COMPUTER PROGRAM

FOR ANALYSIS OF ENERGY UTILIZATION IN POSTAL FACILITIES

POST OFFICE DEPARTMENT ★ UNITED STATES OF AMERICA ★

BY

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GATX

COMPUTER PROGRAM FOR ANALYSIS OF ENERGY UTILIZATION IN POSTAL FACILITIES

VOLUME III
OPERATION MANUAL

Project No. 67138

CONSTRUCTION RESEARCH DIVISION

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PREFACE

This Operation Manual was prepared by the General American Research Division (GARD) of the General American Transportation Corporation as a part of the Post Office Department Contract No. RE 49-67 for the development of a "Computer Program for Analysis of Energy Utilization in Postal Facilities". The project was monitored by Mr. James M. Anders of the POD's Bureau of Research and Engineering. The GARD team that worked on the project was headed by Mr. Metin Lokmanhekim, Manager of Thermal Systems and Computer Applications. Other GARD personnel who contributed to the project includes: Messrs. James Y. Shih, Robert H. Henninger, Charles C. Groth, Stephen J. Lis, Ajit L. Kapil, and Fred H. Bloedow.

We take this opportunity to acknowledge the guidance and inspiration received from our Project Monitor, Mr. James M. Anders. We were also very fortunate that the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE) became interested in this problem concurrent with our contract. Our appreciation is extended to the members of their Task Group on Energy Requirements for Heating and Cooling, whose technical efforts contributed to this project, with special thanks to:

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Dr. D. G. Stephenson	National Research Council of Canada
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SECTION 1

INTRODUCTION

The Computer Program for Analysis of Energy Utilization in Postal facilities is written in Fortran Language. During the development of the program, the CDC 3600, CDC 6600, Univac 1108, IBM 1130 and IBM 360 computer systems were utilized. In the final versions of the program, which are the IBM 360/65 and CDC 6600 versions, compatibility of the programs with each other is maintained as much as possible.

SECTION 2

CORE REQUIREMENTS AND THE DIMENSION STATEMENTS

2.1 Load Calculation Sub-program

Certain variables in the Load Calculation Sub-program have only one value. For instance, FNS, the number of spaces, is described by one number. The direct normal radiation, RDN, also take on one value, which varies with time, but may be described at any given time by one number. Such variables, called scalars, require only one location in the computer memory. This location is assigned automatically the first time scalar variable is used.

Other variables, however, possess a number of values. For example, AW, the area of a window, has as many values as there are windows in the building. The number of vertices of a shade polygon added to a window, FNVAW, has a different value, for each of the added shade polygons, for each window. Such multi-valued variables are called arrays or matrices. They each require more than one location in the computer's memory.

The computer does not assign such blocks of memory automatically. The number of values (the dimensions) of a matrix variable must be assigned by the use of special statements, called dimension statements.

The core requirements for running the program depend upon the numbers entered into the dimension statements. For the most efficient utilization of a computer system, the user of this program should arrange dimensions according to his applications.

NOTE: Since the computer does not accept "zero" for a dimension value, if a dimensioned variable is equal to zero, always use "ONE" for dimension value.

The dimension statements which require change are given in Table 1.

