APPENDIX 6 : PROGRAM POETS LISTING

```
10!RE-STORE "POET:HP913X,703,0"
20    !POET : Program to calculate the maximum and daily refrigeration loads
30    !       for a constant volume flowrate air conditioning plant.
40    !     : Use is made of the data base generated by the Building
50    !       Program
60    !
70    ! Initialize machine display parameters
80    PRINTER IS 1
90    GINIT
100   OPTION BASE 1
110   GRAPHICS ON
120   GCLEAR
130   PRINT CHR$(12)
140   WINDOW 0,100,0,100
150   CLIP 15,85,35,100
160   FRAME
170   PRINT TABXY(20,2);CHR$(129);"   P S Y C H R O M E T R I C   P R O G R A M
  ";CHR$(128)
180   PRINT TABXY(20,6);"THIS PROGRAM CALCULATES THE PEAK AND OPERATING"
190   PRINT TABXY(20,8);"STATES OF A CONSTANT VOLUME AICONDITIONING"
200   PRINT TABXY(20,10);"PLANT."
210   OFF KEY
220   Code$=Jobnum$
230   DISP CHR$(130);"Enter the PROJECT NUMBER ... "&CHR$(128)&"(Or 'E' to exit)
";
240   INPUT Code$
250   IF Code$="E" OR Code$="e" THEN LOAD "MENU1:HP913X,703,0"
260   DISP CHR$(132);"Select output media ... ";
270   ON KEY 5 LABEL "PRINTER" GOTO 410
280   ON KEY 6 LABEL "SCREEN" GOTO 380
290   ON KEY 2 LABEL "" GOTO 270
300   ON KEY 3 LABEL "" GOTO 270
310   ON KEY 4 LABEL "" GOTO 270
320   ON KEY 0 LABEL "" GOTO 270
330   ON KEY 1 LABEL "" GOTO 270
340   ON KEY 7 LABEL "" GOTO 270
350   ON KEY 8 LABEL "" GOTO 270
360   ON KEY 9 LABEL "" GOTO 270
370   GOTO 270
380   Printers=1
390   OFF KEY
400   GOTO 430
410   Printers=701
420   OFF KEY
430   Jobnum$=Code$
440   ON ERROR GOTO 490
450   MASS STORAGE IS ":HP913X,703,1"
460   ASSIGN @Path1 TO Jobnum$
470   ASSIGN @Path2 TO Jobnum$&"_PSY"
480   GOTO 540
```

```
490   DISP TAB(15);CHR$(129);" ERROR ";CHR$(128);" : JOB FILE DOES NOT EXIST IN
DRIVE 1 "
500   BEEP 100,1
510   WAIT 1
520   GOTO 230
530   !
540 ! DIMENSION VARIABLES
550   OFF ERROR
560   REAL Sens(12,24),Latent(12,24)
570   DIM T1$(12)[6],T2$(12)[6],N$(12)[6],R(12,11),Ahps(10,12,24),Ahpl(10,12,24)
,Wsen(12)
580   DIM W(12,22),Nf(13),N(12),Nam$[75],A$[10],L$[6],Rf$[10],Zone$(12)[24]
590   DIM In(12,12),Month$(12)[20],Facade$(12,12)[24],Sensload(12,12,24),Latload
(12,12,24)
600   DIM T3(12,12),T4(12,12),T5(12,12),Infil(12),Twboa(12),Rhoa(12)
610   DIM Voa(24),Loc$[75]
620   DIM Vec(10),T1(12),T2(12),Toa(12,24),Hoa(12,24),Woa(12,24),Svoa(12,24)
630   DIM Tret(10),Rhret(10),Rh(12,12)
640   DIM Startp(10),Endp(10),Bypass(10)
650   DIM Pdiff(10),Vahp(12,10,24),Refrig(12,10,24),Tondb(12,10,24),Tonwb(12,10,
24),Toffdb(12,10,24),Toffwb(12,10,24)
660   DIM Fsup(10),Fret(10),Month(10,12),Mn(10)
670   DIM P_hour(10),P_month(10),Wint(10)
680   DIM Plant_ps(10),Plant_pl(10),Mon$(12)[16],Trans(13)
690   DIM Plant(12),Des_vol(10),Des_adpt(10),Des_wadp(10),Des_hadp(10),Des_toffd
b(10),Des_hoff(10),Des_cap(10),Des_won(10)
700   DIM Des_ton(10),Des_svsup(10),Des_woff(10),Des_toffwb(10)
710   COM Jobnum$[40]
720   !
