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SHARE PROGRAM LIBRARY SUBMITTAL FORM

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SPLA CONTROL NUMBER: 192

This form should be completed and submitted with the program package to the SHARE Program Library Agency at the address shown above. Standards and instructions for submitting programs are in the "SHARE Reference Manual".

- (1) Program Number (to be filled in by SPLA)..... 360D-23.0.004
- (2) System Type (machine)..... 360/370
- (3) Search Key..... Plant Layout, Office
Layout, Relationship
Charts
- (4) Programming Systems/Languages..... Fortran IV
- (5) Author's Name and Address..... S. M. Seehof
IBM Corporation
and
- (6) Direct Technical Inquiries to Name & Address (if different than Author) J. A. Tompkins
Box 5511
North Carolina State University
Raleigh, North Carolina 27607
- (7) Title of Program..... ALDEP: Automated Layout
Design Problem
- (8) Submitter's Installation Membership Code..... NCS
- (9) Submitter's Own Program Identification and Suffix(Optional).. ALDEP
- (10) Primary Subject Code..... 230
- (11) Minimum System Requirements OS/Fortran IV
- (12) New or Revision Code (if revision, show prior Program Number in Item 1) N
- (13) Year Completed..... 1968
- (14) Date of Submittal..... 4/15/76
- (15) Documentation (number of original pages submitted)..... 7
- (16) Abstract (should contain sufficient information for a reader to determine the value of the program). Listed on the reverse side of this form are subjects which may serve as a guide for a descriptive abstract.

SHARE PROGRAM LIBRARY SUBMITTAL FORM

Subject Guide:

- Purpose
- Programming Language used
- Version and modification level or release number
- Field of application
- Type of routine (main program, subroutine, etc.)
- Specific description of machine requirements

ABSTRACT
ALDEP (Automated Layout Design Program) is a computer program designed
to generate and evaluate layouts based upon the relationships among departments
within the layout. ALDEP constructs several layouts utilizing a random number
generator and a heuristic selection procedure. The layouts resulting from ALDEP
are evaluated and assigned a rating depending upon the adherence of the layout
to the originally input relationship chart. ALDEP is the only widely utilized
routine which allows the inclusion of more than single floor facilities. The
input into ALDEP is the departmental areas and relationships. ALDEP is written
in Fortran IV and contains approximately 700 cards. Storage of 200k is required
to implement ALDEP.
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(Please attach additional pages if necessary).....Total pages attached <u>0</u>

Permission to Publish

"I hereby give the SHARE Program Library Agency permission to reprint, re-produce, and distribute this program."

- (17) Signature of Submitter and Date James A. Tompkins 4/15/76
- (18) Signature of Installation Addressee W. R. Hamilton (NCS)

ALDEP USER'S GUIDE

ALDEP, an acronym representing Automated Layout Design Program, is a plant layout construction routine which consists of a selection procedure and a placement procedure. The selection procedure determines the order in which departments should enter the layout and the placement procedure determines the location within the layout where the department should be positioned. The basis for selection and placement is a relationship chart which indicates the desired closeness among the departments to be included with the layout. Detailed information on ALDEP may be obtained from either of the references stated at the end of this guide.

This guide is divided into three sections. The first section describes the input format, the second section lists the input for an example problem, and the last section lists and interprets ALDEP'S diagnostics.

Section 1: Input Format

<u>CARD</u>	<u>COLUMN</u>	<u>EXPLANATION</u>
1	Date Card 1-4	ARUN=A name indicating the particular job being run.
2	Parameter Card 1-4	NMOD=odd number to start random number generator. (Note-this number must be changed for succeeding runs of the same layout data.)
	5-6	NCOL(1)=column number to begin placement for first (top) floor. Usually begin in first column. This statement places the layout wherever you want it on the printout sheet. Starting in Col. 1 assures that the layout will not run out of room since the print-out starts left and moves right.
	7-8	NCOLW(1)=max. column width for sweep for first floor (Usually allow width of 2 col. assigned at a time) Do this for all floors.
	9-12	NALSQS(1)=squares available on first floor (sq.ft. on floor)...e.g. if the total area of the layout is 2160 sq. ft. and DSQ=4 (no. of sq. ft. in square), then 540 squares will be required. Therefore, NALSQS(1)=540.
	13-16	NWIDE(1)=width of first floor in squares. For example, from the previous example, if 540 squares were needed for the layout, then the building parameters might be 20 sqs. X 27 sqs. Therefore, NWIDE(1)=20.
	17-20	NDEEP(1)=depth of first floor in squares. From example above, if 540 squares were required and NWIDE(1)=20, then NDEEP <u>must</u> equal 27.