TABLE 1

DIMENSION STATEMENTS WHICH REQUIRE CHANGE

MAIN ROUTINE

```
 DIMENSION                                                                      LOAD 32
*     QU( A ),   SUMA( A ),   SUMB( A ),   SUMC( A ),  HRLDL( A ),              LOAD 33
* RMRIS1( A ), RMRISC( A ), RATRIS( A ), RMRPS1( A ), RMRPSC( A ),              LOAD 34
* RATRPS( A ),  RMRX1( A ),  RMRXC( A ),  RATRX( A ),  RMRG1( A ),              LOAD 35
*  RMRGC( A ),  RATRG( A ),     H1( A ),     H2( A ),     H3( A ),              LOAD 36
*    WOF( A ),  NIHTS( A ),     NQ( A ),     ND( A ),    NUW( A ),              LOAD 37
*    NUF( A ),     NW( A ),  PLITE( A ),  IVENL( A ),  NFOLK( A ),              LOAD 38
*  HASSL( A ),  TSPAC( A ),    QEQ( A ),   IWOO( A ),  QIHTS( A ),              LOAD 39
*    VOL( A ), SSHMAX( A ), ISSHMA( A ), SSHMIN( A ), ISSHMI( A ),              LOAD 40
* STCMAX( A ), ISTCMA( A ), STCMIN( A ), ISTCMI( A ), INFCOD( A ),              LOAD 41
                                                          CODING
              FLORA(A)   ,  TROOM(A)  ,   QUW(A)     ,  QUF(A)
 DIMENSION                                                                      LOAD 42
*     AD( B ),    WTD( B ),    WAD( B ),    NVD( B ),    NXD( B ),              LOAD 43
*    NYD( B ),    NDD( B ),    NAD( B ),  SHADD( B ,24),ROGD( B ),              LOAD 44
*    ISD( B ),    ABD( B ),    IRF( B ),   SUMN( B,3),   SUMR( B,3),            LOAD 45
*     QN( B,3),    QR( B,3), QSTORD( B ),  ICALD( B )                           LOAD 46
 DIMENSION                                                                      LOAD 47
*     AQ( C ),    WTQ( C ),    WAQ( C ),    NVQ( C ),    NXQ( C ),              LOAD 48
*    NYQ( C ),    NDQ( C ),    NAQ( C ),  SHADQ( C ,24),ROGQ( C ),              LOAD 49
*    ISQ( C ),    ABQ( C ),     UQ( C ), QSTORQ( C ),  ICALQ( C ),              LOAD 50
 DIMENSION                                                                      LOAD 51
*     AW( D ),    WTW( D ),    WAW( D ),    NVW( D ),    NXW( D ),              LOAD 52
*    NYW( D ),    NDW( D ),    NAW( D ),  SHADW( D ,24),ROGW( D ),              LOAD 53
*    NPW( D ), IGLASW( D ),   FFWS( D ),   FFWG( D ),  SHACO( D ),              LOAD 54
* QSTORC( D ), QSTORR( D ),  ICALW( D )                                         LOAD 55
 DIMENSION                                                                      LOAD 56
*  RATOS( E ),     IR( E ),    SXN( E ),    SXR( E ),    SYN( E ),              LOAD 57
*    SYR( E )                                                                   LOAD 58
 DIMENSION                                                                      LOAD 59
*  FIHTS( F ),  ISPC1( F ),  ISPC2( F ),    FUW( G ),    FUF( H ),              LOAD 60
 DIMENSION                                                                      LOAD 61
*     XV( I ),     YV( I ),     ZV( I ),     XX( J ),     YY( J ),              LOAD 62
*     ZZ( J ),  ILETE( K )                                                      LOAD 63
 DIMENSION                                                                      LOAD 64
* IDD( B, L ), NVAD( B, M ), XVD( B, N ), XAD( B, M, O ),                       LOAD 65
*  TD( B,500,3), PAD( B, M ), YVD( B, N ), YAD( B, M, O ),                      LOAD 66
*FIDD(    L ),                ZVD( B, N ), ZAD( B, M, O ),                      LOAD 67
 DIMENSION                                                                      LOAD 68
* IDQ( C, P ), NVAQ( C, Q ), XVQ( C, R ), XAQ( C, Q, S ),                       LOAD 69
*              PAQ( C, Q ), YVQ( C, R ), YAQ( C, Q, S ),                        LOAD 70
*FIDQ(    P ),                ZVQ( C, R ), ZAQ( C, Q, S ),                      LOAD 71
 DIMENSION                                                                      LOAD 72
* IDW( D, T ), NVAW( D, U ), XVW( D, V ), XAW( D, U, W ),                       LOAD 73
*              PAW( D, U ), YVW( D, V ), YAW( D, U, W ),                        LOAD 74
*FIDW(    T ),                ZVW( D, V ), ZAW( D, U, W ),                      LOAD 75
```

TABLE 1 (CONT'D)

```
                                 1/100          1/100
 DIMENSION RX( E, 50 ),RY( E, 50 )                                     LOAD 76
 DIMENSION                                                             LOAD 77
* NVSP( X ),  PSP( X ),  XSP( X, Y ),  YSP( X, Y ),  ZSP( X, Y )       LOAD 78
 DIMENSION                                                             LOAD 79
*  NVA( Z ),    PA( Z ),    XA( Z,AA ),    YA( Z,AA ),    ZA( Z,AA )   LOAD 80
 DIMENSION                                                             LOAD 81
*IHTS( A, AB ),IQ( A,AC ),ID( A,AD ),IUW( A,AE ),IUF( A,AF ),          LOAD 82
*  IW( A, AG )                                                         LOAD 83
 DIMENSION FFIHTS( AB ),FIQ( AC ),FID( AD ),FIUW( AE ),FIUF( AF ),     LOAD 84
*FIW( AG )                                                             LOAD 85
 DIMENSION MLOOKD(AH),ILOOKD(AH),JLOOKD(AH)                            LOAD 86
 DIMENSION MLOOKQ(AI),ILOOKQ(AI),JLOOKQ(AI)                            LOAD 87
 DIMENSION MLOOKW(AJ),ILOOKW(AJ),JLOOKW(AJ)                            LOAD 88
```

