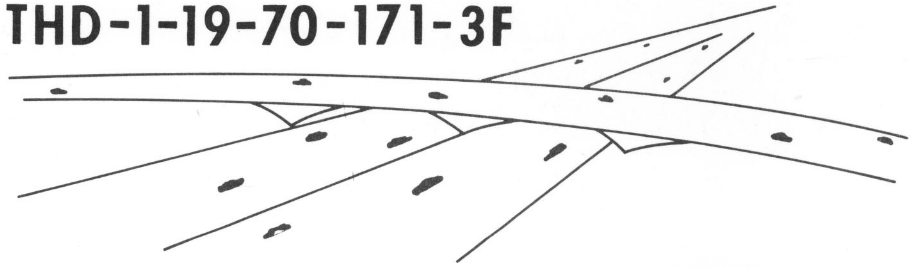
THD-1-19-70-171-3F



DEPARTMENTAL RESEARCH

Report Number : 171-3F

EXTENSIONS OF THE ROADWAY DESIGN SYSTEM - FINAL REPORT

TEXAS HIGHWAY DEPARTMENT

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16. Abstract

This report details the revisions and additions (extensions) made to the TIES Roadway Design System (RDS). These extensions represent Version 4.0 of the system and accommodate the development of (1) the comprehensive general bridge geometry processes as detailed in the report entitled "Extensions of the Roadway Design System - Bridge Design," and (2) preliminary location and design studies as outlined in the report entitled "Extensions of the Roadway Design System - Preliminary Location and Design Studies".

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EXTENSIONS OF THE TIES ROADWAY DESIGN SYSTEM -FINAL REPORT

by

Larry G. Walker
and
Shelton E. Mangum, Jr.

Research Report 171-3F
Extension of the TIES Road Design System

Research Study 1-19-70-171

Conducted by
Division of Automation
Texas Highway Department
In cooperation with the
U.S. Department of Transportation
Federal Highway Administration

May 1973

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Federal Highway Administration.

SUMMARY

The objective of this study was to make revisions and additions (extensions) to the TIES Roadway Design System (RDS) so that it could accommodate preliminary location and design studies and the development of a comprehensive general bridge geometry process that would handle a majority of possible bridge configurations. The extensions made are as follows:

1. The structure of the system was changed to accommodate the bridge routines. The details of the changes are given in the report entitled "Extensions of the Roadway Design System - Bridge Design".
2. Station accuracy was increased from 0.01 foot to 0.0001 foot to accommodate bridge design and analysis and geometric computations.
3. Nineteen additional horizontal alignments were added to the existing six design alignments and baseline.
4. Greater flexibility was obtained for preliminary route and location capabilities by streamlining the design data common areas, adding new data sorting procedures, increasing the amount of design data available and reducing the amount of core storage for this process.
5. Design profile grades can now be plotted.
6. A construction staking report was added which lists both slope staking and "bluetop" grades.
7. Two new options were added to the superelevation calculations for transitioning from normal crown to fully superelevated sections.
8. Revised output listings were created for earthwork design list and right of way and maximum slope intercept list.
9. The design data delete capability was added.

This report details the technical aspects of the changes.

IMPLEMENTATION

The overall objective of this study was directed toward extending the Roadway Design System (RDS) which is already in production and is being used on design projects. Extended capabilities for bridge design and for preliminary location and design have been added to the existing system. These capabilities will begin to be used in a production design environment immediately. The study has also developed recommendations for further extensions to the system.

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EXTENSIONS OF THE TIES ROADWAY DESIGN SYSTEM - FINAL REPORT

I. Introduction

The Roadway Design System (RDS) was developed as a tool for highway designers. More than 200 computer processes have been integrated into this system, which also incorporates automated photogrammetry and digital plotting processes. All of the processes work with an integrated data base which serves the function of data transfer between processes. RDS was developed by the Texas Highway Department's Division of Automation in cooperation with the Federal Highway Administration, using programming standards established for the TIES project.

The initial objective for RDS was the development of a comprehensive design tool having sufficient flexibility and precision to serve the highway designer in making final highway designs. The structure of the system features modularity and use of utility routines in concert with centralized data files which make possible the extension of the system considerably beyond its initial objective. Texas Highway Department HPR Research Project No. 171, titled "Extension of TIES Roadway Design System," was conceived to explore such extension into two of the possible areas: (1) bridge geometry and design computations and (2) preliminary route location studies.

In the area of bridge geometry and design, the objective was to demonstrate the use of system utilities, geometry, computation capabilities and the roadway shape storage features of RDS in generalized bridge geometry and design procedures. In the area of preliminary route location studies the objective was to define the modifications that would be necessary for adapting RDS to preliminary design and location studies and to demonstrate these possibilities as far as possible.

The broad overall scope of the Roadway Design System may be demonstrated by the list below. A designer using RDS may use any or all of these capabilities:

+ Reduce geodetic traverses and control mapping
+ Establish horizontal alignments
+ Control roadway section shapes
+ Compute, store, and plot geometric layouts
+ Reduce, store, and plot terrain data
+ Combine terrain and design data into completed design cross-sections
+ Generate a variety of plots.

The proposed extended capabilities in the area of bridge design would allow the designer to:

+ Define the plan view elements of structures
+ Compute the dimensional aspects of the bridge frame
+ Store the dimensional aspects for further processing
+ Plot the plan view of the structure along with any other features available through RDS plot capabilities
+ Design simple span prestressed concrete beams
+ Do a preliminary design on continuous beams or slabs
+ Compute the vertical and horizontal blocking data for continuous beams
+ Compute vertical clearance between structures and lower roadways
+ Plot surface contours on roadways to aid in design of ramp mergers.

The proposed extensions in the area of preliminary route location studies were more exploratory in nature. The activities proposed were to:

+ Identify the requirements for the terrain and design data storage. Consider automatic cross-sectioning capability
+ Study the applicability of existing RDS processes to the environment input statement

+ Adapt and demonstrate this applicability as time permits
+ Prepare a report including findings and recommendations for modifications needed.

There are two companion reports published with this report for both the bridge design capability and the preliminary route location capability, which are entitled "Extensions of the Roadway Design System- Bridge Design" and "Extensions of the Roadway Design System - Preliminary Location and Design Studies". The bridge report is organized as a user manual for the special set of bridge instructions used in executing various portions of the bridge design and analysis capability. The preliminary route location report is organized into several phases: the route selection definition process, the applicability of RDS to this process, and recommendations for modifications to RDS to further implement preliminary route location.

This report describes Version 4.0 of the Roadway Design System. It serves to supplement both the two companion reports mentioned above and Volumes 1 through 13 of the documentation for Version 3 of RDS. Familiarity with Version 3 and its pertinent documentation is assumed. This report enumerates the revisions and additions to the system included in Version 4.0 and gives revised descriptions of the system structure and data files.

Version 4.0 of the Roadway Design System was conceived and programmed as a result of the need to accommodate the bridge design and analysis capability and the preliminary route location capability into the system. It became apparent that Version 3 of RDS should be augmented in several respects for these capabilities. The existing Roadway Design System needed added versatility in the design data read and store portion and there were some capabilities that had to be added. Below is a list of the changes that needed to be made to Version 3 to accommodate the bridge and preliminary route location capabilities:

+ The structure of the system was changed to accommodate the bridge routines. This entailed rewriting several key driver routines to incorporate calls to the bridge monitoring process and including the bridge process in the RDS overlay structure. Another file was added to accommodate the bridge files. At this time the record length of all data records was changed to allow more efficient use of IBM 2314 disk packs. Good efficiency was also retained on the 2311 and 3330 disk packs with the new length record.
+ In the original concept of RDS, stations were kept to the nearest hundredth of a foot (0.01 ft). This was considered to be adequate for roadway design and quantity calculations. In bridge design and analysis and geometric computations more accuracy is required. RDS was updated to four decimal place accuracy (0.0001 ft). This entailed changing all the utilities within the system to double precision accuracy. Common blocks that were affected were also updated to reflect this double precision stationing.
+ The Roadway Design System originally allowed seven horizontal alignments (six design alignments and a baseline). Bridge requirements dictated the addition of nineteen horizontal alignments along with the associated design data (roadway templates, superelevation, widening, profile grade and equations). These nineteen alignments (designated H-Z) may be used to define any bridge alignment, ramp, etc. in three dimensions. These roadways may not be used in earthwork design; they may be used in any geometric calculations. Design profile plots may be obtained along any of these alignments. The design data read and store process and the geometric utilities were modified to accept these additional alignments. The project file was also modified to make room for the alignments.
+ The design data requirements for the preliminary route and location capability called for greater flexibility, more data storage and an update

capability. The design data read and store process was completely revised to accommodate these capabilities. The revisions to this process included streamlining the design data common areas, adding new data sorting procedures, increasing the amount of design data available and reducing the amount of core storage for this process. The update capability allows updating of design data by type for a particular roadway.

+ A program was developed to plot design profile grades so that bridge grades, ramp grades, etc. could be plotted in true relationship to the roadway that defines the element. This capability is used for both bridge and road design and was added to the original profile plot process. Both design and original plots may be combined in the same plotting field. Many of the utilities developed for the original profile plot process are used in plotting design profiles.

Version 4.0 of RDS includes several expanded roadway design capabilities that were not complete in Version 3.

+ A construction staking report which lists both slope staking and "bluetop" grades was programmed and added to RDS. This also entailed the addition of a hub elevation calculation process to the terrain edit and store process.
+ Two new options were added to the superelevation calculation portion of the earthwork design process. These two options deal with transitioning from normal crown to fully superelevated sections.
+ Several revised output listings including the earthwork design list and right-of-way and maximum slope intercept list were added to the system.

The input data forms used in RDS were modified to reflect the changes required for Version 4.0. One new form (Design Data Delete) was added. Version 4.0 of RDS is a more powerful and versatile tool for designers.

In every practical case, the input and output routines have been separated from computational routines in keeping with the specifications for the TIES project. This provides for ease of revision in the input/output modules without affecting the engineering applications. A combination of command structured input and fixed form input is used. Command structured input using a general format input form allows any sequence of commands. This type of input is used wherever feasible. In the case of repetitive input, fixed data forms have been used. Output has been tailored for 8-1/2" by 11" binders wherever possible.

This cooperative venture between the Federal Highway Administration and the Texas Highway Department is dedicated to exploiting not only the computer but any automated process that can be shown to produce a return on investment for the road designer. It is dedicated to the system concept of integrating the flow of data through the various processes with minimum manual intervention while exploiting program modularity, computer equipment independence, compatible high level languages, data structuring techniques, code efficiency, automated data acquisition, and input/output media.

II. System Structure

The system structure of Version 4.0 is not radically different than that documented in Volume I, Chapter III, of the documentation of the Roadway Design System. Only the differences from the documented system structure will be discussed here. The order is the same as found in Volume I.

