. HEAT OUTFLUX IN KW :
  FUEL=     657.5                    SULF.=       0.0   SUM =      657.5
SENS. HEAT OUTFLUX IN KW    :
  EXT.=   86384.0   REC. =       0.0                     SUM =    86384.0
OUTFLUX TO HEAT SINKS IN KW :
  RAD.=  111578.0   CONV.=   34095.9                     SUM =   145673.9
TOTAL HEAT OUTFLUX :                                          232715.4 KW
CHEM. HEAT INFLUX IN KW :
  FUEL=  213514.3   EVAP.=       0.0   CALC.=       0.0
  SULF=      0.0                                        SUM =   213514.3
SENS. HEAT AIR INFLUX IN KW :
  SEC.=   18145.5   PRIM.=     612.4   TRANS.=      0.0
  REC.=      0.0                                        SUM =    18757.9
SENS. HEAT FUEL INFLUX IN KW :
  DRY =     349.0   H2OG =      94.6                     SUM =      443.6
SENS. HEAT SORBENT INFLUX IN KW :
  CAO =       0.0   H2OG =       0.0   CO2G =       0.0   SUM =        0.0
TOTAL HEAT INFLUX :                                           232715.8 KW
GAS ZONE HEAT BALANCE :
HEAT BALANCE -> OUT - IN    :        -0.4 KW
HEAT BALANCE -> (OUT-IN)/IN :   -0.000181 %

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS
  I  J  M      TOLDW              QCONIN  QCONNT  QDIFIN  QDIFNT          QRADIN  QRADNT  QTOTIN  QTOTEX  QTOTN   TNEWW
                 K                  KW      KW      KW      KW              KW      KW      KW      KW      KW      K
  1  2  1       988.3                0.    1439.     68.    -68.            1901.  -1370.   1969.   1969.    0.   988.3
  2  3  1      1194.7                0.    1691.     67.    -67.            2561.  -1624.   2628.   2628.    0.  1194.7
  3  4  1      1317.8                0.    1586.     57.    -57.            2917.  -1529.   2974.   2974.    0.  1317.8
                                                                                                                  -----------------------------------------------------------------------------------------------------------------------------------

 SURFACE ZONE HEAT BALANCE :   0.0E-01 4.7E+03 1.9E+02-1.9E+02          7.4E+03-4.5E+03 7.6E+03 7.6E+03-1.5E-04
                                                                                                                  ===================================================================================================================================

 ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS
  I  J  M    DTMAX       I  J  M    RDTMAX       I  J  M    DQMAX       I  J  M   RDQMAX      DQTOTAL   RDQTOTAL
               K                      %                     KW                     %           KW          %
  3  4  1     0.00       3  4  1     0.000       2  3  1      0.0       2  3  1     0.000         0.0       0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS
  I  J  M      TOLDW              QCONIN  QCONNT  QDIFIN  QDIFNT          QRADIN  QRADNT  QTOTIN  QTOTEX  QTOTN   TNEWW
                 K                  KW      KW      KW      KW              KW      KW      KW      KW      KW      K
 13  3  3      1214.9                0.    1280.     50.    -50.            2233.  -1230.   2283.   2283.    0.  1214.9
 13  4  3      1183.5                0.    1211.     48.    -48.            2066.  -1163.   2114.   2114.    0.  1183.5