APOL SUBROUTINE

```
 DIMENSION X( J ), Y( J ), Z( J )                                      APOL  2
```

SEARCH SUBROUTINE

```
Maximum of AH, AI, AJ

 DIMENSION NA(  ), NB(  ), NC(  )                                      SEARC  2
```

SHADOW SUBROUTINE

```
 DIMENSION                                                             SHADO  4
* XVERTF( I ), YVERTF( I ), ZVERTF( I ), IDLETE( K ), ANGLE(AK ),      SHADO  5
*     X1(AK ),      Y1(AK ),      Z1(AK )                              SHADO  6
 DIMENSION                                                             SHADO  7
* NVERT( X ), PFRM( X ), XVERT( X, Y ), YVERT( X, Y ),                 SHADO  8
*                        ZVERT( X, Y )                                 SHADO  9
 DIMENSION                                                             SHADO 10
*NVERTA( Z ), PERMA( Z ), XVERTA( Z,AA ), YVERTA( Z,AA ),              SHADO 11
*                         ZVERTA( Z,AA ),                              SHADO 12
 DIMENSION                                                             SHADO 13
*NVERTS( AL ), PFRMS( AL ), XVERTS( AL, AM ), YVERTS( AL, AM ),        SHADO 14
*                           ZVERTS( AL, AM )                           SHADO 15
 DIMENSION ISHADE( AN, AO )                                            SHADO 16
```

MATCON SUBROUTINE

```
 DIMENSION ISHADE( AN, AO )                                            MATCO  2
```

TABMAK SUBROUTINE

```
 DIMENSION STCHAX( A ),ISTCMA( A ),STCMIN( A ),ISTCMI( A )             TABMA  3
 DIMENSION SSHMAX( A ),ISSHMA( A ),SSHMIN( A ),ISSHMI( A )             TABMA  4
```

GLOSSARY

A : Number of spaces in building

B : Number of distinct delayed heat transfer surfaces in building

C : Number of distinct quick heat transfer surfaces in building

D : Number of distinct windows in building

E : Number of types of delayed heat transfer surfaces

F : Number of inside heat transfer surfaces in building

G : Number of underground walls in building

H : Number of underground floors in building

I : Maximum number of sides of any exterior heat transfer surface

J : Maximum number of sides of any exterior heat transfer or shading surfaces ($J \geq I$)

K : Maximum number of shading surfaces deleted from any exterior heat transfer surface

L : Maximum number of shading surfaces deleted from a delayed heat transfer surface ($L \leq K$)

M : Maximum number of shading surfaces added to a delayed heat transfer surface

N : Maximum number of sides of a delayed heat transfer surface

O : Maximum number of sides of a shading surface added to a delayed heat transfer surface

P : Maximum number of shading surfaces deleted from a quick heat transfer surface ($P \leq K$)

Q : Maximum number of shading surfaces added to a quick heat transfer surface

R : Maximum number of sides of a quick heat transfer surface

S : Maximum number of sides of a shading surface added to a quick heat transfer surface

T : Maximum number of shading surfaces deleted from a window ($T \leq K$)

GLOSSARY (CONT'D)

U		: Maximum number of shading surfaces added to a window
V	WINDOW	: Maximum number of sides of a window
W		: Maximum number of sides of a shading surface added to a window
X	COMMON	: Number of common shading surfaces
Y		: Maximum number of sides of a common shading surface
Z		: Maximum number of shading surfaces added to any exterior heat transfer surface
AA	ADDED	: Maximum number of sides of a shading surface added to any exterior surface
AB		: Maximum number of inside heat transfer surfaces in a space
AC		: Maximum number of quick heat transfer surfaces in a space
AD		: Maximum number of delayed heat transfer surfaces in a space 5
AE	SPACES	: Maximum number of underground walls in a space 3
AF		: Maximum number of underground floors in a space 1
AG		: Maximum number of windows in a space
AH		: Number of pictures desired of shadows on delayed heat transfer surfaces
AI		: Number of pictures desired of shadows on quick heat transfer surfaces
AJ		: Number of pictures desired of shaded areas of windows
AK	SHADING	: Must exceed number of sides of any exterior heat transfer surface or any shading surface (for example: AK = J + 3)
AL		: Maximum value of (number of commons - number of deletions + number of additions) for any exterior heat transfer surface