Process and File Interaction

Version 4.0 of RDS consists of eleven major processes, the main driver, a secondary driver, a process management routine, and several regions of utilities. There are eleven data files associated with Version 4.0 of the system; six are disk files, five are tape files. Three tape files are off-line storage of the disk files. The interaction of the processes and files is illustrated in Figure 1 as well as the basic overlay structure of the system. Figure 2 which shows the basic flow of data within the system has also been revised to reflect changes required in Version 4.0. Figure 3 showing the flow of data through the bridge design process is included in this 4.0 documentation. Table I is also included and reflects Version 4.0 programming and common blocks.

System Management Procedures

Version 4.0 is resident on different libraries than Version 3.0 or 3.75. The differences are shown in this list:

Library	Function
D19.RDS4LIB	- contains all the FORTRAN source routines for RDS
D19.RDS4OBJ	- contains temporary object modules of RDS routines
D19.RDS4LINK	- contains latest working Version of RDS in object form
D19.USERLIB	- Same as Version 3.0
SYS1.FORTLIB	- Same as Version 3.0

The only difference in the procedures between Version 3.75 and Version 4.0 is the substitution of the correct library names and the name of the load module created. The new load module is named RDS400. The load module creation job control language for Version 4.0 is shown after Table I.

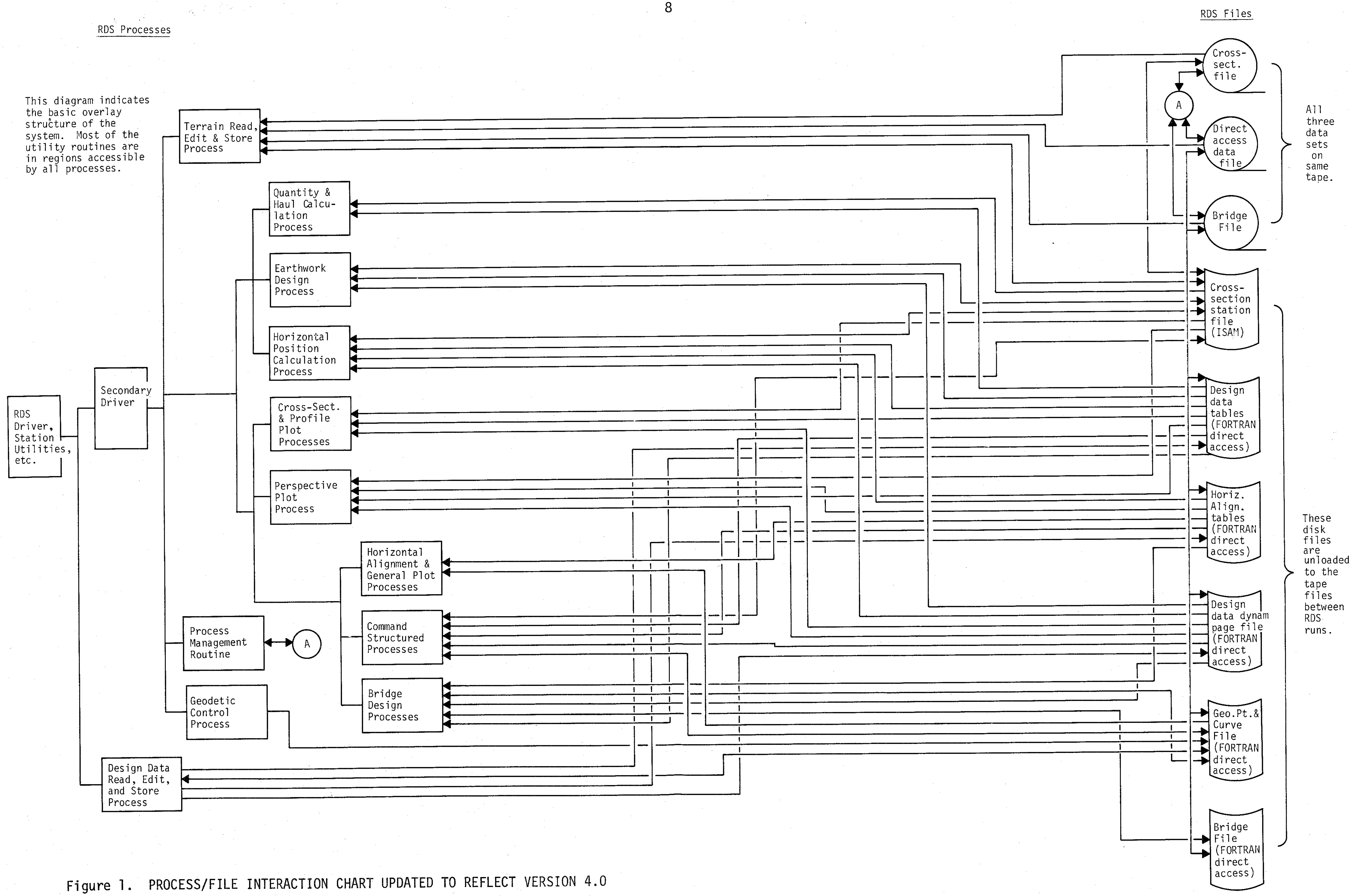
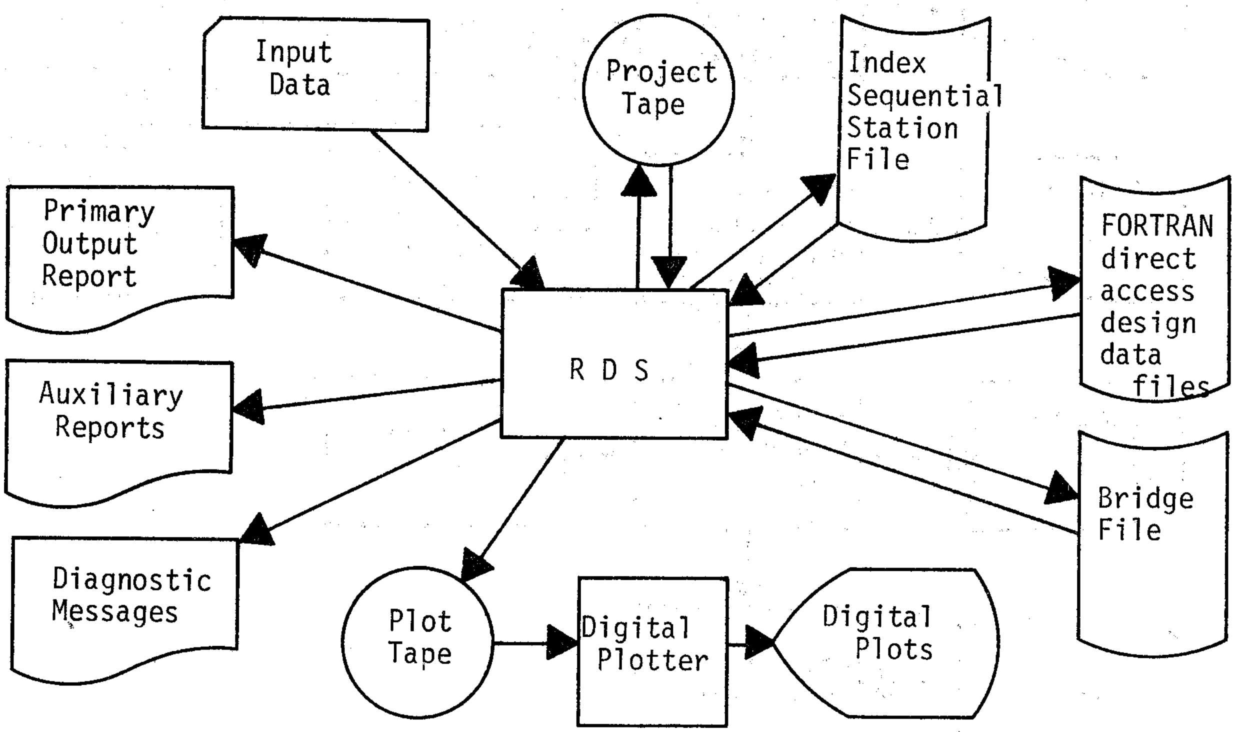


Figure 1. PROCESS/FILE INTERACTION CHART UPDATED TO REFLECT VERSION 4.0



NOTE: The project tape is off-line storage for the three disk files.

Figure 2. DATA FLOW THROUGH RDS (REVISED FOR 4.0)