                                                                                                                  -----------------------------------------------------------------------------------------------------------------------------------

 SURFACE ZONE HEAT BALANCE :   0.0E-01 2.5E+03 9.8E+01-9.8E+01          4.3E+03-2.4E+03 4.4E+03 4.4E+03 2.7E-05
                                                                                                                  ===================================================================================================================================

 ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS
  I  J  M    DTMAX       I  J  M    RDTMAX       I  J  M    DQMAX       I  J  M   RDQMAX      DQTOTAL   RDQTOTAL
               K                      %                     KW                     %           KW          %
 13  4  3     0.00      13  4  3     0.000      13  3  3      0.0      13  3  3     0.000         0.0       0.000

ENERGY BALANCE FOR SURFACE ZONES AFTER 100 ITERATIONS
  I  J  M      TOLDW              QCONIN  QCONNT  QDIFIN  QDIFNT          QRADIN  QRADNT  QTOTIN  QTOTEX  QTOTN   TNEWW
                 K                  KW      KW      KW      KW              KW      KW      KW      KW      KW      K
  1  2  4       963.9                0.    5431.    294.   -294.            7082.  -5137.   7376.   7376.    0.   963.9
  2  3  4      1167.9                0.    2810.    123.   -123.            4182.  -2687.   4306.   4306.    0.  1167.9
  3  4  4      1313.6                0.    5994.    217.   -217.           10988.  -5777.  11206.  11206.    0.  1313.6
  4  4  4      1383.2                0.    5616.    158.   -158.           11864.  -5458.  12022.  12022.    0.  1383.2
  5  4  4      1209.6                0.    3662.     58.    -58.            6306.  -3604.   6364.   6364.    0.  1209.6
  6  4  4      1159.6                0.    3678.     68.    -68.            5893.  -3610.   5961.   5961.    0.  1159.6
  7  4  4      1261.6                0.    3394.     38.    -38.            6554.  -3356.   6593.   6593.    0.  1261.6
  8  4  4      1469.8                0.    6143.    166.   -166.           15701.  -5977.  15867.  15867.    0.  1469.8
  9  4  4      1454.2                0.    3347.     91.    -91.            8083.  -3255.   8175.   8175.    0.  1454.2
 10  4  4      1390.2                0.    6451.    186.   -186.           14170.  -6265.  14355.  14355.    0.  1390.2
 11  4  4      1332.6                0.    2576.     80.    -80.            5210.  -2496.   5290.   5290.    0.  1332.6
 12  4  4      1272.4                0.    6168.    201.   -201.           11552.  -5967.  11753.  11753.    0.  1272.4
 13  4  4      1197.0                0.    5742.    214.   -214.            9903.  -5529.  10117.  10117.    0.  1197.0
 14  2  4      1173.5                0.    6521.    298.   -298.           10773.  -6224.  11070.  11070.    0.  1173.5
 15  2  4      1115.3                0.    3178.    157.   -157.            4864.  -3021.   5021.   5021.    0.  1115.3
 16  2  4      1042.3                0.    5422.    304.   -304.            7710.  -5118.   8014.   8014.    0.  1042.3
 17  2  4       971.0                0.    5035.    324.   -324.            6663.  -4711.   6988.   6988.    0.   971.0
 18  2  4       902.0                0.    4449.    339.   -339.            5564.  -4110.   5903.   5903.    0.   902.0