730   ! Retreive building solar loads from data base
740   GOSUB Retreive
750   CALL Plant(Noplant,Vec(*),Startp(*),Endp(*),Pdiff(*))
760   CALL Bypass(Noplant,Vec(*),Bypass(*))
770   CALL Vent(Noplant,Plant(*),Nz,In(*),R(*),Vec(*),Voa(*))
780   CALL Panduct(Noplant,Vec(*),Fsup(*),Fret(*))
790   !
800   !
810   !********************** PLANT LOOP **********************************
820   PRINTER IS Printers
830   GCLEAR
840   GOSUB Heading                                          ! PRINT HEADING
850   PRINT
860   PRINT TAB(5);"AIRCONDITIONING PLANT INPUT PARAMETERS"
870   PRINT TAB(5);"--------------------------------------"
880   FOR P=1 TO Noplant
890     PRINT
900     PRINT TAB(5);"AIR HANDLING PLANT No:";Vec(P)
910     PRINT TAB(5);"-------------------------"
920     PRINT USING 980;Startp(P),Endp(P)
930     PRINT USING 990;Fsup(P),Fret(P)
940     PRINT USING 1000;Pdiff(P),Bypass(P)
950     PRINT USING 1010;Voa(P)
960   NEXT P
```

```
970  !
980   IMAGE 5X,"PLANT START TIME     : ",2D.DD,"   GMT",3X,"PLANT ENDING TIME
  : ",2D.DD,"   GMT"
990   IMAGE 5X,"SUPPLY FAN GAIN      : ",2D.DD," deg C",3X,"RETURN FAN & DUCT GAI
N : ",2D.DD," deg C"
1000  IMAGE 5X,"MAX COIL TEMP DIFF   : ",2D.DD," deg C",3X,"COIL BYPASS FACTOR
  : ",2D.DD
1010  IMAGE 5X,"OUTDOOR VENTILATION : ",2D.DD," m^3/S"
1020 !
1030 !
1040  FOR P=1 TO Noplant
1050    PRINT CHR$(12)
1060    PRINT USING 1700
1070    PRINT TAB(5);"DETERMINING PLANTS PEAK DESIGN PARAMETERS"
1080    PRINT TAB(5);"PLANT No :";Vec(P)
1090    PRINT USING 1700
1100    PRINT USING 1660
1110    PRINT USING 1670
1120    PRINT USING 1680
1130    PRINT USING 1690
1140    PRINT USING 1700
1150    Des_cap(P)=0
1160    FOR L=1 TO Nm
1170      PRINT
1180      PRINT TAB(5);Mon$(N(L))
1190      PRINT TAB(5);"----------"
1200      FOR J=Startp(P) TO Endp(P)
1210        Startp1=Startp(P)
1220        Endp1=Endp(P)
1230        GOSUB Conplant
1240!       Determining design parameters corresponding to maximum refrigeration
 cap
1250        IF Des_cap(P)<Rload THEN
1260          Des_cap(P)=Rload
1270          Des_vol(P)=Q
1280          Des_mass=Msup
1290          Des_tondb(P)=Q
1300          Des_tonwb=Y
1310          Des_toffdb(P)=Rr
1320          Des_toffwb(P)=S
1330          Des_mon$=Mon$(N(L))
1340          Des_time=J
1350          Des_reheat=Rheat
1360          Des_tsup=Tsup
1370          Des_tret=Ret
1380          Des_adpt(P)=Adpt
1390          Des_wadp(P)=Wadp
1400          Des_hadp(P)=Hadp
1410          Des_hoff(P)=Hoff
1420          Des_won(P)=Won
1430          Des_woff(P)=Woff
1440          Des_svsup(P)=Svsup
1450        END IF
```

```
970  !
980   IMAGE 5X,"PLANT START TIME     : ",2D.DD,"   GMT",3X,"PLANT ENDING TIME
  : ",2D.DD,"   GMT"
990   IMAGE 5X,"SUPPLY FAN GAIN      : ",2D.DD," deg C",3X,"RETURN FAN & DUCT GAI
N : ",2D.DD," deg C"
1000  IMAGE 5X,"MAX COIL TEMP DIFF   : ",2D.DD," deg C",3X,"COIL BYPASS FACTOR
  : ",2D.DD
1010  IMAGE 5X,"OUTDOOR VENTILATION : ",2D.DD," m^3/S"
1020 !
1030 !