NOTE

NWIDE(X) times NDEEP(X)=NALSQS(X), X=floor level=1, 2, or 3. These parameters will give the shape of the building. If an area is to be restricted and it is desired to include this in the layout, then provisions must be made for the square feet and the number of squares that this area will consist of. These squares must be included in NALSQS. For example, suppose that 2000 square ft. were required for departments in a layout and our layout must be designed around the lobby which occupies 160 sq. ft. If each square was 4 sq. ft., then the lobby would require 40 squares and the departments would require 500 squares. The total squares would be 540 (500 + 40). Therefore, NALSQS(X)=540 for this example. The restricted area would be included in the printout under a dummy department number. In another example, if the total squares required for the departments were 530, with no restricted areas, and we wish to make this building layout 20 squares by 27 squares, a dummy department may be created consisting of 10 squares. This dummy department will be in the output layout. It would be disregarded when the layout is evaluated or rearranged by hand.

<u>CARD</u>	<u>COLUMN</u>	<u>EXPLANATION</u>
2	21-22	NCOL(2)=as defined before - 2 represents ground floor
	23-24	NCOLW(2)=as defined before
	25-28	NALSQS(2)=as defined before
	29-32	NWIDE(2)=as defined before
	33-36	NDEEP(2)=as defined before
	37-38	NCOL(3)=as defined before - 3 represents terrace level
	39-40	NCOLW(3)=as defined before
	41-44	NALSQS (3)=as defined before
	45-48	NWIDE(3)=as defined before
	49-52	NDEEP(3)=as defined before

NOTE

When a floor is not used NCOL(X)=01, X=1, 2, or 3, and all other values [NDEEP(X), NWIDE(X), NALSQS(X), NCOLW(X)] are 0. If ALDEP is being used for only one floor, then use ground floor (2nd floor).

2	53-57	DSQ=no. sq. ft. in a square
	58-61	RINC=rounding factor to determine squares required (.6 is commonly used)
	62-65	NTIMES=no. of layouts to be tried (20 is suggested maximum)
	66-69	NEVTST=minimum allowable score for acceptance of layout Use zero as the minimum allowable score on the first run For the second and succeeding runs, use the maximum layout score achieved on the preceding runs.
	70-72	MUST=minimum dept. preference (Typically, 64 or 16 is used)

3 Format Card
 1-8

FRMT(1)=width of first floor plus two, followed by I3
and enclosed in parenthesis (left oriented)...e.g. if
NWIDE(1)=20, then FRMT(1)=(22I3)

 9-16

FRMT(2)=as defined above for first floor. If NWIDE(2)=0,
then FRMT(2)=(2I3)

 17-24

FRMT(3)=as defined above

4 to Square
N+3 Footage Cards
 2-4

IDEPT(J)=dept. no. (3 digit integer)e.g. dept. 1 would be
111 and dept. 12 would be 122

 7-14

DSQFT(J)=area of dept. in square feet. (decimal in col. 14)
If Dept. 1 had 160 sq.ft., then the card would look like
this: 111 160.

There is only one card per department.

BLANK CARD

N+5 to Relationship
2N+4 Cards
 1-3

ITEMP=Dept. number (must be 3 digit integer and must
follow rules set above for IDEPT)

 4-66

IPREFR(I,J)=REL chart values of department with all
other departments. Use S for same department.

2N+5 Floor or Area
to ? Restriction
 Cards
 1

DESIG=A, if area on floor is to be assigned (i.e. for area
restrictions). DESIG=F if dept. is to assigned to a
specific floor.