 19  2  4       742.6                0.    1435.    241.   -241.            1637.  -1194.   1879.   1879.    0.   742.6
 20  2  4       716.3                0.    1089.    221.   -221.            1252.   -868.   1472.   1472.    0.   716.3
 21  2  4       706.7                0.    1181.    220.   -220.            1408.   -961.   1628.   1628.    0.   706.7
 22  2  4       668.9                0.     560.    197.   -197.             718.   -363.    914.    914.    0.   668.9
                                                                                                                  -----------------------------------------------------------------------------------------------------------------------------------

 SURFACE ZONE HEAT BALANCE :   0.0E-01 9.0E+04 4.2E+03-4.2E+03          1.6E+05-8.6E+04 1.6E+05 1.6E+05 5.5E-03
                                                                                                                  ===================================================================================================================================

 ABSOLUTE AND RELATIVE RESIDUALS AFTER 100 ITERATIONS
  I  J  M    DTMAX       I  J  M    RDTMAX       I  J  M    DQMAX       I  J  M   RDQMAX      DQTOTAL   RDQTOTAL
               K                      %                     KW                     %           KW          %
 16  2  4     0.00      16  2  4     0.000      16  2  4      0.0      22  2  4     0.000         0.0       0.000


     THE DISTRIBUTION OF   T in K AFTER  100 ITERATIONS
```

J= 4	0.000E-01	0.000E-01	1.739E-03	1.693E-03	1.367E-03	1.344E-03	1.365E-03	1.742E-03	1.744E-03	1.690E-03
J= 3	0.000E-01	1.693E-03	1.748E-03	1.731E-03	1.638E-03	1.633E-03	1.711E-03	1.768E-03	1.777E-03	1.739E-03
J= 2	1.410E-03	1.654E-03	1.715E-03	1.726E-03	1.706E-03	1.716E-03	1.736E-03	1.773E-03	1.789E-03	1.[illegible]
J= 1	1.404E-03	1.576E-03	1.614E-03	1.637E-03	1.670E-03	1.706E-03	1.740E-03	1.773E-03	1.777E-03	1.[illegible]

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=[illegible]

J= 4	1.650E-03	1.595E-03	1.540E-03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	1.712E-03	1.653E-03	1.588E-03	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	1.758E-03	1.716E-03	1.642E-03	1.598E-03	1.566E-03	1.517E-03	1.476E-03	1.439E-03	1.309E-03	1.234E-03
J= 1	1.772E-03	1.744E-03	1.679E-03	1.646E-03	1.620E-03	1.586E-03	1.546E-03	1.510E-03	1.421E-03	1.361E-03

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20

J= 4	0.000E-01	0.000E-01
J= 3	0.000E-01	0.000E-01
J= 2	1.126E-03	1.049E-03
J= 1	1.253E-03	1.138E-03

		I=21		I=22						
I	J	CO2	H2O	N2	O2	VOL	SO2	ASH	CHAR	SOOT
-	-	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG	KG/KG
1	1	0.2046	0.0575	0.6903	0.0315	0.0000	0.0055	0.0103	0.0004	0.0000
2	1	0.2032	0.0575	0.6902	0.0326	0.0000	0.0055	0.0103	0.0007	0.0000
3	1	0.2034	0.0575	0.6900	0.0327	0.0000	0.0054	0.0103	0.0007	0.0000
4	1	0.2034	0.0574	0.6898	0.0329	0.0001	0.0054	0.0103	0.0007	0.0000
5	1	0.2012	0.0567	0.6892	0.0357	0.0007	0.0053	0.0103	0.0009	0.0000
6	1	0.1988	0.0558	0.6891	0.0380	0.0014	0.0052	0.0103	0.0012	0.0001
7	1	0.1916	0.0532	0.6888	0.0455	0.0036	0.0049	0.0103	0.0019	0.0002
8	1	0.1966	0.0550	0.6890	0.0404	0.0020	0.0051	0.0103	0.0014	0.0001
9	1	0.1994	0.0561	0.6889	0.0376	0.0011	0.0052	0.0103	0.0011	0.0001
10	1	0.2021	0.0571	0.6890	0.0349	0.0003	0.0054	0.0103	0.0009	0.0000
11	1	0.2028	0.0573	0.6891	0.0342	0.0002	0.0054	0.0103	0.0008	0.0000