GLOSSARY (CONT'D)

AM : Maximum number of sides of any shading surface, common or added +3

AN, AO : Fineness of division of exterior heat transfer surface for shadow analysis (corresponds to x and y divisions of a surface)

2.1.1 Roof Selection Supporting Program

The core requirement of the Roof Selection Supporting program is as follows:

CDC 6600	60 K (octal)
IBM 360/65	200 K

2.1.2 Wall Selection Supporting Program

The core requirement of the Wall Selection Supporting program is as follows:

CDC 6600	75 K (octal)
IBM 360/65	200 K

2.2 Punch Sub-program

Dimension statements within the Punch Sub-program limit the number of space plot card output decks to 50. Core requirements for this program are indicated below:

CDC 6600	:	60 K (octal)
IBM 360/65	:	100 K

2.3 Editing Sub-program

Dimension statements within the Editing Sub-program enable a building of 200 spaces to be editted into at most, 50 fan systems, each with no more than 10 zones and no more than 20 spaces being combined into any zone. Core requirements are shown below:

CDC 6600	:	120 K (octal)
IBM 360/65	:	150 K

2.4 Thermal Loads Plot Sub-program

Any number of plots can be made during one run. This sub-program is for use only on the IBM 1130 computer system and requires 4 K of core for executing.

2.5 Systems Simulation Sub-program

Dimension statements within the System Simulation Sub-program allow a building to be analyzed that has no more than 50 fan systems, each with 10 zones. As many as 20 building equipment combinations can be run at one time. Core requirements for this sub-program are:

CDC 6600	:	60 K (octal)
IBM 360/65	:	200 K

2.6 Economics Analysis Sub-program

Any number of building equipment combinations can be analyzed by the Economics Analysis Sub-program at one time. Core requirements for this sub-program are:

CDC 6600	:	60 K (octal)
IBM 360/65	:	100 K

2.7 Packaged Systems Simulation Sub-program

The Packaged Systems Simulation Sub-program can handle a building as large as 30 spaces. Core requirements for this sub-program are:

CDC 6600	:	60 K (octal)
IBM 360/65	:	200 K

SECTION 3

CDC 6600, IBM 360/65, AND IBM 1130
COMPUTER SYSTEMS OPERATION CONTROL CARDS

Within this section, the control cards required for each sub-program are described for each type of computer system. The information to be punched on cards should always start in column 1, unless otherwise specified. The following symbols will be used to differentiate between the alpha "O" and numeric zero.

O : alpha O

Ø : numeric zero

3.1 CDC 6600 Computer System

3.1.1. Load Calculation Sub-program

1st Card

```
$SEQUENCE,XXXXX.
```

Note: XXXXX corresponds to the sequence number.

2nd Card

```
$JOB,XXXXX.
```

Note: XXXXXX corresponds to the account number.

3rd Card

```
$TAPE,SCR=ØØ,OLD=Ø1,NEW=Ø1.
```

4th Card

```
$LEVEL,X.
```

Note: X corresponds to the priority level and can have values of Ø to 6.

5th Card

```
LOADS,Ø1,XXXX,XXXXXX.
```

Note: XXXX is the maximum Central Processor time required in octal seconds. XXXXXX is the maximum core required in octal and cannot be greater than 3ØØØØØ.

6th Card

If the 136 characters per record version of SCOPE is to be used, the U.S. Weather Bureau tapes cannot be used directly by the CDC 6600, but must be copied onto another tape by means of the special program listed on page 10. The control card for this is then

REQUEST,TAPE1,HI. (XXXX/NORING) PLEASE RETURN FILE.

If the long record version of SCOPE is used, the U. S. Weather Bureau tape can be used directly by the CDC 6600. The control card for this then is

REQUEST,TAPE1,HI,X. (XXXX/NORING) PLEASE RETURN FILE.

Note: XXXX is the tape number which is assigned to the weather input tape.

7th Card

REQUEST,TAPE2,HI. (ASSIGN/RING) PLEASE PUT ON FILE.

The computer operator will assign this output tape a number. This tape number will be used later.