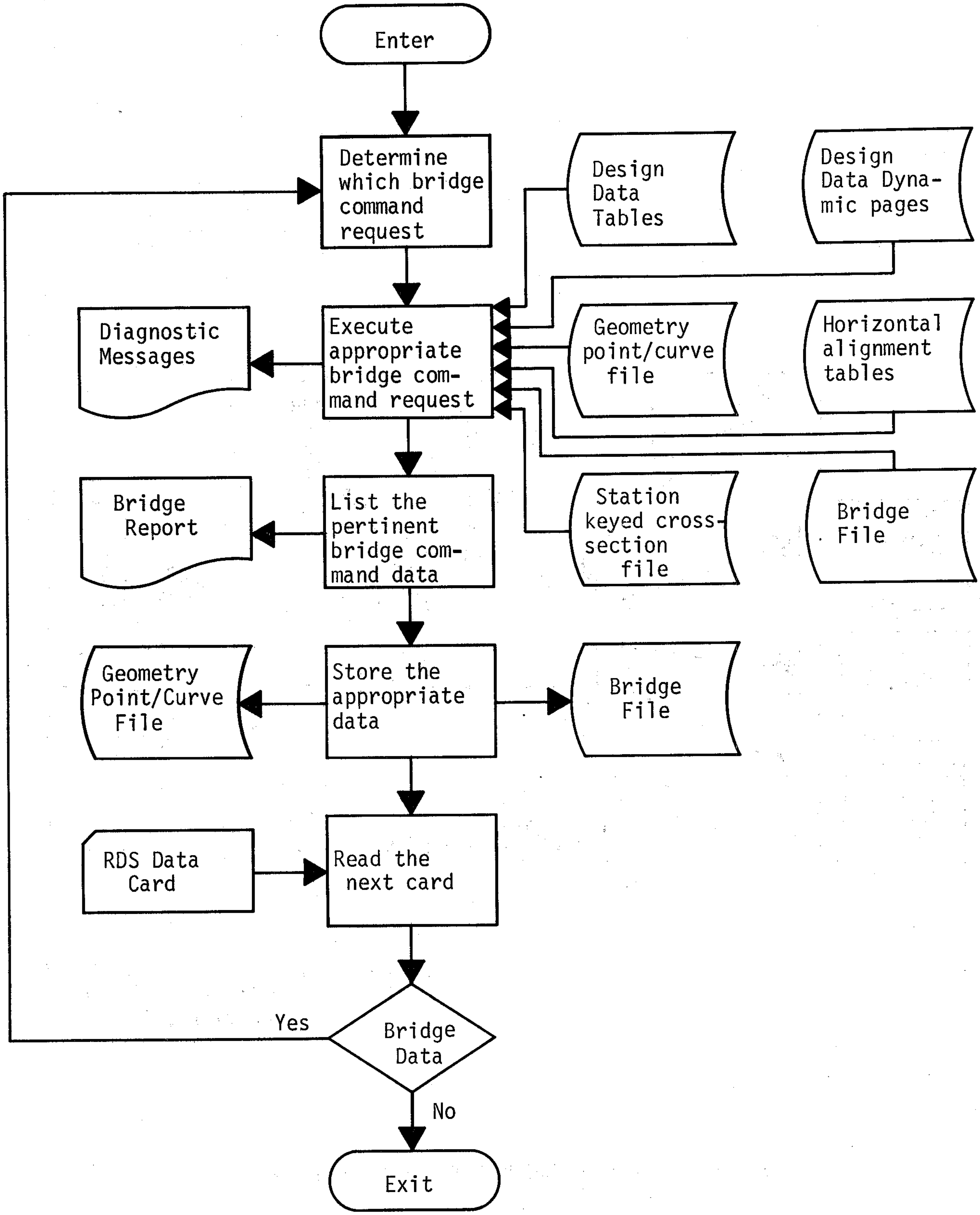


Figure 3. DATA FLOW THROUGH THE BRIDGE DESIGN PROCESS

RDS DRIVER

Routines

TIESD
DIST
PLOTS
REREAD#
STATN

Commons

CCEDI
CERWK
EQBLK
PLTARY
PNTCRV
TITLE
PLTARG
SYSTM
CFIND
CAZDMS
CLARC
PARM
CBRDIS
PCSAV
CSPOFF

SECONDARY DRIVER

Routines

EDRIV

PROCESS MANAGEMENT

Routines

CEDIT
GETDAY
JREPT
PLRPT
TFRST
TLAST
PATYP

TERRAIN DATA

Routines

CARD
FILE
SORT
STANO
TRES
PRNTR
DELET
EXTND
HUB
NZERO
IXSEC
RDD
STPTS
XSEC

Commons

CDATA
CMAIN
CPRNT
TKEY
CSORT
CSTAT
CDELE
CIXSE
CINT

DESIGN DATA

Routines

DEDES
BLSTA
XOFST
DALGT
SERCH
CHKEQ
COSTA
DCASO
DCAXY
DCLOSR
DEDEP
DSORT
EFSTA
STAT
ERPNT
GENST
HAEDT
HAGET
IOTAB
PAGER
INDEX
READR
READ1
READ2
TSORT
UNPAG

Commons

DCCLO
FLAG
EFSTB
INDX
TBLK
PGBLK
WBLK
SUBLK
HABLK
SBLK
MBLK
DEBLK
NOBLK
SDBLK
EFBLK
DKEY
PAGEC

GEODETIC CONTROL

Routines

CNTRL
AREAD
ARITE
DREAD
DRITE
ETAPE
PANEL
PREAD
THEOD
PRITE
SREAD
SRITE
SSHOT
TRAVS
ANLYT
STRIP
TREAD
TRITE
TPLOT

Commons

CTYPE
CONCOM
ETAPEC
THEODC
PANELC
SDATA
TRAVSC

HORIZONTAL POSITION

Routines

HPCAL
HCLOS
HALXY
HOFST

Commons

HOBLK
CLOSB

EARTHWORK DESIGN

Routines

DESGN
LDFIL
PI4PT
DITCK
DPRNT
ENDAR
INSRT
BENCH
CTFIL
EXTEN
SLOPE
SLECT
SOLVE
TRYSP
MDPT
MEDAN
XLINE
STAKE
OVLAP

Commons

SLBLD
MDBLD
ENBLD
LDBLD
OTOL
SLOPC
MDBLK
SLBLK

QUANTITY & HAUL

Routines

HAUL
EQADJ
FRHL
HSP
ORDST
PLEQ
PLTST
VAMO

Commons

CHAUL
CPLEQ

X-SEC. PROFILE

Routines

PDRIV
OGSTA
PROFIL
DRAW
EQUAT
HLIMIT
PAPLT
SIXHUN
STREL
VAPLT
VLIMIT
COMSTA
CRL
ELSTA
LKEY
SYMPST
VATYP
VERTB
OFFST
OGPROF
DASHPT
XPLOT
PPRNT
APUT
AROW
CLPLT
CSPLT
INTRC
LNESBL
TYLINE

Commons

CDRAW
CPSTO
CVAPL
EQUAZ
PRMMTR
MPLOT
CAPUT
CCSPL
CLINT

PERSPECTIVE

Routines

CODE
CAXYZ

Commons

CCODE

ALIGNMENT & GENERAL PLOT

Routines

BLOC1
CNTRS
CNTR1
ARCPLT
AREAS
LABPLT
LINPLT
PNTPLT
SERPLT
TLNPLT
ARCP
ARPLOT
CRVFIT
MAXMIN
MIDPNT
ENDXY
LNLSQ
MPAGE
ORIEN
EDSTA
HPRNT
RSCAL
SPAGE
AXSPLT
NARROW
PLTSIZ
BERLB
CIRPL
CNLIN
DIRPI
EQAPL
INTLB
LABEL
LINTR
OFSET
ROUND
SAVER
SPIPL
SPIR
STALB
STRPL
CIRCN
COMBG
DATAB
DATAS
PLDAT
STAFX
TABPT

Commons

CONVER
TYPES
ANNOTC
CAPLOT
PLTCON
ELDATA
AELTAB
PSCALE
BCDERS
CENCIR
CIRCLE
CURVFT
OFFTAB
PLPOOP
LIMITS

TABLE I. ROUTINES AND COMMON BLOCKS IN EACH MAJOR PROCESS IN RDS

COMMAND STRUCTURED

Routines

BLOC2
BRGDIS
COMENT
ISECT
LAMBRT
LSKIP
PEJECT
STCRV
STPNT
TRVRS
YZPNT
BLOC3
ISECPR
PARLIN
PERLIN
STOSTA
STOVAL
TANCIR
TANGC
ALREL
HAINV
HAPRT
HAREL
ISCRB
ISLIN
OFSEC
OFSPL
OSPRL
TSPISC
AZCHK
CIRCE
OCIRC
OTANG
GPRNT
GREAD
LNCHK
ANGL
PCLST
RDWYE

Commons

CONST
PRINT
PIC
SPRLC
BLK6
BLK11
HDATA
NPCRV
ICARD
OSECB

BRIDGE

Routines

PSLD
FDRIV
BPRNT
BEAMR
BENTR
BRNGR
CSTA
FLUSH
FRLIN
NAMES
PSLBR
SLABR
STALN
TRSL
DFRAM
SOPT9
BMLCD
BMLCV
DAZPT
DISBL
DXYPT
SOP10
CFRAM
SFRAM
SOPT3
SOPT4
SOPT5
SOPT6
SIMDI
SOPT7
SUREL
BMPLT
BMPRT
PLOTX
PLTCV
BLDIA
DIAF
DIBML
DICHD
DIPHI
DISRT
LDBMC
LDBMS
SRBML
SRCHD
LDBRG
SLTAB
BSELR
BMTAB
TLPSI
VRTCL
DSLAB

Continued

SOPT1
BPAGE
BNTLD
BSORT
B30
B30P2
B30RD
B30P1
B30CI
B30PS
B3SRT
ALLOW
CONLD
ECCEND
INDATA
MILLER
PROPTY
PSTRES
RRLOAD
CAMBER
JMLOAD
LANELD
MACKS
SPCL
STRMOD
TYPELD
MOMENT
OUTPUT
PRESC
SHEAR
HELP

Commons

BGEOM
CONVR
NAMFL
BENTC
FRAME
INDXP
TLINE
SPSAV
PTYSP
SLINE
BRGDX
BLDAT
BNRPT
SPLIC
DIPHM
SPAN
WORK
CSIDE

Continued

B30C1
B30C2
B30C3
B30C4
B30C5
B30C6
B30C7
B30C8
B30C9
JJJ
BNS
CONC
LI
J
IBM
JWM
ELL
MM
LLI
JDF
JRR
MSC
ALL
FYB
HD
HLF
ILL
KAP
KI
LOC
MMM
TJH

UTILITY

Routines

PGRAD
TEMPL
ELCAL
FISECT
TLPSI
D3RT
FIND
LARC
RADBR
SPLINT
SPOFF
BRDIS
NUMBER
SYMBOL
PLOTQ
LETR
ALGET
ALNUM
INSECT
INSEC
HLUS
AZDMS
XYCAL
CLOSR
IOFIL
CIRLE
DCODE
CALXY
CALSO
RDFIL
BCOMP
DPLUS
PLUS