12	1	0.2037	0.0575	0.6891	0.0334	0.0000	0.0054	0.0103	0.0006	0.0000
13	1	0.2042	0.0575	0.6890	0.0331	0.0000	0.0054	0.0103	0.0005	0.0000
14	1	0.2045	0.0575	0.6890	0.0329	0.0000	0.0054	0.0103	0.0004	0.0000
15	1	0.2046	0.0575	0.6890	0.0328	0.0000	0.0054	0.0103	0.0004	0.0000
16	1	0.2048	0.0575	0.6890	0.0326	0.0000	0.0054	0.0103	0.0003	0.0000
17	1	0.2050	0.0575	0.6890	0.0326	0.0000	0.0054	0.0103	0.0003	0.0000
18	1	0.2051	0.0575	0.6890	0.0325	0.0000	0.0054	0.0103	0.0002	0.0000
19	1	0.2051	0.0575	0.6890	0.0325	0.0000	0.0054	0.0103	0.0002	0.0000
20	1	0.2051	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
21	1	0.2052	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
22	1	0.2052	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
1	2	0.2042	0.0575	0.6902	0.0318	0.0000	0.0055	0.0103	0.0005	0.0000
2	2	0.2018	0.0573	0.6901	0.0339	0.0002	0.0054	0.0103	0.0010	0.0000
3	2	0.2007	0.0571	0.6899	0.0350	0.0004	0.0054	0.0103	0.0012	0.0000
4	2	0.1987	0.0562	0.6895	0.0375	0.0011	0.0053	0.0103	0.0015	0.0001
5	2	0.1908	0.0532	0.6886	0.0464	0.0036	0.0049	0.0103	0.0021	0.0002
6	2	0.1865	0.0516	0.6886	0.0505	0.0049	0.0047	0.0103	0.0025	0.0003
7	2	0.1753	0.0476	0.6883	0.0618	0.0083	0.0043	0.0103	0.0037	0.0005
8	2	0.1911	0.0531	0.6888	0.0459	0.0037	0.0049	0.0103	0.0020	0.0002
9	2	0.1965	0.0551	0.6892	0.0401	0.0020	0.0051	0.0103	0.0015	0.0001
10	2	0.2013	0.0569	0.6891	0.0356	0.0005	0.0053	0.0103	0.0010	0.0000
11	2	0.2024	0.0572	0.6890	0.0346	0.0002	0.0054	0.0103	0.0008	0.0000
12	2	0.2036	0.0575	0.6890	0.0336	0.0000	0.0054	0.0103	0.0006	0.0000
13	2	0.2043	0.0575	0.6890	0.0330	0.0000	0.0054	0.0103	0.0004	0.0000
14	2	0.2047	0.0575	0.6890	0.0327	0.0000	0.0054	0.0103	0.0003	0.0000
15	2	0.2048	0.0575	0.6890	0.0326	0.0000	0.0054	0.0103	0.0003	0.0000
16	2	0.2050	0.0575	0.6890	0.0325	0.0000	0.0054	0.0103	0.0003	0.0000
17	2	0.2051	0.0575	0.6890	0.0325	0.0000	0.0054	0.0103	0.0002	0.0000
18	2	0.2051	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
19	2	0.2052	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
20	2	0.2052	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
21	2	0.2052	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
22	2	0.2052	0.0575	0.6890	0.0324	0.0000	0.0054	0.0103	0.0002	0.0000
2	3	0.1998	0.0568	0.6900	0.0358	0.0006	0.0054	0.0103	0.0014	0.0000
3	3	0.1958	0.0555	0.6897	0.0399	0.0017	0.0052	0.0103	0.0018	0.0001
4	3	0.1846	0.0511	0.6895	0.0513	0.0053	0.0047	0.0103	0.0028	0.0003
5	3	0.1630	0.0444	0.6887	0.0725	0.0109	0.0039	0.0103	0.0056	0.0006
6	3	0.1588	0.0429	0.6894	0.0759	0.0122	0.0038	0.0103	0.0060	0.0007
7	3	0.1520	0.0409	0.6883	0.0834	0.0138	0.0035	0.0103	0.0070	0.0008
8	3	0.1922	0.0537	0.6887	0.0448	0.0032	0.0050	0.0103	0.0019	0.0002
9	3	0.1986	0.0560	0.6890	0.0383	0.0013	0.0052	0.0103	0.0013	0.0001
10	3	0.2024	0.0572	0.6891	0.0346	0.0002	0.0054	0.0103	0.0008	0.0000
11	3	0.2032	0.0574	0.6891	0.0338	0.0001	0.0054	0.0103	0.0007	0.0000
12	3	0.2041	0.0575	0.6891	0.0331	0.0000	0.0054	0.0103	0.0005	0.0000
13	3	0.2046	0.0575	0.6891	0.0328	0.0000	0.0054	0.0103	0.0004	0.0000
3	4	0.1924	0.0546	0.6892	0.0436	0.0024	0.0051	0.0103	0.0023	0.0001
4	4	0.1699	0.0467	0.6893	0.0653	0.0090	0.0042	0.0103	0.0048	0.0005
5	4	0.1104	0.0332	0.6885	0.1191	0.0191	0.0024	0.0103	0.0160	0.0011
6	4	0.1061	0.0322	0.6887	0.1228	0.0197	0.0023	0.0103	0.0168	0.0011
7	4	0.1106	0.0331	0.6879	0.1196	0.0191	0.0023	0.0103	0.0159	0.0011