8th Card

RUN(S)

9th Card

LGO./RFL,LL=XXXXXX/

Note: XXXXXX corresponds to the printed output line limit in octal and cannot be greater than 7ØØØØØ.

10th Card

7
8 in column 1
9

```
$SEQUENCE,XXXXX.                                   Sequence No.
$JOB,XXXXX.                                        Account No.
$TAPE,SCR=00,OLD=01,NEW=01.
$LEVEL,X.                                          Priority No.
EXTBCD,1,300,50000.                                Input Tape No.
REQUEST,TAPE1,HI,X.   (3397/NORING)   PLEASE RETURN FILE.
REQUEST,TAPE2,HI.   (6915/RING)   PLEASE PUT ON FILE.
FTN(L)                                             Output Tape No.
SETCORE.
LGO.
                                                   7
      PROGRAM EXTBCD(INPUT,OUTPUT,TAPE1,TAPE2)     8   in column 1
      DIMENSION IBUF(128)                          9
      KOUNT = 0
   10 LEN = 128
      CALL LRD (5LTAPE1,IBUF(1),LEN,10B,ISTAT)
      IF (ISTAT.EQ. 400B) GO TO 200
      IF (ISTAT .EQ. 1100B) GO TO 100
      BUFFER OUT (2,0) (IBUF(1),IBUF(LEN))
      IF (UNIT(2)) 20,20,20
   20 KOUNT = KOUNT + 1
      GO TO 10
  100 ENDFILE 2
      PRINT 110, KOUNT
  110 FORMAT (1H1,I8,2X,*RECORDS COPIED*)
      GO TO 300
  200 ENDFILE 2
      PRINT 210,KOUNT
  210 FORMAT (1H1,10X,*PARITY ERROR ON INPUT AFTER*,I8,2X,*RECORDS*)
  300 CONTINUE
      REWIND 2
      BUFFER IN (2,0) (IBUF(1),IBUF(128))
      IF (UNIT(2)) 310,310,310
  310 LEN = LENGTH(2)
      PRINT 320,(IBUF(I),I=1,LEN)
  320 FORMAT (//(10X,8A10))                        7
      END                                          8   in column 1
                                                   9

                                                   6
                                                   7   in column 1
                                                   8
                                                   9
```

Figure 1 SPECIAL WEATHER CONVERSION PROGRAM

11th Card

```
+ + 029
ø ø
1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
```

in column 2

in column 1

12th Card

```
PROGRAM LOADS (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1,TAPE2)
```

seventh column

(MAIN PROGRAM AND SUBROUTINES SOURCE DECK)

13th Card

```
7
8   in column 1
9
```

(CARD INPUT DATA)

14th Card

```
6
7   in column 1
8
9
```

3.1.1.1. Roofs Selection Supporting Program

1st Card and 2nd Card

Same as for Load Calculation Sub-program.

3rd Card

```
$TAPE,SCR=øø,OLD=øø,NEW=øø.
```

4th Card

Same as for Load Calculation Sub-program.

5th Card

ROOF,Ø1,XXXX,XXXXXX.

See Load Calculation Sub-program, 5th Card, for explanation of XXXX and XXXXXX.

6th Card through 9th Card

Same as for Load Calculation Sub-program, 8th through 11th Card.

10th Card

```
PROGRAM SELECR (INPUT,OUTPUT,TAPES=INPUT,TAPE6=OUTPUT)
└─seventh column
```

(PROGRAM SOURCE DECKS)

11th Card

Same as Load Calculation Sub-program, 13th Card.

(CARD INPUT DATA)

12th Card

Same as for Load Calculation Sub-program, 14th Card.

3.1.1.2 Walls Selection Supporting Sub-program

1st Card and 2nd Card

Same as for Load Calculation Sub-program.

3rd Card

$TAPE,SCR=ØØ,OLD=ØØ,NEW=ØØ.

4th Card

Same as for Load Calculation Sub-program.

5th Card

WALL,Ø1,XXXX,XXXXXX.

See Load Calculation Sub-program, 5th Card, for explanation of XXXX and XXXXXX.

6th Card through 9th Card

Same as for Load Calculation Sub-program, 8th through 11th Card.

10th Card

```
PROGRAM SELECW (INPUT,OUTPUT,TAPES=INPUT,TAPE6=OUTPUT)
└──seventh column
```

(PROGRAM SOURCE DECK)

11th Card

Same as Load Calculation Sub-program, 13th Card.