Commons

CSPLI

OTHER

Routines

ERWK
GEOM
ISAM
CORE#

Commons

CPAGE
CLDFI
CACSO
TMBLD
TMBLK
GEOM1
CCLOS
HARLN
QSAM

```
//T260300F JOB (2476,9027,,1),'D-59 HERBER',MSGLEVEL=1,
// REGION=280K,TIME=2,CLASS=C      * BUILD RDS400 *
//LKED EXEC PGM=IEWLF880,PARM='LIST,LET,MAP,OVLY,SIZE=(280K,30K),DCBS'
//SYSLIB DD DSN=D59.RDS4LINK,DISP=SHR
//         DD DSN=SYS1.FORTLIB,DISP=SHR
//            DD DSNAME=D59.PLOT1136,DISP=SHR
//SYSLIN   DD  DDNAME=SYSIN
//SYSLMOD DD DSN=&&TEMP401(RDS401),UNIT=SYSDA,DISP=(,PASS),
//  DCB=(BLKSIZE=6400),SPACE=(CYL,(7,,1))
//SYSPRINT DD  SYSOUT=A
//SYSUT1   DD  UNIT=SYSDA,SPACE=(1024,(200,20))
//TIESLIB  DD  DSN=D59.RDS4LINK,DISP=SHR
//USERLIB  DD  DSN=D59.USERLIB,DISP=SHR
//SYSIN DD *
        ENTRY MAIN
   INCLUDE TIESLIB(TIESD,BKDRV)
   INCLUDE USERLIB(REREAD)
   INSERT DIST,EDRIV,STATN
   INSERT CAZDMS,CFIND,CLARC,EQBLK,PLTARG
        OVERLAY A
   INCLUDE USERLIB(CORE)
   INCLUDE TIESLIB(BKE)
   INSERT QSAM
        OVERLAY B
   INSERT CEDIT,GETDAY,TFRST,TLAST,JREPT
        OVERLAY B
   INCLUDE TIESLIB(TRESB)
   INSERT TRES,CARD,FILE,SORT,STANO,PRNTR
   INSERT CSORT,CSTAT,CDELE,C1XSE,CMAIN,CDATA,CPRNT,TKEY
        OVERLAY C
   INSERT EXTND
        OVERLAY C
   INSERT HUB
        OVERLAY C
   INSERT NZERO
        OVERLAY C
   INSERT DELET
        OVERLAY C
   INSERT IXSEC,RDD,STPTS,XSEC,CINT
        OVERLAY B
   INCLUDE TIESLIB(RDFILB)
   INSERT PI4PT,CPAGE,CACSO,CLDFI,TMBLK,TMBLD
   INSERT HLUS
        OVERLAY C
   INSERT ERWK
        OVERLAY D
   INSERT CHAUL
   INSERT IHCFMAXD,IHCFMAXR,IHCFMAXI
        OVERLAY E
   INSERT VAMO
        OVERLAY E
   INSERT HAUL,CPLEQ
        OVERLAY D
   INSERT DESGN,LDFIL,DPRNT,ENDAR,INSRT,DITCK
   INSERT SLBLD,MDBLD,ENBLD,LDBLD,OTOL,SLOPC,MDBLK,SLBLK
        OVERLAY E
   INSERT SLOPE,BENCH,CTFIL,EXTEN,TRYSP,SLECT,SOLVE
        OVERLAY E
   INSERT MEDAN,MDPT,XLINE
        OVERLAY E
```

```
INSERT STAKE
     OVERLAY D
INSERT HPCAL,HOBLK,CLOSB
     OVERLAY E
INSERT HCLOS
     OVERLAY E
INSERT HALXY,HOFST
     OVERLAY C
INSERT HARLN,CCLOS,OSECB
     OVERLAY D
INSERT DASHPT,PLUS
     OVERLAY E
INSERT XPLOT,PPRNT,MPLOT,CAPUT,CCSPL,CLINT
INSERT APUT,AROW,CLPLT,CSPLT,INTRC,LNESBL,TYLINE
     OVERLAY E
INSERT PDRIV,CDRAW,CPSTO,CVAPL,EQUAZ,PRMMTR
     OVERLAY F
INSERT PROFIL,OGSTA
     OVERLAY F
INSERT DRAW,EQUAT,HLIMIT,PAPLT,SIXHUN,VAPLT,VLIMIT,STREL
     OVERLAY D
INSERT CAXYZ,CODE,CCODE
     OVERLAY D
INSERT GEOM
INCLUDE TIESLIB(BKG)
INSERT BENTC,BGEOM,BRGDX,CONVR,FRAME,GEOM1,INDXP,NAMFL,PTYSP,SLINE
INSERT SPSAV,TLINE
     OVERLAY E
INSERT COMBG,IHCSATN2,IHCSTNCT
     OVERLAY F
INSERT GREAD,GPRNT,LNCHK,PRINT,CONST,ICARD
     OVERLAY G
INSERT BLOC1,ANNOTC
     OVERLAY H
INSERT CNTRS,CNTR1
     OVERLAY H
INSERT ARCPLT,LABPLT,PNTPLT,SERPLT,LINPLT,TLNPLT
INSERT IHCFRXPI
INSERT AREAS,MIDPNT,MAXMIN,ARPLOT,ARCP,CRVFIT,CAPLOT,PLTCON
     OVERLAY H
INCLUDE TIESLIB(BK1)
INSERT ORIEN,LNLSQ,MPAGE,ENDXY,SPAGE,RSCAL,EDSTA,HPRNT,TYPES,ELDATA
INSERT AELTAB,PSCALE,BCDERS,CENCIR,CIRCLE,CCNVER,CURVFT,OFFTAB,PLPOOP
INSERT LIMITS
     OVERLAY G
INSERT BLOC3,ISECPR,NPCRV,PARLIN,PERLIN,STOVAL,STOSTA,TANCIR,TANGC
INSERT INSECT
     OVERLAY H
INSERT ANGL,RDWYE,PCLST
     OVERLAY H
INSERT BLOC2,BRGDIS,TRVRS,STPNT,STCRV,ISECT,YZPNT
INSERT COMENT,LSKIP,PEJECT,LAMBRT
     OVERLAY H
INSERT OFSEC,PIC,SPRLC,OSPRL,TSPISC,BLK6,BLK11,ISLIN
INSERT OFSPL,ISCRV,OTANG,OCIRC,CIRCE,AZCHK
     OVERLAY H
INSERT ALREL,HDATA
     OVERLAY I
INSERT HAINV
     OVERLAY I
```

```
INSERT HAPRT,HAREL
     OVERLAY F
INSERT FDRIV,WORK
     OVERLAY G
INSERT STALN
     OVERLAY H
INSERT NAMES,FLUSH
     OVERLAY H
INSERT BENTR,BRNGR,BEAMR,PSLBR,FRLIN,CSTA,SLABR,TRSL
     OVERLAY G
INSERT CFRAM,DFRAM
INSERT BLDAT,BNRPT,SPLIC
     OVERLAY H
INSERT SOPT9,BMLCD
     OVERLAY H
INSERT SOP10,BMLCV,DAZPT,DISBL,DXYPT
     OVERLAY G
INSERT SFRAM,SOPT3,SOPT4,SOPT5,SOPT6,SOPT7,SUREL
INSERT SIMDI
INSERT SPAN
     OVERLAY G
INSERT VRTCL
     OVERLAY G
INCLUDE TIESLIB(BKP)
INSERT PRESC,SHEAR,MOMENT,OUTPUT
INSERT ALL,BNS,CONC,ELL,FYB,HD,HLF,IBM,ILL,J,JDF,JJJ,JRR,JWM,KAP,KI
INSERT L1,LL1,LOC,MM,MMM,MSC,TJH
     OVERLAY E
INSERT B30P2,B30C6,B30C8,B30C9
     OVERLAY A
INSERT IHCLEXP,IHCFDXPD,IHCLLOG,IHCFIXPI
INSERT TRITE
     OVERLAY B
INSERT ETAPE,DREAD,DRITE,ETAPEC,THEOD,AREAD,ARITE,THEODC
INSERT PANEL,PREAD,PRITE,PANELC,SSHOT,SREAD,SRITE,SDATA
     OVERLAY B
INSERT TRAVS,TRAVSC
     OVERLAY B
INSERT ANLYT
     OVERLAY B
INSERT STRIP
     OVERLAY A
INSERT TBLK,WBLK,SUBLK,HABLK,SBLK,MBLK,DEBLK,NOBLK,SDBLK,EFBLK
     OVERLAY B
INSERT UNPAG
     OVERLAY B
INSERT READR,INDEX
     OVERLAY C
INSERT READ1
     OVERLAY C
INSERT READ2
     OVERLAY B
INSERT HAECT,GENST
INSERT HAGET
     OVERLAY B
INSERT COSTA,DCCLO
     OVERLAY C
INSERT TSORT
     OVERLAY C
```

```
INSERT DSORT
     OVERLAY C
INSERT EFSTA,STAT
     OVERLAY C
INSERT PAGER,PAGEC
     OVERLAY B
INSERT DEDP1
     OVERLAY K(REGION)
INCLUDE USERLIB(SISAM)
     OVERLAY K
INSERT TABPT,STRPL
     OVERLAY K
INSERT BMTAB,BNTLD,BPAGE,BPRNT,BSORT,PSLD
INSERT DIPHM
     OVERLAY K
INSERT B3ORD
     OVERLAY K
INSERT B3OP1
     OVERLAY K
INSERT B3SRT,B3OCI,B3OPS
     OVERLAY K
INSERT MILLER
     OVERLAY K
INSERT CNTRL,CONCOM,CTYPE
INCLUDE TIESLIB(BKC)
     OVERLAY K
INSERT DEDES,PGBLK,DKEY,EFSTB,FLAG,INDX
     OVERLAY L(REGION)
INSERT ALNUM,ALGET
     OVERLAY L
INSERT COMSTA,CRL,ELSTA,LKEY,SYMPST,VATYP,VERTB
     OVERLAY L
INSERT EQADJ,FRHL,HSP,ORDST,PLEQ,PLTST
     OVERLAY L
INSERT ERPNT
     OVERLAY L
INSERT BLSTA,XOFST,SERCH
INSERT DALGT
     OVERLAY L
INSERT DEDEP
     OVERLAY L
INSERT TREAD
     OVERLAY L
INSERT TPLOT
     OVERLAY L
INSERT TEMPL,ELCAL
     OVERLAY L
INSERT OFFST
     OVERLAY L
INSERT OVLAP
     OVERLAY L
INSERT FIND,LARC,SPOFF,RADBR,SPLINT,D3RT,CSPLI
     OVERLAY L
INSERT AXSPLT,NARROW,PLTSIZ
     OVERLAY L
INSERT DATAS,DATAB,CIRCN,PLDAT,STAFX
     OVERLAY L
INSERT BERLB,CIRPL,CNLIN,DIRPI,EQAPL,INTLB,LABEL,LINTR,OFSET
INSERT ROUND,SAVER,SPIPL,SPIR,STALB
     OVERLAY L
```

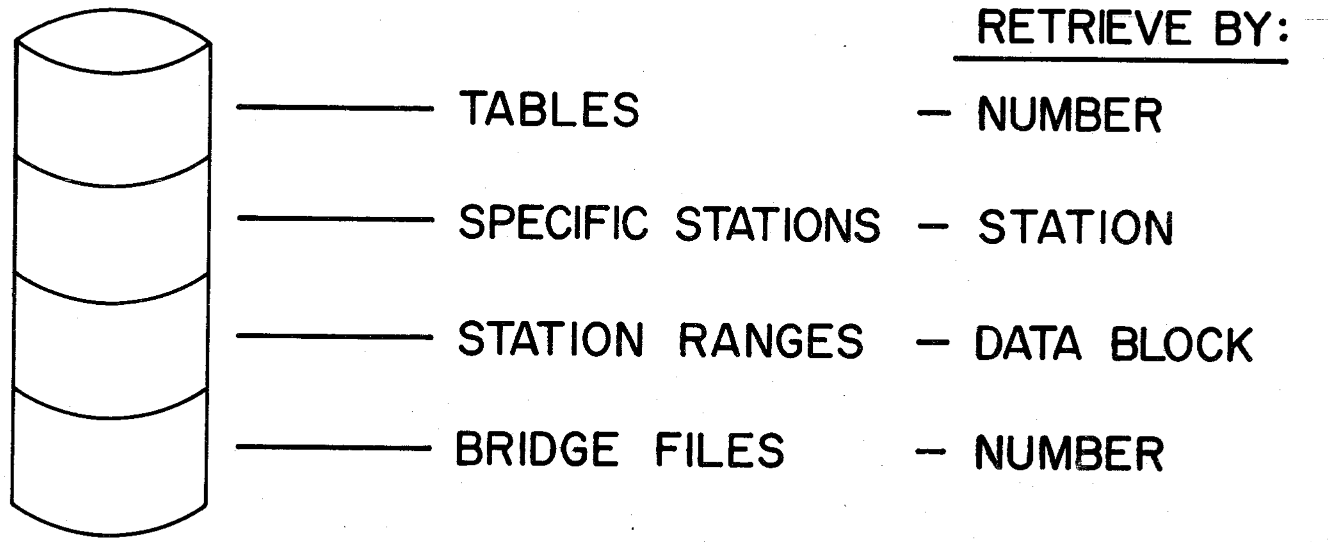
```
INSERT SOPT1,CSLAB,CSIDE
      OVERLAY L
INSERT BMPRT,SLTAB
      OVERLAY L
INSERT BMPLT,PLOTX,PLTCV,DIPHI,SRBML,SRCHD,DISRT,DICHD,DIBML
INSERT DIAF,BLDIA
      OVERLAY L
INSERT B30C1,B30C2,B30C3,B30C4,B30C7
      OVERLAY L
INSERT INDATA,PROPTY,ALLOW,PSTRES,ECCEND,RRLOAD,CONLD,TYPELD
INSERT JMLOAD,SPCL,LANELD,STRMOD,MACKS,CAMBER
      OVERLAY M(REGION)
INSERT AZDMS
      OVERLAY M
INSERT IOFIL
      OVERLAY M
INSERT RDFIL
      OVERLAY M
INSERT NUMBER,SYMBOL,PATYP,PLOTQ,PLRPT,DPLUS
      OVERLAY M
INSERT DCODE
      OVERLAY M
INSERT OGPROF
      OVERLAY M
INSERT PGRAD
      OVERLAY M
INSERT CALXY
      OVERLAY M
INSERT CALSO
      OVERLAY M
INSERT CLOSR
      OVERLAY M
INSERT FISECT,TLPSI
      OVERLAY M
INSERT LDBMC,LDBMS
      OVERLAY M
INSERT LDBRG
      OVERLAY M
INSERT BSELR
      OVERLAY M
INSERT HELP
      OVERLAY M
INSERT B3C,B30C5
      OVERLAY M
INSERT IOTAB
      OVERLAY M
INSERT CHKEQ
      OVERLAY M
INSERT DCAXY
      OVERLAY M
INSERT DCASO
      OVERLAY M
INSERT DCLOSR
```

III. Description of Files

All of the data either input, computed or captured for storage in the Roadway Design System may be classified in one of four categories for access and retrieval. (See Figure 4.)