8	4	0.1919	0.0537	0.6890	0.0447	0.0032	0.0050	0.0103	0.0020	0.0002
9	4	0.1996	0.0564	0.6893	0.0369	0.0009	0.0053	0.0103	0.0012	0.0000
10	4	0.2029	0.0574	0.6894	0.0338	0.0001	0.0054	0.0103	0.0008	0.0000
11	4	0.2036	0.0574	0.6893	0.0333	0.0001	0.0054	0.0103	0.0006	0.0000
12	4	0.2043	0.0575	0.6892	0.0328	0.0000	0.0054	0.0103	0.0004	0.0000
13	4	0.2047	0.0575	0.6891	0.0326	0.0000	0.0054	0.0103	0.0003	0.0000

THE DISTRIBUTION OF QG in kW/m**3 AFTER 100 ITERATIONS

J= 4	0.000E-01	0.000E-01	2.051E-02	2.314E-02	2.091E-02	-1.898E+02	-2.568E+02	1.493E+02	1.072E+02	7.980E+01
J= 3	0.000E-01	1.708E-02	1.139E-02	1.882E-02	1.568E-02	1.949E-02	1.107E-02	1.443E-02	7.520E-01	6.558E+01
J= 2	5.349E-01	5.430E-01	8.157E-01	7.637E-01	1.212E-02	1.188E-02	1.477E-02	1.213E-02	9.365E-01	7.199E+01
J= 1	2.074E+01	3.944E+01	1.646E+01	9.636E+00	4.983E+01	9.512E-01	9.352E+01	5.753E+01	8.236E+01	4.697E+01

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10

J= 4	8.524E+01	5.828E+01	6.127E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	4.202E+01	5.233E+01	4.224E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	8.421E+01	5.208E+01	4.699E+01	5.795E-01	7.248E+01	6.994E+01	5.502E+01	6.201E+01	9.425E-01	7.419E+01
J= 1	4.204E+01	4.533E+01	4.924E+01	6.108E-01	7.505E+01	4.922E+01	6.239E+01	4.793E+01	1.180E+02	8.601E+01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	0.000E-01	0.000E-01								
J= 3	0.000E-01	0.000E-01								
J= 2	4.873E+01	5.076E+01								
J= 1	6.625E+01	5.794E+01								

	I=21	I=22

THE DISTRIBUTION OF TRES in sec AFTER 100 ITERATIONS

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	1.479E-01	1.437E-01	5.599E-02	5.508E-02	4.347E-02	1.563E-01	1.203E-01	2.028E-01
J= 3	0.000E-01	9.636E-02	7.370E-02	8.858E-02	4.973E-02	5.056E-02	4.100E-02	9.498E-02	8.507E-02	1.370E-01
J= 2	5.948E-01	8.219E-02	1.342E-01	1.245E-01	5.760E-02	5.630E-02	3.724E-02	7.618E-02	6.184E-02	1.104E-01
J= 1	6.978E-01	9.295E-02	1.387E-01	1.378E-01	8.476E-02	8.082E-02	5.169E-02	8.657E-02	5.931E-02	1.116E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	1.059E-01	2.183E-01	2.302E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	7.580E-02	1.458E-01	1.164E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	5.256E-02	1.168E-01	7.762E-02	1.850E-01	1.020E-01	1.817E-01	1.876E-01	2.170E-01	1.899E-01	1.765E-01
J= 1	4.870E-02	1.164E-01	7.189E-02	1.092E-01	6.601E-02	1.206E-01	1.239E-01	1.348E-01	1.101E-01	1.203E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	0.000E-01	0.000E-01								
J= 3	0.000E-01	0.000E-01								
J= 2	2.313E-01	2.098E-01								
J= 1	1.841E-01	1.766E-01								

	I=21	I=22

THE DISTRIBUTION OF VOHR in kW AFTER 100 ITERATIONS

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	3.743E-03	7.451E+03	3.883E-03	4.040E+03	2.757E-03	3.534E+03	1.064E+03	4.188E+02
J= 3	0.000E-01	5.933E+02	2.635E+03	4.677E+03	4.424E+03	5.043E+03	4.947E-03	3.839E+03	1.038E+03	5.846E+02
J= 2	4.363E+01	2.618E+02	1.099E+03	1.911E+03	2.286E+03	3.193E+03	4.214E+03	5.148E+03	1.754E+03	1.501E+03
J= 1	0.000E-01	7.853E+01	6.108E+01	1.483E+02	6.806E+02	1.283E+03	2.844E+03	2.879E+03	1.021E+03	1.143E+03

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	2.618E+01	1.745E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	6.980E+01	4.363E+01	1.745E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	2.443E+02	1.658E+02	1.745E+01	1.745E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	1.920E+02	2.181E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	0.000E-01	0.000E-01								