 2-3

NC=card no. (more than one card may be required to
specify restricted area. See example below)

 4-7

KDEPT=dept. no. being assigned or dummy number used to
designate unusable area. For dummy area, use 88

<u>No.</u>	<u>Designates</u>
1	Dock
2	Elevator
3	Stairwell
4	Lobby
19	Asile

 8-9

NFLOR=floor to which area is being assigned

 10-12

NQSQS=no. of squares to be allotted to restricted areas

 13-14

KCOL(1)=column assigned

 15-16

KROW(1)=row assigned

 17-18

KCOL()=column assigned

 19-20

KROW()=row assigned

 . .

 . .

 . .

 69-70

KCOL()=column assigned

 71-72

KROW()=row assigned

Next Card 1

A--this card used to designate end since no value for KDEPT or value of 0 or negative ends data. This card is necessary whether you are restricting an area or not.

LAST CARD

BLANK CARD

EXAMPLE OF USE OF CARDS

Suppose there is a square area, 16 sqs. x 16 sqs. and it is desired to restrict an area of 36 sqs. in the lower right hand corner of the layout. The following data would accomplish this:

```
      :....
      : Indicates no. of squares
      :
A01008802036111312131313141315131613071408140914101411141214
A020088020001314141415141614071508150915101511151215131514151516150716
A03008802000081609161016111612161316141615161616
: : : :
: : : :
: : : : :....KROW(27)---Indicates row 16.....
: : : : : These 2 :
: : : : :.....KCOL(27)---Indicates column 08...: numbers :
: : : : : represent :
: : : : :.....NFLOR=2----Indicates 2nd floor : 1 square :
: : : : :
: : : : :.....NDEPT=88----Indicates dummy
: : : : : dept. no. used to restrict area
: :
: :
: :.....NC=3-----Indicates that last
: : card is third card.
: : NC=1--first card
: :
: :
: :.....DESIG=A----Indicates area on floor
: : is being assigned.
```

Section 2: Input for an Example Problem

Column 1

MEX1

093101 010201800018001001 040000060002000000001

(213) (2013) (213)

0111 0012000

0112 0008000

0113 0006000

0114 0012000

0115 0008000

0116 0012000

0117 0012000

111S

112ES

113OUS

114EUS

115OUIIS

116UIOUAS

117UUUUUES

A

Section 3: ALDEP Diagnostics

1. SET UP ERROR---SQ FOOTAGE CARDS NOT IN SEQUENCE

Either erroneous punched square footage cards or square footage cards no in sequence.

2. SET UP ERROR---SQ. FOOTAGE CARDS GREATER THAN 63 -

Exceeded maximum of 64 departments.

3. SEQUENCE ERROR---PREFERENCE CARDS NOT IN SAME SEQUENCE AS DEPARTMENT AREA SPECIFICATION CARDS -

Either erroneous punched preference cards or preference cards not in sequence.

4. LAYOUT ERROR -

Number of departments per floor greater than total number of departments to be assigned in the layout. This results from a program assignment error. Evaluate any preassignments made. If adjustments here are not sufficient to correct the run, try combining departments.

5. ASSIGNED DEPARTMENT XX DOES NOT APPEAR IN INVENTORY SUMMARY -

No square footage cards for department XX.

6. THIS CARD IS NOT AN A OR F ASSIGNMENT

Either wrong code punched in card or cards out of sequence. This message will be followed by a printout of the card.

REFERENCES

1. Seehof, S. M. and Evans, W. O., "Automated Layout Design Program," Journal of Industrial Engineering, December, 1967, pp. 690-695.
2. Tompkins, J. A. and Moore, J. M., Computer Aided Facilities Design: A User's Guide, Facilities Planning and Design Division, American Institute of Industrial Engineers, 25 Technology Park, Norcross, Georgia, 1976, Chapter 7.

MAGNETIC TAPE KEY

The tape volume contains two files and three tape marks (TM) as shown below. The DCB information is the same for all files:

DCB=(RECFM=FB,LRECL=80,BLKSIZE=1600)

File 1: ALDEP source program
EBCDIC
549 card images
28 blocks
TM

File 2: Sample input data
EBCDIC
11 card images
1 block
TM
TM