1040  FOR P=1 TO Noplant
1050    PRINT CHR$(12)
1060    PRINT USING 1700
1070    PRINT TAB(5);"DETERMINING PLANTS PEAK DESIGN PARAMETERS"
1080    PRINT TAB(5);"PLANT No :";Vec(P)
1090    PRINT USING 1700
1100    PRINT USING 1660
1110    PRINT USING 1670
1120    PRINT USING 1680
1130    PRINT USING 1690
1140    PRINT USING 1700
1150    Des_cap(P)=0
1160    FOR L=1 TO Nm
1170      PRINT
1180      PRINT TAB(5);Mon$(N(L))
1190      PRINT TAB(5);"----------"
1200      FOR J=Startp(P) TO Endp(P)
1210        Startp1=Startp(P)
1220        Endp1=Endp(P)
1230        GOSUB Conplant
1240!       Determining design parameters corresponding to maximum refrigeration
 cap
1250        IF Des_cap(P)<Rload THEN
1260          Des_cap(P)=Rload
1270          Des_vol(P)=Q
1280          Des_mass=Msup
1290          Des_tondb(P)=Q
1300          Des_tonwb=Y
1310          Des_toffdb(P)=Rr
1320          Des_toffwb(P)=S
1330          Des_mon$=Mon$(N(L))
1340          Des_time=J
1350          Des_reheat=Rheat
1360          Des_tsup=Tsup
1370          Des_tret=Ret
1380          Des_adpt(P)=Adpt
1390          Des_wadp(P)=Wadp
1400          Des_hadp(P)=Hadp
1410          Des_hoff(P)=Hoff
1420          Des_won(P)=Won
1430          Des_woff(P)=Woff
1440          Des_svsup(P)=Svsup
1450        END IF
```

```
1460        GOSUB Print
1470      NEXT J
1480    NEXT L
1490    PRINT CHR$(12)
1500    PRINT USING 1700
1510    PRINT TAB(5);"COOLING PARAMETERS FOR PLANT ";Vec(P)
1520    PRINT TAB(5);"-------------------------------"
1530    PRINT USING "5X,25A,15A";"DESIGN MONTH                : ";Des_mon$
1540    PRINT USING "5X,25A,2D.DD,4A";"DESIGN TIME                 : ",Des_time," G
MT"
1550    PRINT USING "5X,25A,2D.DDD,6A,2A,2D.DDD,6A";"FAN AIR VOLUME              :
",Des_vol(P)," m^3/s"," (";Des_mass," kg/s)"
1560    PRINT USING "5X,25A,2D.D,2A";"FAN SUPPLY TEMPERATURE    : ";Des_tsup," C"
1570    PRINT USING "5X,25A,2D.D,2A";"FAN RETURN TEMPERATURE    : ";Des_tret," C"
1580    PRINT USING "5X,25A,2D.D,2A";"APPARATUS DEW POINT TEMP  : ";Des_adpt(P),"
 C"
1590    PRINT USING "5X,25A,2D.D,6A,2D.D,6A";"COIL ON TEMPERATURES      : ",Des_t
ondb(P)," db C/",Des_tonwb," wb C"
1600    PRINT USING "5X,25A,2D.D,6A,2D.D,6A";"COIL OFF TEMPERATURES     : ";Des_t
offdb(P),"db C/",Des_toffwb(P),"wb C"
1610    PRINT USING "5X,25A,3D.D,6A,3D.D,7A";"REFRIGERATION CAPACITY    : ",Des_c
ap(P)," kW  (",Des_cap(P)*.2844;" tons)"
1620  ! PRINT USING "5X,25A,3D.D,3A,";"REHEAT CAPACITY              : ",Des_reheat,"
 kW"
1630    PRINT USING 1700
1640  NEXT P
1650  !
1660  IMAGE 5X,"  AHP    SEN    LAT  FRIG PREHEAT  REHEAT   TEMP ON   TEMP OFF    T
EMP  SUPPLY SUPPLY       ENTH    ENTH    ENTH     ROOM HUMID"
1670  IMAGE 5X," TIME  LOAD  LOAD  LOAD    LOAD    LOAD      COIL       COIL
OUT  VOLUME   MASS       COIL     RET     OUT   RETURN  LOAD"
1680  IMAGE 5X,"                                                (db/wb)    (db/wb)  DO
ORS    FLOW   FLOW   (on/off)     AIR   DOORS    STATE"
1690  IMAGE 5X,"(GMT)  (kW)  (kW)  (kW)    (kW)    (kW)   (deg C)    (deg c)(deg
 C) (m^3/S) (kg/S)    (kJ/kg) (kJ/kg) (kJ/kg)    (C/%)  (kW)"
1700  IMAGE 4X,"-------------------------------------------------------------------
-------------------------------------------------------------"
1710  !
1720  !START PARTIAL LOAD CALCULATION
1730  FOR P=1 TO Noplant
1740    PRINT CHR$(12)
1750    PRINT USING 1700
1760    PRINT TAB(5);"PLANTS PARTIAL LOAD PERFORMANCE"
1770    PRINT TAB(5);"PLANT No : ";Vec(P)
1780    PRINT USING 1700
1790    PRINT USING 1660
1800    PRINT USING 1670
1810    PRINT USING 1680
1820    PRINT USING 1690
1830    PRINT USING 1700
1840    Startpl=Startp(P)
1850    Endpl=Endp(P)
1860    Preheat=0
1870    Reheat=0
1880    Huload=0
1890    FOR L=1 TO Nm
1900      Tot_sen=0
1910      Tot_lat=0
1920      Tot_frig=0
```

```
1930        Tot_pheat=0
1940        Tot_rheat=0
1950        PRINT TAB(5);Mon$(N(L))
1960        PRINT TAB(5);"----------"
1970        !