+ Tabular data - This consists of the following: (a) point coordinates, (b) line or circle properties, and (c) criteria for medians, roadway templates or slope selection. All of these items are stored and retrieved by tabular number. They are stored in convenient sized data blocks to minimize accessing. A call for the data initiates a check to see if the proper block is in core; if not it is brought into core.
+ Data Which is Related to Specific Terrain Cross-Section Stations - This includes terrain cross-section data, alignment relationships, design cross-sections, cross-sectional areas and other parameters. All of these data may be stored and retrieved by station number. It is advantageous for this type of data to be stored in a "selective start point - sequential mode".
+ Data Which Covers Station Ranges for One or More Separate Alignments - This includes vertical alignment elements, template ranges, slope selection criteria ranges, median ranges, special ditch grades, and others. This is the most complex category of data because there is no convenient way to call for data required for an operation. It is a nonhomogeneous category of data since the elements have no relationship to one another. For example, superelevation ranges bear no relationship to vertical alignment ranges. This nonhomogeneous nature is illustrated in Figure 5.

In the single pass design concept, it is desirable to have in core all of the various types of design data required to accomplish the complete design cross-section, but it is not desirable to make multiple accesses to



DATA STRUCTURE

Figure 4. DATA STRUCTURE

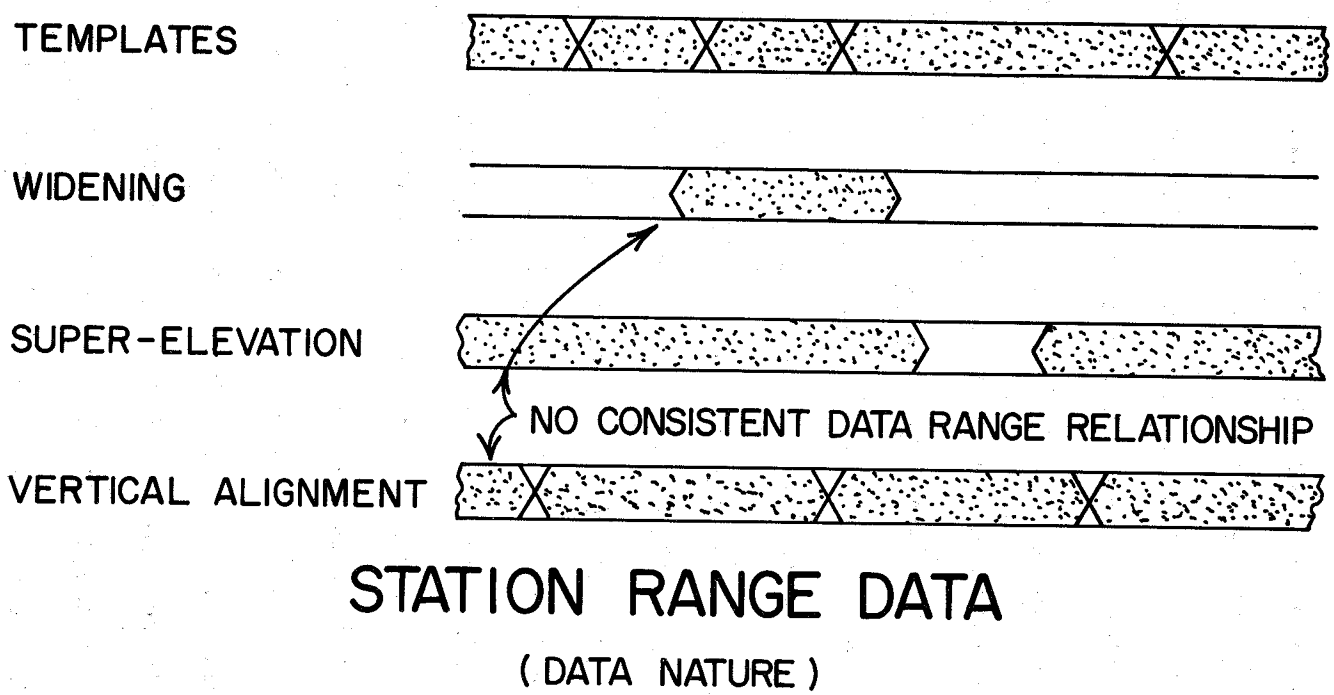


Figure 5. STATION RANGE DATA (DATA NATURE)

get different data types. For this reason, the "design data block concept" was developed. The design data block concept involves the filling of station range data into a convenient sized data block until the data block is full and contains data of all types sufficient to cover a given range of stationing. The storage and retrieval routines examine data, separate it into data blocks, and keep indexes of the blocks so that when design data is needed for a given station the proper block of design data is brought into core if it is not already there. There is some overlapping of data in the blocks to assure that the full range of data is covered. (See Figure 6.)

The design data blocks are constant in record length; however, they cover varying station ranges. This concept has several advantages. The core requirement for complete design data for six roadways is only 3.4K bytes. Disk accessing for this type of data is minimized in a sequential processing operation such as earthwork design. Only one access per station range is required. The storage and retrieval process is a system utility routine which can be used in any application program requiring design data.

+ Bridge Data - This consists of constant length records of 1088 bytes that describe bridge criteria. There are a maximum of 360 records in this file. The first record is a master index to the location of bridge criteria for the individual bridges in the job. A maximum of seventeen bridges can be indexed in a given job. Within the file for a particular bridge, additional indices point to the specific data items for the given bridge.

All of the files in the system are discussed specifically on the following pages: tape files first, then the disk data files, and finally the system files.

Tape Files

Tape files FT02F001, FT02F002, and FT02F003 provide long-term storage for the station data file, the paged data file, and the bridge file, respectively. The

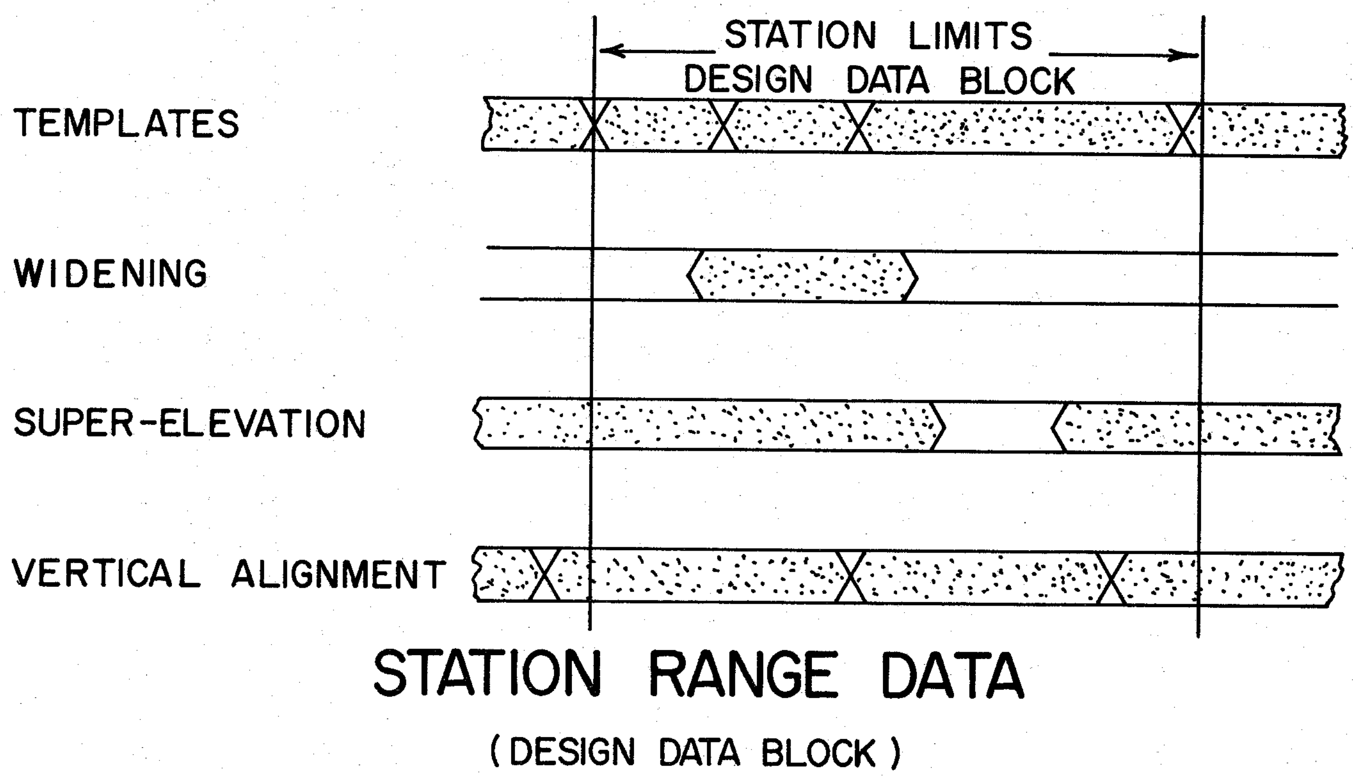


Figure 6. STATION RANGE DATA (DESIGN DATA BLOCK)

records in the first two tape files are the same length - 3400 bytes; the bridge records are 1088 bytes. The tape is written by routine TLAST and is read by routines TRES and TFRST. See Figure 7. Tape file FT03F001 is the perspective plot data tape used as input to the stand alone perspective plot process. A plot tape is generated to be plotted by an off-line digital plotter.

+ FT02F001 (SYSTP)

This is the first of the tape files. If no station data file is in existence when the tape is written, this tape file consists only of an end-of-file mark. If the station data file does exist, it is written on the tape sequentially, beginning with the record of lowest key (see STAF) and ending with the record of highest key, followed by an end-of-file mark.