J= 3	0.000E-01	0.000E-01								
J= 2	0.000E-01	0.000E-01								
J= 1	0.000E-01	0.000E-01								

	I=21	I=22

THE DISTRIBUTION OF VOL in kg/(kg.mixture) AFTER 100 ITERATIONS

	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
J= 4	0.000E-01	0.000E-01	2.530E-03	9.478E-03	2.016E-02	2.086E-02	2.020E-02	3.342E-03	9.222E-04	1.010E-04
J= 3	0.000E-01	5.894E-04	1.748E-03	5.611E-03	1.153E-02	1.289E-02	1.460E-02	3.365E-03	1.337E-03	2.485E-04
J= 2	0.000E-01	1.611E-04	3.784E-04	1.169E-03	3.765E-03	5.203E-03	8.749E-03	3.905E-03	2.101E-03	5.119E-04
J= 1	0.000E-01	1.978E-05	1.598E-05	5.594E-05	7.080E-04	1.450E-03	3.777E-03	2.156E-03	1.185E-03	3.197E-04

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	5.570E-05	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 3	1.135E-04	1.549E-05	5.971E-06	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 2	2.212E-04	2.662E-05	1.620E-05	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01
J= 1	1.695E-04	5.509E-06	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01

	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
J= 4	0.000E-01	0.000E-01								
J= 3	0.000E-01	0.000E-01								
J= 2	0.000E-01	0.000E-01								
J= 1	0.000E-01	0.000E-01								

	I=21	I=22

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

	M1= 1
J= 4	1.318E+03
J= 3	1.195E+03
J= 2	9.883E-02
J= 1	4.000E+02

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

	M1= 1
J= 4	3.594E+02
J= 3	3.155E+02
J= 2	1.939E+02
J= 1	2.106E+02

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

J= 4 -1.368E+02
J= 3 -1.458E+02
J= 2 -1.027E+02
J= 1 -2.091E+02

M1= 1

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

J= 4 1.183E+03
J= 3 1.215E+03
J= 2 7.820E+02
J= 1 7.820E+02

M3= 1

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

J= 4 2.545E+02
J= 3 2.750E+02
J= 2 3.325E-01
J= 1 5.109E-01

M3= 1

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

J= 4 -1.044E+02
J= 3 -1.104E+02
J= 2 -1.204E+01
J= 1 -2.989E-01

M3= 1

THE DISTRIBUTION OF TW in K AFTER 100 ITERATIONS

M4= 1	9.639E+02	1.168E+03	1.314E+03	1.383E+03	1.210E+03	1.160E+03	1.262E+03	1.470E+03	1.454E+03	1.390E+03
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	1.333E+03	1.272E+03	1.197E+03	1.179E+03	1.115E+03	1.042E+03	9.710E+02	9.020E+02	7.426E+02	7.163E+02
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
M4= 1	7.067E+02	6.689E+02								
	I=21	I=22								

THE DISTRIBUTION OF QIN in kW/m**2 AFTER 100 ITERATIONS

M4= 1	1.782E+02	2.951E+02	3.560E+02	3.843E+02	2.832E+02	2.647E+02	2.944E+02	4.272E+02	4.246E+02	3.797E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	3.432E+02	3.074E+02	2.636E+02	2.546E+02	2.315E+02	1.990E+02	1.720E+02	1.437E+02	6.368E+01	4.869E+01
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
M4= 1	4.455E+01	2.300E+01								
	I=21	I=22								

THE DISTRIBUTION OF QW in kW/m**2 AFTER 100 ITERATIONS

M4= 1	-9.566E+01	-1.388E+02	-1.359E+02	-1.274E+02	-1.151E+02	-1.156E+02	-1.067E+02	-1.170E+02	-1.230E+02	-1.210E+02
	I= 1	I= 2	I= 3	I= 4	I= 5	I= 6	I= 7	I= 8	I= 9	I=10
M4= 1	-1.188E+02	-1.149E+02	-1.070E+02	-1.079E+02	-1.059E+02	-9.799E+01	-9.100E+01	-8.041E+01	-3.908E+01	-2.964E+01
	I=11	I=12	I=13	I=14	I=15	I=16	I=17	I=18	I=19	I=20
M4= 1	-2.616E+01	-1.256E+01								
	I=21	I=22								