1980        CALL Oatemp(L,Startpl,Endpl,T1(L),T2(L),Twboa(L),Patm,Toa(*),Hoa(*),Wo
a(*),Svoa(*))
1990        CALL Return(Noplant,Nz,Vec(*),Plant(*),Rh(*),T3(*),L,Tret(*),Rhret(*))
2000        CALL Prop(Patm,Tret(P),Rhret(P),Wret,Hret,Svret)
2010        Des_trm=Tret(P)
2020        FOR J=Startp(P) TO Endp(P)
2030          Trans(1)=Ahps(P,L,J)
2040          Trans(2)=Ahpl(P,L,J)
2050          Trans(3)=Toa(L,J)
2060          Trans(4)=Hoa(L,J)
2070          Trans(5)=Woa(L,J)
2080          Trans(6)=Voa(P)/Svoa(L,J)
2090          Trans(7)=Tret(P)
2100          Trans(8)=Wret
2110          Trans(9)=Svret
2120          Trans(10)=Rhret(P)
2130          Trans(11)=Des_trm
2140          Trans(12)=Fsup(P)
2150          Trans(13)=Fret(P)
2160          Lm=Des_woff(P)
2170          Ln=Des_toffwb(P)
2180          Lo=Des_toffdb(P)
2190          Lq=Des_cap(P)
2200          Lr=Des_won(P)
2210          Ls=Des_tondb(P)
2220          Lt=Des_svsup(P)
2230          O=Des_vol(P)
2240          CALL Cv_pload(Trans(*),Lm,Ln,Lq,Lo,Ls,Lt,O,Patm,Rload,Q,Y,Rr,S,Hon,H
off,Msup,Rheat,Pheat,Hload)
2250          Toffwb(L,P,J)=S
2260          Toffdb(L,P,J)=Rr
2270          Tonwb(L,P,J)=Y
2280          Tondb(L,P,J)=Q
2290          Refrig(L,P,J)=Rload
2300          Vahp(L,P,J)=O
2310          Jj=Trans(10)*100
2320          G=Trans(7)
2330          Trans(7)=Tret(P)
2340          Trans(10)=Rhret(P)
2350          IF Preheat<Pheat THEN Preheat=Pheat
2360          IF Reheat<Rheat THEN Reheat=Rheat
2370          IF Huload<Hload THEN Huload=Hload
2380          Tot_sen=Tot_sen+Trans(1)
2390          Tot_lat=Tot_lat+Trans(2)
2400          Tot_frig=Tot_frig+Rload
2410          Tot_pheat=Tot_pheat+Pheat
```

```
2420        Tot_rheat=Tot_rheat+Rheat
2430        GOSUB Print
2440      NEXT J
2450      PRINT USING 1700
2460      PRINT USING "4X,6A,1X,3D.D,1X,3D.D,1X,3D.D,3X,3D.D,2X,3D.D,2X,4A";"TOT
ALS",Tot_sen,Tot_lat,Tot_frig,Tot_pheat,Tot_rheat,"kW-h"
2470      PRINT USING 1700
2480      PRINT
2490    NEXT L
2500    PRINT CHR$(12)
2510    PRINT TAB(5);"HEATING PARAMETERS FOR PLANT ";Vec(P)
2520    PRINT TAB(5);"-------------------------------"
2530    PRINT USING "5X,25A,2D.D,3A";"MAXIMUM REHEAT LOAD      : ";Reheat," kW"
2540    PRINT USING "5X,25A,2D.D,3A";"MAXIMUM PREHEAT LOAD     : ";Preheat," kW"
2550    PRINT USING "5X,25A,2D.D,3A";"MAXIMUM HUMIDIFIER LOAD  : ";Huload," kW"
2560  NEXT P
2570  !
2571  LOAD "MENU1:HP913X,703,0"
2580  STOP
2590  !
2600  !
2610  ! ********************** CONSTANT VOLUME PLANT ************************
2620 Conplant:!This subroutine determines the plant psychrometric states for
2630  !       for the peak yearly sensible load condition.