+ FT02F002 (SYSTP)

This is the second of the tape files. If no paged data file is in existence when the tape is written, this tape file consists only of an end-of-file mark. If the paged data file exists, it is written on the tape sequentially, beginning with record 1 and ending with record 70, followed by an end-of-file mark.

+ FT02F003 (SYSTP)

This is the third of the tape files. If no bridge data file is in existence when the tape is written, this tape file consists only of an end-of-file mark. If the bridge file exists, it is written on the tape sequentially, beginning with record 1 and ending with the last record generated by the data, followed by an end-of-file mark. A maximum of 360 records is permitted.

+ FT03F001 (ITAPE)

This is the fourth of the tape files. This tape is used as input to the stand alone perspective plot process. It contains XYZ tri-ordinates for points within the range of stations to be plotted. There is also a point

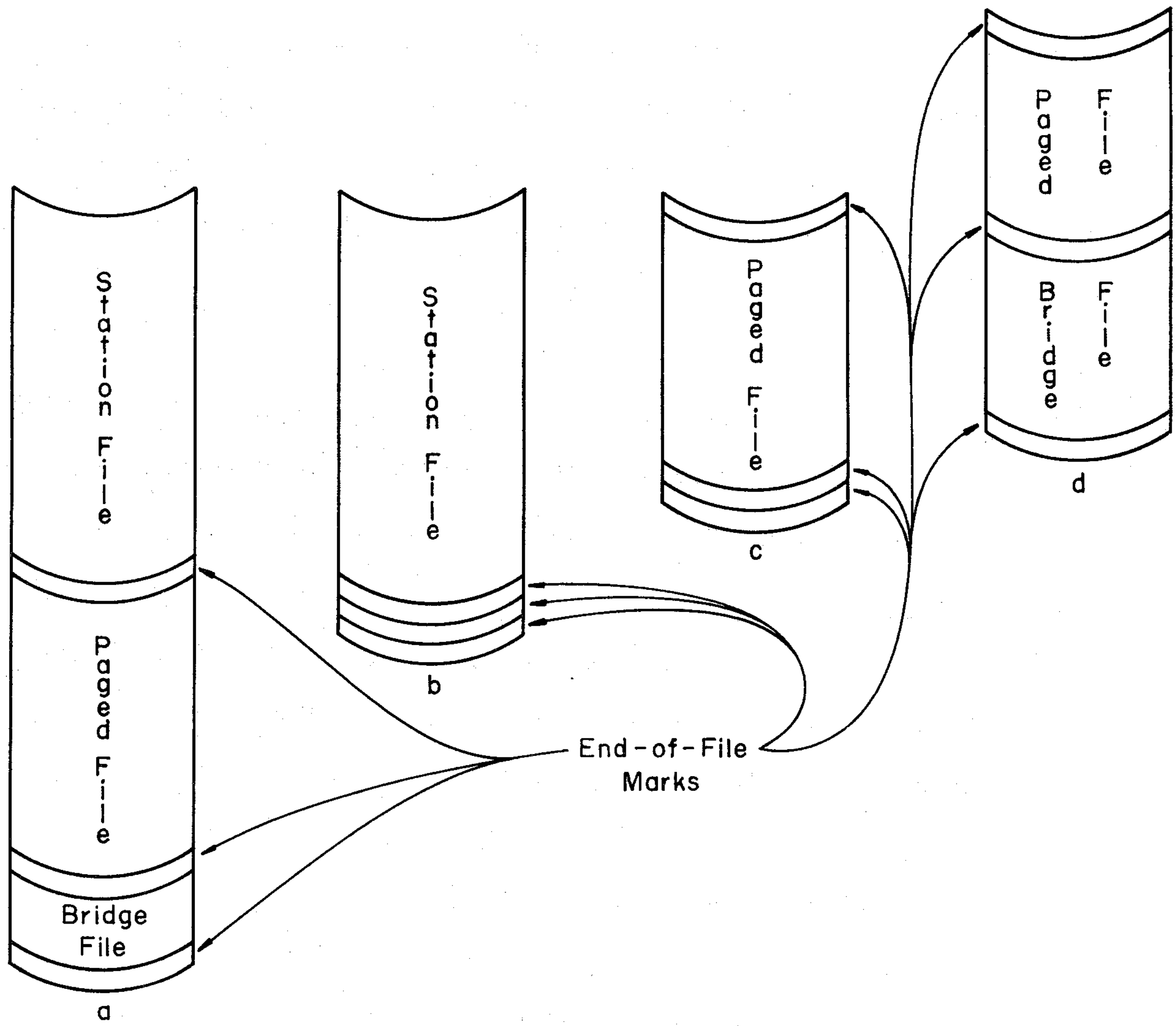


Figure 7. PROJECT TAPE LAYOUT

code stored with the tri-ordinates for each point. The records in this tape file are 3400 bytes. The tape is written by routine CAXYZ.

+ Plot Tape

This is the fifth of the tape files. This tape is used to drive a digital plotter to generate digital plot displays calculated by the Roadway Design System. Many routines write on this tape file. The plot tape may be "opened" in several routines; it is always "closed" in routine CEDIT as the last procedure of a run of the system.

Disk Data Files

There are three temporary disk data files used by the system: &&PAGES(FT08F001), &&BPAGES(FT09F001) and &&STAF(STAF). &&PAGES and &&BPAGES are FORTRAN direct access files and &&STAF is an index sequential file.

+ FT08F001 (&&PAGES)

This is the temporary disk storage for the paged data file. This paged data file consists of seven types of records: (See Figure 8)

a) Design data tables (records 1-11)

b) Indices (record 12)

c) Horizontal alignments (records 13-38)

d) Equations (records 39-42)

e) Design data pages (records 43-50)

f) Geometry points (records 51-60)

g) Geometry curves (records 61-70).

Each record is 3400 bytes long and is accessed using the basic direct access method (BDAM). Routine IOTAB creates records 1-42 and routine PAGER creates records 43-50 of this file; routine RDFIL reads and decodes record 12 and 43-50 of this file; routine ALGET reads and decodes records 13-38 and the appropriate processes read records 1-11. Routine IOFIL writes and reads records 51-70 of this file. Routines TFRST and TRES read record 39 and routines HAEDT, STATN and DIST read records 39-42 as needed.

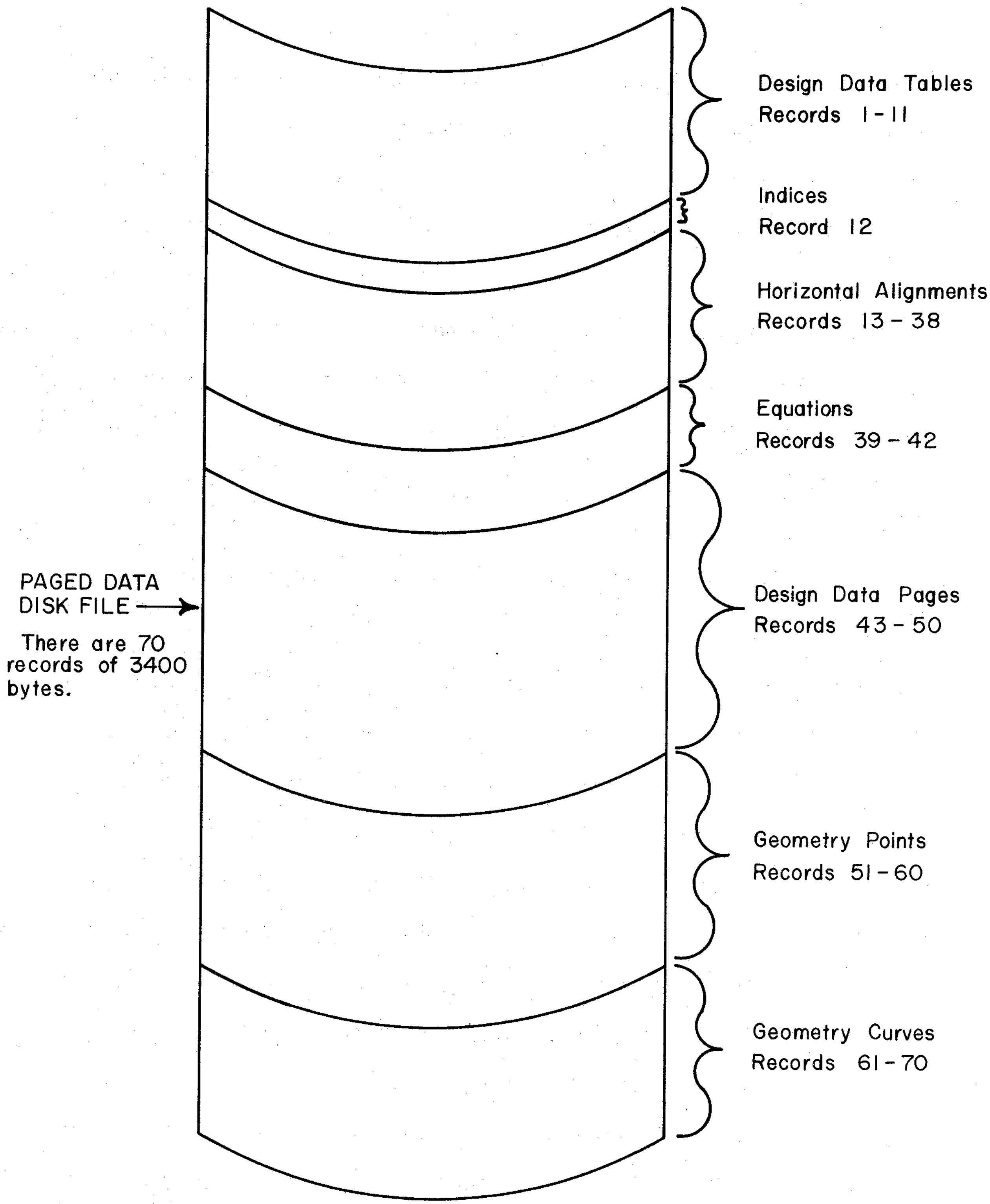


Figure 8. PAGE DATA FILE LAYOUT

Figure 9 shows the layout of the design data tables. Template criteria are stored on the first five records; slope criteria on the next three. Slope tabular data and right of way data are stored on the ninth record. Median data, compaction factors and forced balance stations are on the tenth record; added quantities on the eleventh. The external page index to the paged data and the index to the horizontal alignments are stored on the twelfth record.

Figure 10 shows the layout of the horizontal alignment records. Record thirteen contains alignment A, record fourteen contains alignment B, ..., record thirty-eight contains alignment Z.

Figure 11 shows the layout of the equation records. Equations for alignments A-G are on record thirty-nine, H-N on forty, O-U on forty-one, and V-Z on forty-two. Table II contains the array or variable location on the various pages.

The design data pages (records 43-50) are laid out in a unique manner. Briefly, each record contains all of the design data associated with a range of stations. The external page index indicates which record contains the design data for a particular range of stations. There is an internal page index stored on each page record that indicates the beginning position of each type of data stored in the record. This index is expanded by RDFIL so that a pointer indicates the beginning of all discreet data types. The scheme of storing data in and retrieving data from the paged data records is included in the documentation of routines PAGER and RDFIL.