iter. no.=100. act.err.= -0.1228 %. avg.err.= 1.9992 % 20 it.err.= -0.1818 % hb.err.= -0.0002 %

BALANCE OF TOTAL RADIATIVE EXCHANGE

NUMBER OF BEAMS = 367920

SUM OF EMITTED RADIATION (KW) :						
VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
3.025E+06	9.924E+04	2.911E+03	1.080E+04	2.509E+03	8.302E+04	3.125E+06

SUM OF ABSORBED RADIATION (KW) :						
VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
2.951E+06	1.739E+05	1.033E+04	0.000E+01	5.479E+03	1.581E+05	3.124E+06

SUM OF NET EMITTED RADIATION (KW) :						
VOLUME ZONES	WALL SECTIONS	M=1	M=2	M=3	M=4	TOTAL
7.465E+04	-7.465E+04	-7.418E+03	1.080E+04	-2.971E+03	-7.506E+04	6.172E-01

ERROR OF RADIATIVE ENERGY BALANCE = 1.975E-05 %

TOTAL HEAT BALANCE :
HEAT TO FURNACE WALLS IN KW :
RAD.= 92603.8 CONV.= 4485.6 SUM = 97089.4
HEAT TO FURNACE EXIT IN KW :
RAD.= 587.3 CONV.= 0.0 SUM = 587.3
HEAT TO FURNACE HOPPER IN KW :
RAD.= 2928.8 CONV.= 0.0 SUM = 2928.8

HEAT FLUXES TO ZONAL HEAT EXCHANGERS IN KW :

ZONE I	BY RADI.	BY CONV	SUM
19	6154.0	6874.9	13028.9
20	3334.6	4372.7	7707.3
21	3027.7	9128.2	12155.9
22	3120.3	9234.8	12355.1

CLOSURE OF TOTAL HEAT BALANCE :
HEAT FLUX FROM FLUE GAS : 145673.9 KW
HEAT FLUX TO HEAT SINKS : 145852.7 KW
DIFFERENCE : 178.8 KW
ACT. PERCENTAGE ERROR : -0.122759 %
AVG. PERCENTAGE ERRRR : 1.636214 %
AVG. ERROR OF LAST 20 IT. : -0.181827 %

I INDEX	X-CO-ORDINATE M	NET NORM. MASS FLUX -	MEAN TEMP. K	MEAN RES. TIME Sec	SUM OF RES. TIME Sec
1	1.513	0.0500	1403.98	4.6379	3.2760
2	3.480	0.2500	1591.38	0.3382	0.7879
3	4.803	0.5500	1679.90	0.3666	0.4355
4	6.541	0.8000	1695.00	0.2523	0.1261
5	8.037	0.9324	1599.04	0.1657	0.0829
6	9.291	0.8156	1529.11	0.1891	0.2603
7	10.545	1.0096	1714.76	0.1518	0.4308
8	12.207	1.0097	1768.38	0.2286	0.6210
9	13.778	1.0001	1777.34	0.1191	0.7948
10	15.365	1.0001	1782.29	0.2368	0.9728
11	16.844	1.0001	1743.31	0.3976	1.1400
12	18.329	1.0001	1702.47	0.2483	1.3129
13	20.445	1.0001	1698.45	0.2583	1.5662
14	23.114	1.0000	1627.68	0.2142	1.8025
15	25.525	1.0000	1599.47	0.1083	1.9637
16	27.800	1.0000	1559.48	0.2051	2.1204
17	30.749	1.0000	1519.29	0.2106	2.3283
18	33.699	1.0000	1479.42	0.2165	2.5418
19	36.152	1.0000	1378.55	0.1549	2.7275
20	38.110	1.0000	1302.70	0.1631	2.8865
21	40.293	1.0000	1194.95	0.2188	3.0775
22	42.684	1.0000	1093.47	0.2348	3.3043

MEAN GAS SPECIES CONCENTRATION ALONG FURNACE :

I	X-CO-ORD. M	CO2 VOL% WET	H2O VOL% WET	N2 VOL% WET	O2 VOL% WET	VOL VOL% WET	SO2 VOL% WET
1	1.513	13.8555	9.5112	73.4429	2.9353	0.0000	0.2550
2	3.480	13.7444	9.5020	73.4327	3.0589	0.0085	0.2536
3	4.803	13.5768	9.3959	73.3825	3.2901	0.1054	0.2492
4	6.541	12.8863	8.8101	73.2198	4.2136	0.6399	0.2303
5	8.037	11.2846	7.7659	72.9592	6.2561	1.5415	0.1927
6	9.291	11.4959	7.8666	72.9903	5.9917	1.4585	0.1971
7	10.545	12.2512	8.2189	72.9990	5.1399	1.1805	0.2104
8	12.207	13.0821	8.9194	73.1814	4.0431	0.5412	0.2328
9	13.778	13.4228	9.2261	73.2639	3.5839	0.2612	0.2424
10	15.365	13.6780	9.4454	73.3137	3.2526	0.0619	0.2492
11	16.844	13.7376	9.4806	73.3214	3.1810	0.0289	0.2505
12	18.329	13.8054	9.5097	73.3244	3.1065	0.0024	0.2516
13	20.445	13.8347	9.5119	73.3213	3.0797	0.0005	0.2519
14	23.114	13.8564	9.5125	73.3212	3.0578	0.0000	0.2521
15	25.525	13.8661	9.5125	73.3207	3.0486	0.0000	0.2522
16	27.800	13.8780	9.5125	73.3200	3.0373	0.0000	0.2523
17	30.749	13.8864	9.5125	73.3195	3.0293	0.0000	0.2523
18	33.699	13.8922	9.5125	73.3191	3.0239	0.0000	0.2524