2640  !       PARAMETERS ARE :
2650  !            Sensload   plant peak sensible load
2660  !            Latload    corresponding plant latent load
2670  !            Voa        outdoor air supply volume flow rate
2680  !            Tret       plant return air temperature
2690  !            Wret       plant return moisture content
2700  !            Svret      plant return specific volume
2710  !            Rhret      plant return relative humidity
2720  !            Pdiff      cooler coil temp diff limit
2730  !            Bypass     cooler coil by-pass factor
2740  !            Hret       plant return entalpy
2750  !            Toffwb     off coil wet-bulb temp
2760  !            Toffdb     off coil dry-bulb temp
2770  !            Tonwb      on coil wet-bulb temp
2780  !            Tondb      on coil dry-bulb temp
2790  !            Refrig     plant refrigeration load
2800  !            Vahp       plant supply air volume
2810  !            L          month loop variable
2820  !            startpl    plant start operating hour
2830  !            Endpl      plant ending operating hour
2840  !            T1         outdoor air maximum dry-bulb temperature
2850  !            T2         outdoor air minimum dry-bulb temperature
2860  !            Twboa      outdoor air maximum wet-bulb temperature
2870  !            Patm       atmospheric pressure
2880  !            Toa        interpolated hourly outdoor air temperature
```

```
2890  !            Hoa         hourly outdoor air enthalpy
2900  !            Woa         hourly outdoor air moisture content
2910  !            Svoa        hourly outdoor air specific volume
2920  !
2930  CALL Oatemp(L,Startpl,Endpl,T1(L),T2(L),Twboa(L),Patm,Toa(*),Hoa(*),Woa(*)
,Svoa(*))
2940  CALL Return(Noplant,Nz,Vec(*),Plant(*),Rh(*),T3(*),L,Tret(*),Rhret(*))
2950  CALL Prop(Patm,Tret(P),Rhret(P),Wret,Hret,Svret)
2960  Trans(1)=Ahps(P,L,J)
2970  Trans(2)=Ahpl(P,L,J)
2980  Trans(3)=Toa(L,J)
2990  Trans(4)=Hoa(L,J)
3000  Trans(5)=Woa(L,J)
3010  Trans(6)=Voa(P)/Svoa(L,J)
3020  Trans(7)=Tret(P)
3030  Trans(8)=Wret
3040  Trans(9)=Svret
3050  Trans(10)=Rhret(P)
3060  Trans(12)=Fsup(P)
3070  Trans(13)=Fret(P)
3080  L1=Pdiff(P)
3090  M=Bypass(P)
3100  Z=Hret
3110  CALL Consvol(Trans(*),Z,L1,M,Patm,O,Msup,Rload,Q,Y,Rr,S,Hon,Hoff,Tsup,Ret,
Adpt,Wadp,Hadp,Won,Woff,Svsup)
3120  Toffwb(L,P,J)=S
3130  G=Trans(7)
3140  Jj=Trans(10)*100
3150  Trans(7)=Tret(P)
3160  Trans(10)=Rhret(P)
3170  Toffdb(L,P,J)=Rr
3180  Tonwb(L,P,J)=Y
3190  Tondb(L,P,J)=Q
3200  Refrig(L,P,J)=Rload
3210  Vahp(L,P,J)=O
3220  RETURN
3230  !
3240  ! ********** Retreive DATA FROM FILE ************************************
3250 Retreive:MASS STORAGE IS ":HP913X,703,1"
3260  PRINTER IS 1
3270  GCLEAR
3280  PRINT CHR$(12)
3290  DISP CHR$(128);"                                  Retreiving building data
                     ";CHR$(129)
3300  ASSIGN @Path1 TO Jobnum$
3310  ASSIGN @Path2 TO Jobnum$&"_PSY"
3320  ENTER @Path1,1;Nm,Nz,A,L,Rf,Nf(*),N(*),Nam$,Loc$,Zone$(*),T1$(*),T2$(*),Tw
db,Twwb,Twboa(*),Infil(*),Rh(*)
3330  ENTER @Path1,3;T3(*)  !,T4(*),T5(*)
3340  ENTER @Path1,4;R(*),In(*),Plant(*)
3350  RESTORE 3390
```

```
2890  !             Hoa         hourly outdoor air enthalpy
2900  !             Woa         hourly outdoor air moisture content
2910  !             Svoa        hourly outdoor air specific volume
2920  !