Figure 12 shows the layout of the geometry point/curve records (51-70). There are 2100 geometry points, stored 210 to the record, as shown. The X and Y coordinates for points 1 through 210 are stored on record 51,..., points 1891-2100 on record 60. There are 1400 geometry curves, stored 140

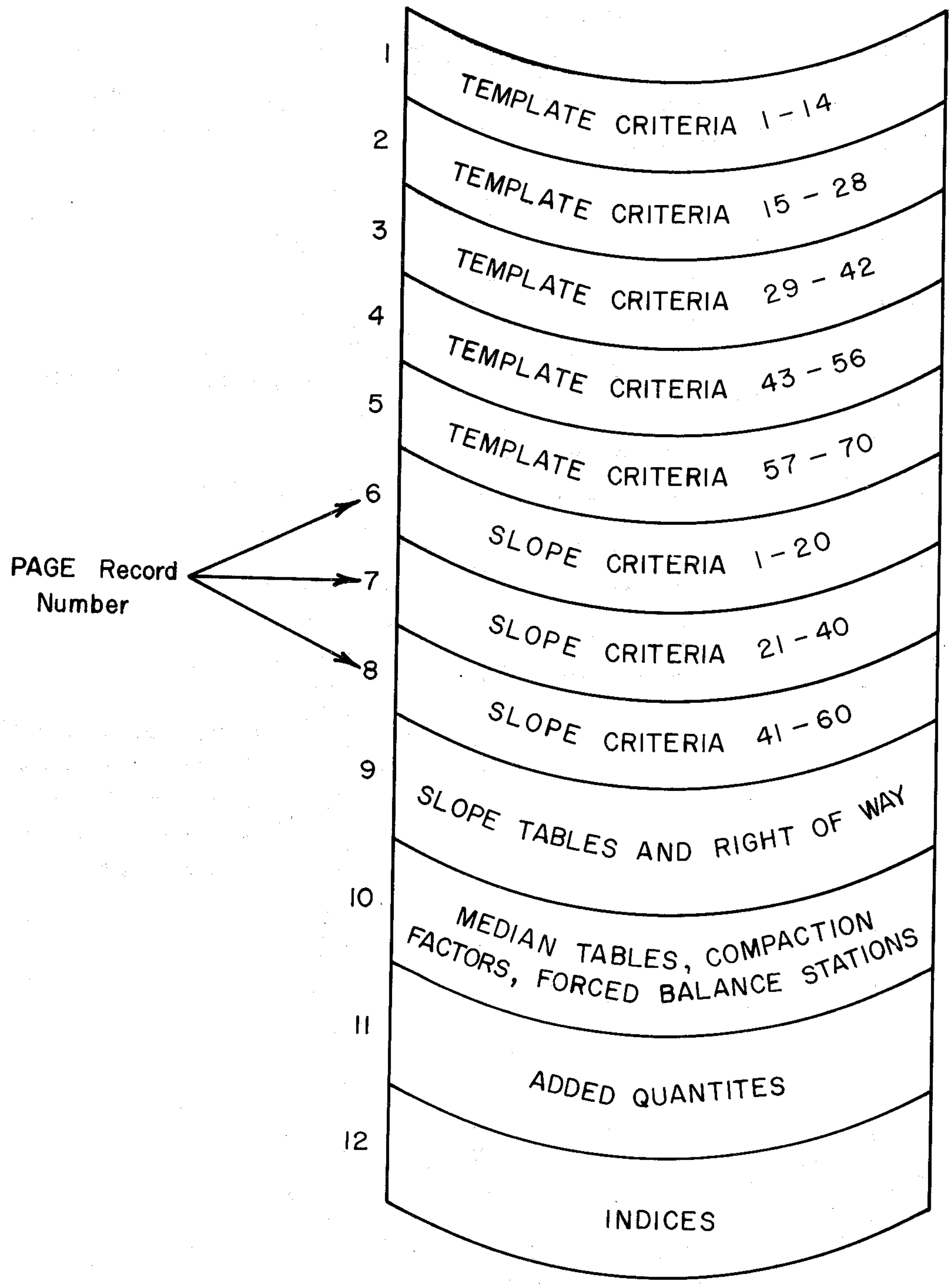


Figure 9. LAYOUT OF DESIGN DATA TABLES

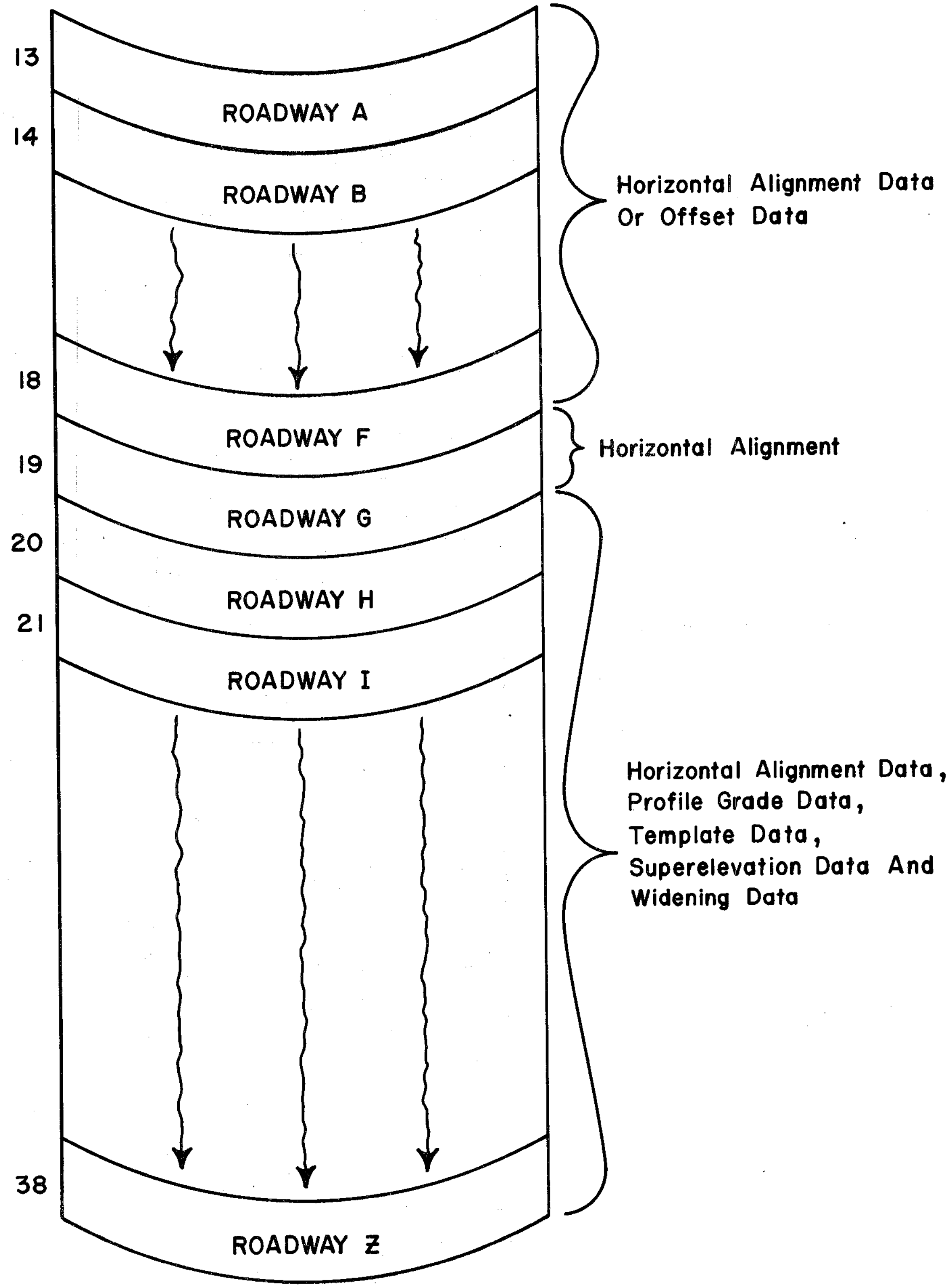


Figure 10. LAYOUT OF HORIZONTAL ALIGNMENT RECORDS

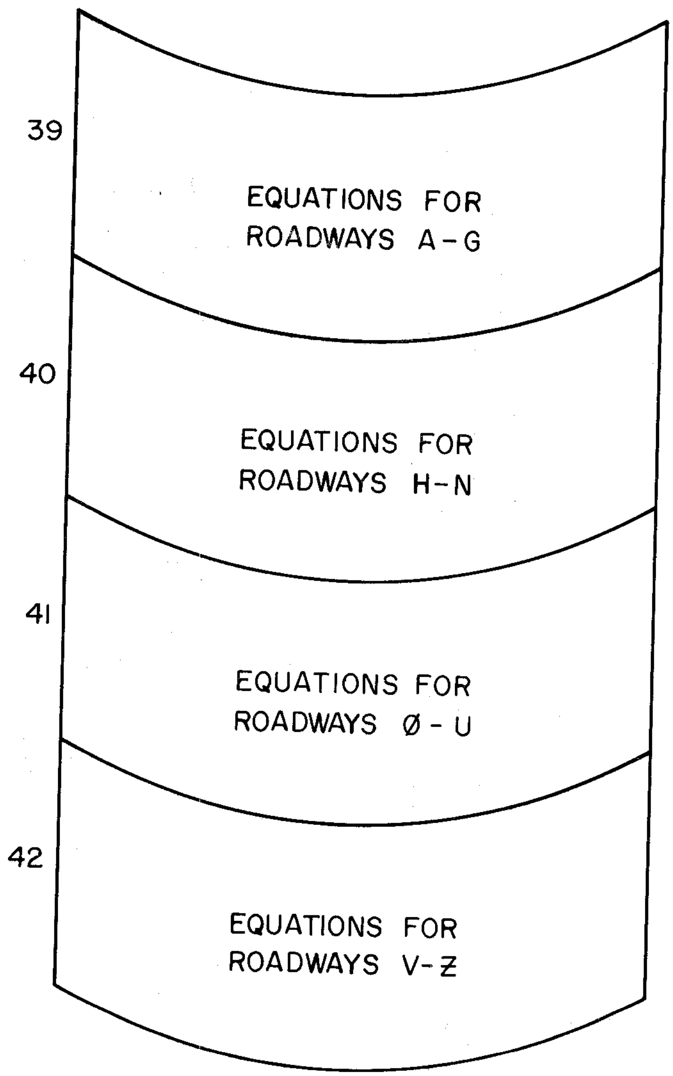


Figure 11. LAYOUT OF EQUATION RECORDS

Table II. THE LOCATIONS OF VARIABLES ON THE STATIC PAGES

LAYOUT OF TEMPLATE TABLES
Pages 1-5

Array or Variable		Location
TSDEP(14)	R*4	1-14
NTPGP(14)	I*4	15-28
NTCLP(14)	I*4	29-42
NTPPL(14)	I*4	43-56
NTPPR(14)	I*4	57-70
NTSF(14)	I*4	71-84
SLOPT(14,16)	I*4	85-308
TSLOP(14,16)	R*4	309-532
TDIST(14,16)	R*4	533-756
NSDOP(14)	I*4	757-770
NTA(14)	I*4	771-784
NTB(14)	I*4	785-798
NTC(14)	I*4	799-812
NTD(14)	I*4	813-826