(CARD INPUT DATA)

12th Card

Same as for Load Calculation Sub-program, 14th Card.

3.1.2 Punch Sub-program

1st Card

Same as for Load Calculation Sub-program.

2nd Card

Same as for Load Calculation Sub-program.

3rd Card

```
$TAPE,SCR=ØØ,OLD=Ø1,NEW=Ø1.
```

4th Card

Same as for Load Calculation Sub-program.

5th Card

```
PUNC,Ø1,XXXX,XXXXXX.
```

See Load Calculation Sub-program for explanation of XXXX and XXXXXX.

6th Card

REQUEST,TAPE1,HI. (XXXX/NORING) PLEASE RETURN FILE.

Note: XXXX is the number of the input tape and is the same as that assigned in Section 3.1.1., 7th Card.

7th Card

REQUEST,TAPE7,HI. (ASSIGN/RING) PLEASE PUT ON FILE.

The computer operator will assign this output tape a number. The engineer must then fill out a Project Control Sheet and instruct the computer center to reproduce the information on this tape onto cards.

8th Card through 11th Card

Same as for Load Calculation Sub-program.

12th Card

PROGRAM PUNC (INPUT,OUTPUT,TAPE6Ø=INPUT,TAPE1,TAPE7)

(PROGRAM SOURCE DECK)

13th Card

Same as for Load Calculation Sub-program.

(CARD INPUT DATA)

14th Card

Same as for Load Calculation Sub-program.

3.1.3 Editing Sub-program

1st Card and 2nd Card

Same as for Load Calculation Sub-program.

3rd Card

$TAPE,SCR=ØØ,OLD=Ø1,NEW=Ø1.

4th Card

Same as for Load Calculation Sub-program.

5th Card

EDIT,Ø1,XXXX,XXXXXX.

See Load Calculation Sub-program for explanation of XXXX and XXXXXX.

6th Card

REQUEST,TAPE1,HI. (XXXX/NORING) PLEASE RETURN FILE.

Note: XXXX is the number of the input tape and is the same as that assigned in Section 3.1.1., 7th Card.

7th Card

REQUEST,TAPE2,HI. (ASSIGN/RING) PLEASE PUT ON FILE.

Note: The computer operator will assign a number to this output tape.

8th Card through 11th Card

Same as for Load Calculation Sub-program.

12th Card

```
PROGRAM EDIT (INPUT,OUTPUT,TAPE6Ø=INPUT,
↑                      TAPE61=OUTPUT,TAPE1,TAPE2)
└──seventh column
```

(PROGRAM SOURCE DECK)

13th Card

Same as for Load Calculation Sub-program.

(CARD INPUT DATA)

14th Card

Same as for Load Calculation Sub-program.

3.1.4 Systems Simulation Sub-program

1st Card and 2nd Card

Same as for Load Calculation Sub-program.

3rd Card

$TAPE,SCR=ØØ,OLD=Ø1,NEW=ØØ.

4th Card

Same as for Load Calculation Sub-program.

5th Card

SYSIM,Ø1,XXXX,XXXXXX.

See Load Calculation Sub-program for explanation of XXXX and XXXXXX.

6th Card

REQUEST,TAPE1,HI.(XXXX/NORING) PLEASE RETURN FILE.

Note: XXXX is the number of the input tape and is the same as that assigned in Section 3.1.1., 7th Card.

7th Card through 10th Card

Same as for Load Calculation Sub-program, 8th through 11th Card.

11th Card

```
PROGRAM SYSIM (INPUT,OUTPUT,TAPE6Ø=INPUT,
                TAPE61=OUTPUT,TAPE1)
└seventh column
```

(MAIN PROGRAM AND SUBROUTINES SOURCE DECK)

12th Card

Same as for Load Calculation Sub-program, 13th Card.

(CARD INPUT DATA)

13th Card

Same as for Load Calculation Sub-program, 14th Card.

3.1.5 Economics Analysis Sub-program

1st and 2nd Card

Same as for Load Calculation Sub-program.

3rd Card

Same as for Load Calculation Sub-program, 4th Card.

4th Card

ECON,Ø1,XXXX,XXXXXX.

See Load Calculation Sub-program, 5th Card, for explanation of XXXX and XXXXXX.

5th Card through 8th Card

Same as for Load Calculation Sub-program, 8th through 11th Card.