2930  CALL Oatemp(L,Startpl,Endpl,T1(L),T2(L),Twboa(L),Patm,Toa(*),Hoa(*),Woa(*)
,Svoa(*))
2940  CALL Return(Noplant,Nz,Vec(*),Plant(*),Rh(*),T3(*),L,Tret(*),Rhret(*))
2950  CALL Prop(Patm,Tret(P),Rhret(P),Wret,Hret,Svret)
2960  Trans(1)=Ahps(P,L,J)
2970  Trans(2)=Ahpl(P,L,J)
2980  Trans(3)=Toa(L,J)
2990  Trans(4)=Hoa(L,J)
3000  Trans(5)=Woa(L,J)
3010  Trans(6)=Voa(P)/Svoa(L,J)
3020  Trans(7)=Tret(P)
3030  Trans(8)=Wret
3040  Trans(9)=Svret
3050  Trans(10)=Rhret(P)
3060  Trans(12)=Fsup(P)
3070  Trans(13)=Fret(P)
3080  L1=Pdiff(P)
3090  M=Bypass(P)
3100  Z=Hret
3110  CALL Consvol(Trans(*),Z,L1,M,Patm,Q,Msup,Rload,Q,Y,Rr,S,Hon,Hoff,Tsup,Ret,
Adpt,Wadp,Hadp,Won,Woff,Svsup)
3120  Toffwb(L,P,J)=S
3130  G=Trans(7)
3140  Jj=Trans(10)*100
3150  Trans(7)=Tret(P)
3160  Trans(10)=Rhret(P)
3170  Toffdb(L,P,J)=Rr
3180  Tonwb(L,P,J)=Y
3190  Tondb(L,P,J)=Q
3200  Refrig(L,P,J)=Rload
3210  Vahp(L,P,J)=0
3220  RETURN
3230  !
3240  ! ********** Retreive DATA FROM FILE ************************************
3250 Retreive:MASS STORAGE IS ":HP913X,703,1"
3260  PRINTER IS 1
3270  GCLEAR
3280  PRINT CHR$(12)
3290  DISP CHR$(128);"                                Retreiving building data
                    ";CHR$(128)
3300  ASSIGN @Path1 TO Jobnum$
3310  ASSIGN @Path2 TO Jobnum$&"_PSY"
3320  ENTER @Path1,1;Nm,Nz,A,L,Rf,Nf(*),N(*),Nam$,Lcc$,Zone$(*),T1$(*),T2$(*),Tw
db,Twwb,Twboa(*),Infil(*),Rh(*)
3330  ENTER @Path1,3;T3(*)  !,T4(*),T5(*)
3340  ENTER @Path1,4;R(*),In(*),Plant(*)
3350  RESTORE 3390
```

```
3360  FOR L=1 TO 12
3370    READ Mon$(L)
3380  NEXT L
3390  DATA JANUARY,FEBRUARY,MARCH,APRIL,MAY,JUNE,JULY,AUGUST,SEPTEMBER,OCTOBER,N
OVEMBER,DECEMBER
3400  Patm=1013.25*EXP(-1.2*9.81*A/(101325))
3410  FOR L=1 TO Nm
3420    T1(L)=VAL(T1$(L))
3430    T2(L)=VAL(T2$(L))
3440    ENTER @Path2,L;Sens(*),Latent(*)
3450    FOR K=1 TO Nz
3460      FOR J=1 TO 24
3470        Sensload(L,K,J)=Sens(K,J)
3480        Latload(L,K,J)=Latent(K,J)
3490      NEXT J
3500    NEXT K
3510  NEXT L
3520  ASSIGN @Path1 TO *
3530  ASSIGN @Path2 TO *
3540  !
3550  !GROUP LOADS INTO THE AHP FOR EACH MONTH
3560  FOR K=1 TO Nz
3570    Vec(K)=Plant(K)
3580  NEXT K
3590  FOR J=1 TO Nz-1
3600    FOR K=J+1 TO Nz
3610      IF Plant(J)=Plant(K) THEN Vec(K)=0
3620    NEXT K
3630  NEXT J
3640  Noplant=0
3650  FOR K=1 TO Nz
3660    IF Vec(K)<>0 THEN Noplant=Noplant+1
3670  NEXT K
3680  FOR K=1 TO Nz-1
3690    IF Vec(K)=0 THEN
3700      FOR J=K TO Nz-1
3710        Vec(J)=Vec(K+1)
3720        PRINT "VEC(J)";Vec(J)
3730      NEXT J
3740      Vec(Nz)=0
3750    END IF
3760  NEXT K
3770  !
3780  FOR P=1 TO Noplant
3790    FOR L=1 TO Nm
3800      FOR J=1 TO 24
3810        Ahps(P,L,J)=0
3820        Ahpl(P,L,J)=0
```

```
3830      NEXT J
3840      FOR K=1 TO Nz
3850        IF Vec(P)=Plant(K) THEN
3860          FOR J=1 TO 24
3870            Ahps(P,L,J)=Ahps(P,L,J)+Sensload(L,K,J)
3880            Ahpl(P,L,J)=Ahpl(P,L,J)+Latload(L,K,J)
3890          NEXT J
3900        END IF
3910      NEXT K
3920    NEXT L
3930  NEXT P
3940  RETURN
3950  !
3960  !