19	36.152	13.8948	9.5125	73.3189	3.0214	0.0000	0.2524
20	38.110	13.8967	9.5125	73.3187	3.0196	0.0000	0.2524
21	40.293	13.8980	9.5125	73.3186	3.0185	0.0000	0.2524
22	42.684	13.8986	9.5125	73.3185	3.0179	0.0000	0.2524

OTHER MEAN QUANTITIES ALONG FURNACE :

I	X-CO-ORD. M	CARBON IN ASH %	TOT. FUEL HEAT REL. %	VOLATILE HEAT REL. %	SO2 REDUCTION %	CAO UTIL. %
1	1.513	3.4784	0.1153	0.0500	0.0000	0.0000
2	3.480	7.1355	0.7782	1.1200	0.0000	0.0000
3	4.803	10.1020	5.7516	9.7600	0.0000	0.0000
4	6.541	17.7943	17.6995	26.0200	0.0000	0.0000
5	8.037	35.4778	37.1585	38.9400	0.0000	0.0000
6	9.291	33.1263 -	57.9966	54.4800	0.0000	0.0000
7	10.545	22.9589	81.8683	71.4000	0.0000	0.0000
8	12.207	14.6017	92.7326	89.0500	0.0000	0.0000
9	13.778	11.0827	95.7621	94.6400	0.0000	0.0000
10	15.365	8.0080	98.1289	98.8200	0.0000	0.0000
11	16.844	6.8695	98.5688	99.4300	0.0000	0.0000
12	18.329	5.2585	99.0737	99.9400	0.0000	0.0000
13	20.445	4.2785	99.2798	99.9800	0.0000	0.0000
14	23.114	3.5091	99.4269	100.0000	0.0000	0.0000
15	25.525	3.1572	99.4830	100.0000	0.0000	0.0000
16	27.800	2.7217	99.5576	100.0000	0.0000	0.0000
17	30.749	2.4086	99.6111	100.0000	0.0000	0.0000
18	33.699	2.1945	99.6498	100.0000	0.0000	0.0000
19	36.152	2.0961	99.6662	100.0000	0.0000	0.0000
20	38.110	2.0247	99.6778	100.0000	0.0000	0.0000
21	40.293	1.9775	99.6858	100.0000	0.0000	0.0000
22	42.684	1.9543	99.6897	100.0000	0.0000	0.0000

Listing 6.5. Contents of file BOILER.DAT (Case 5).

```
0501100.0   100
        97089.43        0.00        0.00        0.00        0.00
            0.00        0.00        0.00        0.00        0.00
            0.00        0.00        0.00        0.00        0.00
            0.00        0.00        0.00    13616.18    7707.35
        12155.85    12388.11        0.00        0.00        0.00
            0.00        0.00        0.00        0.00        0.00
      1403.98 1591.38 1679.90 1695.00 1599.01
      1629.11 1714.76 1768.38 1777.34 1762.29
      1743.31 1702.27 1668.45 1627.68 1599.47
      1559.48 1519.29 1479.42 1378.55 1302.70
      1194.95 1093.47    0.00    0.00    0.00
         0.00    0.00    0.00    0.00    0.00
       0.1386  0.1374  0.1358  0.1289  0.1128
       0.1150  0.1225  0.1308  0.1342  0.1368
       0.1374  0.1381  0.1383  0.1386  0.1387
       0.1388  0.1389  0.1389  0.1389  0.1390
       0.1390  0.1390  0.0000  0.0000  0.0000
       0.0000  0.0000  0.0000  0.0000  0.0000
       0.0951  0.0950  0.0940  0.0881  0.0777
       0.0787  0.0822  0.0892  0.0923  0.0945
       0.0948  0.0951  0.0951  0.0951  0.0951
       0.0951  0.0951  0.0951  0.0951  0.0951
       0.0951  0.0951  0.0000  0.0000  0.0000
       0.0000  0.0000  0.0000  0.0000  0.0000
       0.7370  0.7369  0.7374  0.7409  0.7469
       0.7465  0.7439  0.7396  0.7377  0.7362
       0.7360  0.7356  0.7357  0.7357  0.7357
       0.7357  0.7357  0.7357  0.7357  0.7357
       0.7357  0.7357  1.0000  1.0000  1.0000
       1.0000  1.0000  1.0000  1.0000  1.0000
       0.0294  0.0336  0.0329  0.0421  0.0626
       0.0599  0.0514  0.0404  0.0358  0.0325
       0.0318  0.0311  0.0308  0.0306  0.0305
       0.0304  0.0303  0.0302  0.0302  0.0302
       0.0302  0.0302  0.0000  0.0000  0.0000
       0.0000  0.0000  0.0000  0.0000  0.0000
       0.0000  0.0156  0.7776  0.2067
        94.3622
        85.4743
         8.8879
       0.4189  0.3341  0.1375  0.1095
      24947.10
      27852.79
     232058.17
```