9th Card

```
PROGRAM ECON (INPUT,OUTPUT,TAPE6Ø=INPUT,TAPE61=OUTPUT)
└─── seventh column
```

(PROGRAM SOURCE DECK)

10th Card

Same as for Load Calculation Sub-program, 13th Card.

(CARD INPUT DATA)

11th Card

Same as for Load Calculation Sub-program, 14th Card.

3.1.6 Packaged Systems Simulation Sub-program

1st Card through 4th Card

Same as for Systems Simulation Sub-program.

5th Card

PKGSY,Ø1,XXXX,XXXXXX.

See Load Calculation Sub-program for explanation of XXXX and XXXXXX.

6th Card through 10th Card

Same as for Systems Simulation Sub-program.

11th Card

```
PROGRAM PKGSY (INPUT,OUTPUT,TAPE6Ø=INPUT,
               TAPE61=OUTPUT,TAPE1)
└─── seventh column
```

(PROGRAM SOURCE DECK)

12th Card

Same as for Systems Simulation Sub-program.

(CARD INPUT DATA)

13th Card

Same as for Systems Simulation Sub-program.

3.2 IBM 360/65 Computer System

3.2.1 Load Calculation Sub-program

1st Card

```
//RTESTØØ1 JOB (ØØØØ,9531,XXX,XX,1)
          ,'LOADS',MSGLEVEL=1,CLASS=A,          X
                                                └ column 72
```

Note: XXX corresponds to the time limit in minutes.

XX corresponds to the printed line output in 1000's.

2nd Card

```
//             REGION=XXXK
               └ column 16
```

Note: XXX is the core size required.

3rd Card

```
//ST1  EXEC FORTGCLG
```

4th Card

```
//FORT.SYSIN  DD *
```

(SOURCE DECK OF Ø26/Ø29 CONVERSION PROGRAM)

5th Card

```
/*
```

6th Card

```
//GO.FTØ1FØØ1  DD UNIT=SYSDA,SPACE=(8Ø,(XXXX,1Ø)),
                    DISP=(NEW,PASS),      X
                                          └column 72
```

Note: XXXX is the number of cards in programs.

7th Card

```
//             DSN=++T1
               └── column 16
```

8th Card

```
//GO.SYSIN  DD  *
```

(MAIN PROGRAM AND SUBROUTINE SOURCE DECKS)

9th Card

```
/*
```

10th Card

```
//ST2  EXEC FORTGCLG,PARM.FORT='NAME=LOADS'
```

11th Card

```
//FORT.SYSIN  DD  DSN=++T1,DISP=(OLD,DELETE),UNIT=SYSDA
```

12th Card

```
//GO.FTØ1FØØ1  DD  UNIT=7TRACK,LABEL=(,NL,IN),DCB=
                 (RECFM=F,LRECL=496,          X
                                              └── column 72
```

13th Card

```
               ┌── column 16
//             BLKSIZE=496,DEN=1,TRTCH=ET),DISP=OLD,
                  VOL=SER=XXXXXX
```

Note: XXXXXX is the weather input tape number.

14th Card

```
//GO.FTØ2FØØ1  DD  UNIT=TAPE,VOL=SER=XXXXXX,
                   DSN=LOADS,                    X
                                                 └── column 72
```

Note: XXXXXX is the output tape number.

15th Card

```
               ┌── column 16
//             DCB=(RECFM=F,LRECL=132,BLKSIZE=132),
                DISP=(NEW,KEEP)
```

16th Card

```
//GO.SYSIN  DD  *
```

(CARD INPUT DATA)

17th Card

/*

3.2.1.1 Roof Selection Support Program

1st Card

```
//RTESTØØ2  JOB  (ØØØØ,9531,XXX,XX,1),'ROOFS',
                 MSGLEVEL=1,CLASS=A,            X
                                     column 72 ─┘
```

Note: See Load Calculation Sub-program, 1st Card for explanation of XXX and XX.

2nd Card

```
//            REGION=2ØØK
              └─ column 16
```

3rd Card and 4th Card

Same as for Load Calculation Sub-program.

(SOURCE DECK OF Ø26/Ø29 CONVERSION PROGRAM)

5th Card through 8th Card

Same as for Load Calculation Sub-program.

(MAIN PROGRAM AND SUBROUTINE SOURCE DECKS)

9th Card

Same as for Load Calculation Sub-program.

10th Card

```
//ST2  EXEC FORTGCLG,PARM.FORT='NAME=ROOFS'
```

11th Card

Same as for Load Calculation Sub-program.