3970  !********************* SUBROUTINE TO PRINT PAGE HEADINGS ****************
3980 Heading:  !
3990  PRINT TAB(5);"************   PSYCHROMETRIC PLANT PROGRAM  BY  A da Silva
 ************"
4000  PRINT
4010  PRINT TAB(5);"A J  DA  SILVA                    PROJECT NAME :";Nam$
4020  PRINT TAB(5);"PROJECT REPORT                    PROJECT LOC. :";Loc$
4030  PRINT TAB(5);"WITWATERSRAND UNIVERSITY          PROJECT NO.  :";Jobnum$
4040  PRINT
4050  PRINT TAB(5);"***************** CONSTANT MASS FLOWRATE AIR HANDLING PLANT
**************"
4060  RETURN
4070  !
4080 Print:  !
4090  A=Trans(1)
4100  B=Trans(2)
4110  D=Trans(4)
4120  PRINT USING 4140;J,A,B,Rload,Pheat,Rheat,Tondb(L,P,J),Tonwb(L,P,J),Toffdb(
L,P,J),Toffwb(L,P,J),Toa(L,J),Vahp(L,P,J),Msup,Hon,Hoff,Z,D,G,Jj,Hload
4130  RETURN
4140  IMAGE 5X,2D.DD,3(X,3D.D),2(3X,3D.D),1X,2D.D,"/",2D.D,2X,2D.D,"/",2D.D,3X,2
D.D,2X,2D.DDD,1X,2D.DDD,2X,2D.D,"/",2D.D,2(4X,2D.D),2X,2D.D,"/",2D,1X,3D.D
4150  END
4160  !
4170  !^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
4180  !
4190  SUB Vent(Noplant,Plant(*),Nz,In(*),R(*),Vec(*),Voa(*))
4200  !       Subroutine to determine the fresh air ventilation requirements
4210  !       for each air handling plant
4220  !       PARAMETERS ARE :
4230  !           Pvent     ventilation rate per person
4240  !           Avent     ventilation rate per square metre of floor area
4250  !           Noplant   number of air-handling plants
4260  !           Plant     plant varaible
4270  !           Nopeople  total number of people per plant
4280  !           Farea     total floor area per plant
4290  !           Ventl     total ventilation rate based on person occupancy
```

```
3830      NEXT J
3840      FOR K=1 TO Nz
3850        IF Vec(P)=Plant(K) THEN
3860          FOR J=1 TO 24
3870            Ahps(P,L,J)=Ahps(P,L,J)+Sensload(L,K,J)
3880            Ahpl(P,L,J)=Ahpl(P,L,J)+Latload(L,K,J)
3890          NEXT J
3900        END IF
3910      NEXT K
3920    NEXT L
3930  NEXT P
3940  RETURN
3950  !
3960  !
3970  !******************** SUBROUTINE TO PRINT PAGE HEADINGS ****************
3980 Heading:  !
3990  PRINT TAB(5);"*************   PSYCHROMETRIC PLANT PROGRAM  BY  A da Silva
 *************"
4000  PRINT
4010  PRINT TAB(5);"A J  DA  SILVA                    PROJECT NAME :";Nam$
4020  PRINT TAB(5);"PROJECT REPORT                    PROJECT LOC. :";Loc$
4030  PRINT TAB(5);"WITWATERSRAND UNIVERSITY          PROJECT NO.  :";Jobnum$
4040  PRINT
4050  PRINT TAB(5);"***************** CONSTANT MASS FLOWRATE AIR HANDLING PLANT
**************"
4060  RETURN
4070  !
4080 Print: !
4090  A=Trans(1)
4100  B=Trans(2)
4110  D=Trans(4)
4120  PRINT USING 4140:J,A,B,Rload,Pheat,Rheat,Tondb(L,P,J),Tonwb(L,P,J),Toffdb(
L,P,J),Toffwb(L,P,J),Toa(L,J),Vahp(L,P,J),Msup,Hon,Hoff,Z,D,G,Jj,Hload
4130  RETURN
4140  IMAGE 5X,2D.DD,3(X,3D.D),2(3X,3D.D),1X,2D.D,"/",2D.D,2X,2D.D,"/",2D.D,3X,2
D.D,2X,2D.DDD,1X,2D.DDD,2X,2D.D,"/",2D.D,2(4X,2D.D),2X,2D.D,"/",2D,1X,3D.D
4150  END
4160  !
4170  !^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
4180  !
4190  SUB Vent(Noplant,Plant(*),Nz,In(*),R(*),Vec(*),Voa(*))
4200  !       Subroutine to determine the fresh air ventilation requirements
4210  !       for each air handling plant
4220  !       PARAMETERS ARE :
4230  !           Pvent     ventilation rate per person
4240  !           Avent     ventilation rate per square metre of floor area
4250  !           Noplant   number of air-handling plants
4260  !           Plant     plant varaible
4270  !           Nopeople  total number of people per plant
4280  !           Farea     total floor area per plant
4290  !           Ventl     total ventilation rate based on person occupancy
```

```
4300  !           Vent2     total ventilation rate based on floor area
4310  !           Voa       selected ventilation rate per plant
4320  !
4330    DISP
4340    DISP "Do you wish to alter the ventilation rates ";
4350    INPUT Y$
4360    IF Y$="Y" THEN
4370      INPUT "Select code : 1-alter vent. rates, 2-alter vent. percentage",Co
de
4380      IF Code=2 THEN
4390        INPUT "Enter fresh air percentage ... (fraction, eg  0.5)",Percent
4400      ELSE
4410        INPUT "Enter ventilation rate per person",Pvent
4420        INPUT "Enter ventilation rate per m^2 of floor area",Avent
4430      END IF
4440    END IF
4450    !     Add total floor area & total number of people for each plant.
4460    FOR P=1 TO Noplant
4470      Nopeople=0
4480      Farea=0
4490      FOR K=1 TO Nz
4500        IF Vec(P)=Plant(K) THEN
4510          Nopeople=Nopeople+In(K,1)
4520          Farea=Farea+R(K,9)
4530        END IF
4540      NEXT K
4550    !     Determine ventilation quantities.
4560      IF Y$<>"Y" THEN
4570        Vent1=.012*Nopeople
4580        Vent2=.00166*Farea
4590      ELSE
4600        Vent1=Pvent*Nopeople
4610        Vent2=Avent*Farea
4620      END IF
4630    !     Select greater ventilation quantity.
4640      IF Vent1>Vent2 THEN
4650        Voa(P)=Vent1
4660      ELSE
4670        Voa(P)=Vent2
4680      END IF
4690    NEXT P
4700  SUBEND
4710  !
4720  !
4730  !
4740  SUB Oatemp(L,Start,End,Toamax,Toamin,Toaswb,Patm,Toa(*),Hoa(*),Woa(*),Svoa
(*))
4750  !       Subroutine to determine the outdoor psychrometric states
4760  !       PARAMETERS ARE :
```

```
4770  !           L          site latitude
4780  !           Start      plant starting operating hour
4790  !           End        plant ending operating hour
4800  !           Toamax     maximum outdoor dry-bulb temperature
4810  !           Toamin     minimum outdoor dry-bulb temperature
4820  !           Toawb      maximum outdoor wet-bulb temperature
4830  !           Patm       atmospheric pressure
4840  !           Toa        interpolated hourly outdoor dry-bulb temperature
4850  !           Hoa        hourly outdoor dry-bulb enthalpy
4860  !           Woa        hourly outdoor dry-bulb moisture content
4870  !           Svoa       hourly outdoor dry-bulb specific volume
4880  !           Rh         relative humidity
4890  !
4900    Cf=ATN(1)*4/180
4910  !       Calculate relative humidity.
4920    CALL Humid(Patm,Toamax,Toaswb,Rh)
4930    Toam=(Toamax+Toamin)/2
4940    Toam2=(Toamax-Toamin)/2
4950  !       Interpolate outdoor dry-bulb temperature using sine curve
4960  !       interpolating curve, peaking at 15h00.
4970    FOR J=Start TO End
4980      Toa(L,J)=Toam-Toam2*SIN(15*(J+3)*Cf)
4990      Toa_j=Toa(L,J)
5000      CALL Prop(Patm,Toa_j,Rh,Woa_j,Hoa_j,Svoa_j)
5010      Woa(L,J)=Woa_j
5020      Hoa(L,J)=Hoa_j
5030      Svoa(L,J)=Svoa_j
5040    NEXT J
5050  SUBEND
5060  !
5070  !
5080  !
5090  SUB Humid(Patm,Tdb,Twb,Rh)
5100  !       Subroutine to calculate the relative humidity.
5110  !       PARAMETERS ARE :
5120  !           Tdb        dry-bulb temperture
5130  !           Twb        wet-bulb temperture
5140  !           Rh         relative humidity
5150  !           Pws        vapour pressure at wet-bulb temperature
5160  !           Pss        vapour pressure at dry-bulb temperature
5170  !           Ps         partial  pressure of dry air
5180  !
5190    T1=Tdb+273.15
5200    T2=Twb+273.15
5210    Pws=(10^(30.59051-8.2*LOG(T1)/LOG(10)+.0024804*T1-3142.31/T1))*10
5220    Pss=(10^(30.59051-8.2*LOG(T2)/LOG(10)+.0024804*T2-3142.31/T2))*10
5230    IF Twb>=0 THEN E=.000666
```

Author Da Silva A J
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