12th Card

```
//GO.SYSIN  DD  *
```

(CARD INPUT DATA)

13th Card

/*

3.2.1.2 Wall Selection Support Program

1st Card

```
//RTESTØØ2 JOB (ØØØØ,9531,XXX,XX,1),'WALLS',MSGLEVEL=1,
                 CLASS=A,           X
                                    └──column 72
```

Note: See Load Calculation Sub-program, 1st Card, for explanation of XXX and XX.

2nd Card

```
//            REGION=2ØØK
              └── column 16
```

3rd Card and 4th Card

Same as for Load Calculation Sub-program.

(SOURCE DECK OF Ø26/Ø29 CONVERSION PROGRAM)

5th Card through 8th Card

Same as for Load Calculation Sub-program.

(MAIN PROGRAM AND SUBROUTINE SOURCE DECKS)

9th Card

Same as for Load Calculation Sub-program.

10th Card

```
//ST2  EXEC FORTGCLG,PARM.FORT='NAME=WALLS'
```

11th Card

Same as for Load Calculation Sub-program.

12th Card

```
//GO.SYSIN  DD  *
```

(CARD INPUT DATA)

13th Card

```
/*
```

3.2.2 Punch Sub-program

1st Card

```
//RTESTØ15 JOB (ØØØØ,9531,XXX,XX,1),'PUNC',MSGLEVEL=1,
             CLASS=A,REGION=1ØØK
```

Note: See Load Calculation Sub-program for explanation of XXX and XX.

2nd Card

```
//STEP1  EXEC  FORTGCLG
```

3rd Card

```
//FORT.SYSIN  DD  *
```

(PROGRAM SOURCE DECK)

4th Card

```
/*
```

5th Card

```
//GO.FTØ1FØØ1 DD UNIT=24ØØ,DISP=OLD,DCB=
         (RECFM=U,BLKSIZE=8Ø),            X
                                          └── column 72
```

6th Card

```
//              VOL=SER=XXXXXX,DSN=LOADS
                └── column 16
```

Note: XXXXXX is the input tape number.

7th Card

```
//GO.SYSIN  DD  *
```

(CARD INPUT DATA)

8th Card

```
/*
```

2nd Card and 3rd Card

Same as for Punch Sub-program.

(PROGRAM SOURCE DECK)

4th Card

```
/*
```

5th Card and 6th Card

Same as for Punch Sub-program.

7th Card

```
//GO.SYSIN  DD  *
```

(CARD INPUT DECK)

8th Card

```
/*
```

3.2.5 Economics Analysis Sub-program

1st Card

```
//RTESTØ12 JOB (ØØØØ,9531,XXX,XX,1),'ECONO',MSGLEVEL=1,
               CLASS=A,REGION=1ØØK
```

Note: See Load Calculation Sub-program for explanation of XXX and XX.

2nd Card and 3rd Card

Same as for Punch Sub-program

(PROGRAM SOURCE DECK)

4th Card

```
/*
```

5th Card

```
//GO.SYSIN  DD  *
```

(CARD INPUT DATA)

6th Card

```
/*
```

3.2.6 Packaged Systems Simulation Sub-program

1st Card

```
//RTESTØ12 JOB (ØØØØ,9531,XXX,XX,1),'PKGSY',MSGLEVEL=1,
                    CLASS=A,REGION=2ØØK
```

2nd Card and 3rd Card

Same as for Punch Sub-program.

(PROGRAM SOURCE DECK)

4th Card

```
/*
```

5th Card and 6th Card

Same as for Punch Sub-program.

7th Card

```
//GO.SYSIN  DD  *
```

(CARD INPUT DECK)

8th Card

```
/*
```

3.3 IBM 1130 Computer System Control Cards for Thermal Loads Plot Sub-program

1st Card

```
// JOB
```

2nd Card

```
// FOR
```

3rd Card

```
*ONE WORD INTEGERS
```

4th Card

```
*IOCS(CARD,1132PRINTER,DISK,TYPEWRITER,KEYBOARD,PLOTTER)
```

5th Card

*EXTENDED PRECISION

6th Card

*LIST ALL

(MAIN PROGRAM AND FILES 1, 2 AND 3 SOURCE DECK)

7th Card

// JOB

8th Card

// XEQ SJLLP   1

9th Card

*FILES(1,SJLY1),(2,SJLY2),(3,SJLY3)

(DATA DECK PLUS ONE BLANK CARD)