LAYOUT OF SLOPE TABLES
Pages 6-8

Array or Variable		Location
SOTAB(20,33)	I*4	1-660
SBTOL(20)	R*4	661-680
NFIXS(20)	I*4	681-700
SMAXD(20)	R*4	701-720
SMIND(20)	R*4	721-740
SLTT(20)	R*4	741-760

LAYOUT OF SLOPE SELECTION TABLES,
RIGHT OF WAY TABLES
Page 9

Array or Variable		Location
HORIZ(2,25)	R*4	1-50
VERT(2,25)	R*4	51-100
WIDTH(24)	R*4	101-124
SLOPE(2,24)	R*4	125-172
RWSTA(50)	I*4	173-222
ROWID(50,2)	R*4	223-322
RWMAX(50,2)	R*4	323-422
NOROW	I*4	423

LAYOUT OF MEDIAN, COMPACTION FACTOR,
FORCED BALANCE
Page 10

Array or Variable		Location
MOPT(30)	I*4	1-30
DISL(30,3,2)	I*4	31-210
DISR(30,3,2)	I*4	211-390
MINT(30,2)	I*4	391-450
CFSTA(60)	I*4	451-510
CFACT(60)	R*4	511-570
CFRDY(60)	I*4	571-630
NOCF(6)	I*4	631-636
FBSTA(60)	I*4	637-696
FBRDY(60)	I*4	697-756
NFBAL(6)	I*4	757-762
NOBCF	I*4	763
NOBFB	I*4	764
NUMCF	I*4	765
NUMFB	I*4	766

LAYOUT OF ADDED QUANTITY TABLE
Page 11

Array or Variable		Location
AQSTA(150,2)	I*4	1-300
AQCUT(150)	I*4	301-450
AQFIL(150)	I*4	451-600
AQCF(150)	R*4	601-750
NOAQ(7)	I*4	751-757
NUMAQ	I*4	758

LAYOUT OF INDICES
Page 12

Array or Variable		Location
NOHA(26)	I*4	1-26
IDBST(26)	I*4	27-52
NOEQ(26)	I*4	53-78
TOTPAG or NUMPAG	I*4	79
EXNDX(7,8)	I*4	80-135
NUPAG(50)	I*4	136-185

LAYOUT OF HORIZONTAL ALIGNMENT
TABLES (A-G)
Pages 13-19

Array or Variable		Location
HARFT(50)	R*8	1-100
HAPIX(50)	R*8	101-200
HAPIY(50)	R*8	201-300
HTAN1(50)	R*8	301-400
HTAN2(50)	R*8	401-500
HASTA(50)	R*8	501-600
HASPI(50)	R*4	601-650
HASPO(50)	R*4	651-700
HAPIN(50)	I*4	701-750
NFLAG(50)	I*4	751-800
RHOLD(50)	I*4	801-850

LAYOUT OF HORIZONTAL ALIGNMENT
TABLES A-G
(IF OFFSET DATA)

Array or Variable		Location
OFXST(275)	I*4	1-275
OFOST(275)	I*4	276-550
OFDIS(275)	R*4	551-825

LAYOUT OF ALIGNMENTS H-Z
Pages 20-38

Array or Variable		Location
HARFT(25)	R*8	1-50
HAPIX(25)	R*8	51-100
HAPIY(25)	R*8	101-150
HTAN1(25)	R*8	151-200
HTAN2(25)	R*8	201-250
HASTA(25)	R*8	251-300
HASPI(25)	R*4	301-325
HASPO(25)	R*4	326-350
HAPIN(25)	I*4	351-375
NFLAG(25)	I*4	376-400
RHOLD(25)	I*4	401-425
PGSTA(25)	I*4	426-450
PGELV(25)	R*4	451-475
PGVC1(25)	R*4	476-500
PGVC2(25)	R*4	501-525
PGELC(25)	R*4	526-550
PGPIN(25)	I*4	551-575
TSTA(15)	I*4	576-590
TSREC(15)	I*4	591-605
SUSTA(50)	I*4	606-655
SUPTL(50)	R*4	656-705
SURAT(50)	R*4	706-755
SUPPR(50)	I*4	756-805
WSTA(10)	I*4	806-815
WELNO(10)	I*4	816-825
WIDEN(10)	R*4	826-835
WIDTL(10)	R*4	836-845
NVERT	I*4	846
NTEMP	I*4	847
NSUPR	I*4	848
NWID1	I*4	849
NWID2	I*4	850

LAYOUT OF EQUATION TABLES
Pages 39-42

Array or Variable		Location
EQTAB(7,20,2)	R*8	1-560

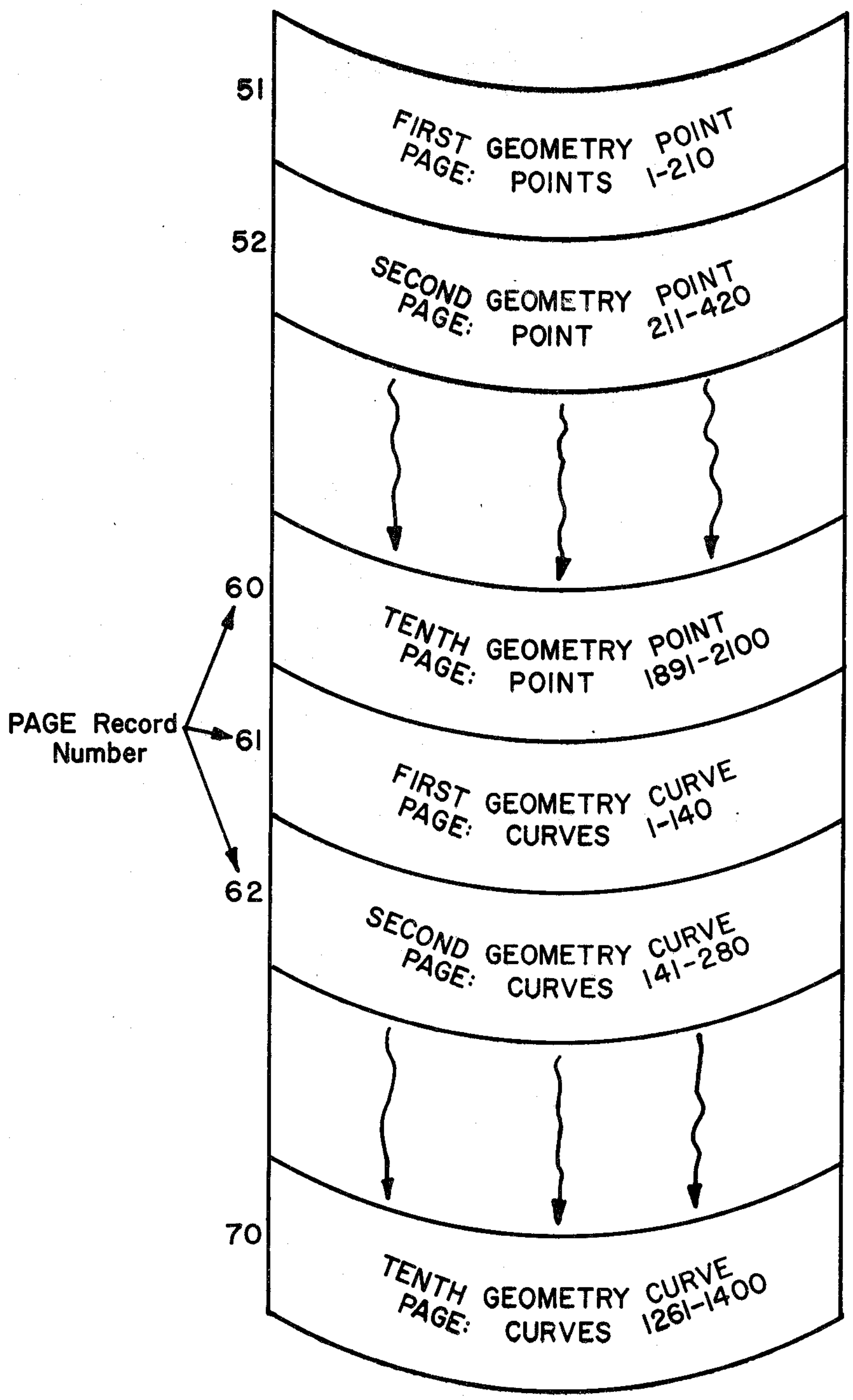


Figure 12. LAYOUT OF GEOMETRY POINT/CURVE RECORDS

to the record as shown. The X and Y coordinates and radius/azimuth of the circle/line of curves 1 through 140 are stored on record 61,..., curves 1261-1400 on record 70.

\+ FT09F001 (&&BPAGES)

This is the temporary disk storage for the bridge data file. There are nine different record formats used to store bridge data:

a. Master Bridge Index (record 1)

b. Index to bridge data for a specific bridge (1 record per bridge)

c. Bent configuration data (as many records as required, stored 15 bents per record)

d. Beam configuration data (as many records as required, stored 34 beams per record)

e. Parallel Slab Line configuration data (as many records as required, stored 17 curves per record with each "PSLB" consisting of one or more curves)

f. Transverse Slab Line configuration data (3 records containing 27 curves each)

g. Transverse Slab Line configuration data and Bearing seat index (1 record containing 11 "TSLB" curves and the Index to the bearing seat pages)

h. Span page containing computed span lengths, slab widths, and slab depths (as many records as required)

i. Bearing seat page containing computed coordinates and bearing seat elevations (as many records as required)

Each record is 1088 bytes long and is accessed using the basic direct access method (BDAM). Only one record of type 'a' is permitted per job. But record types b-i may be repeated in sequence for up to 17 bridges. A bridge may be defined as any group of simple and/or continuous spans that the designer logically wishes to group together.

The master index for a specific bridge is loaded when the NAME card is processed. If work has been done in a previous run, all indicies to the previous work are loaded into core along with the entire "TSLB" file. Bents, beams, "PSLB", and bearing seat data are loaded into core as needed by subroutines BNTLD, BPAGE, PSLD, and LDBRG respectively. Span page information is loaded as required by either subroutine LDBMC or LDBMS, depending on whether a continuous or simple span option has been used to compute the results being stored or retrieved.

To minimize the number of times the file is accessed data blocks containing fifteen bents, thirty-four beams, seventeen "PSLB" curves, ninety-two "TSLB" curves and all required indicies are kept resident in core as long as Command Structured Data is processed. Span and bearing seat data is accessed as required.

At the conclusion of the job all results are placed back in the file so that the file represents the latest run and the master index is altered to reflect the latest data file.

+ STAF (&&STAF)

This is the temporary disk storage for the station data file and is often referred to as the "station file". All of the records in this file are the same length - 3400 bytes. The records are accessed using ISAM (Indexed Sequential Access Method), and there may be a maximum of 1500 records on the file.

Within the station file are two types of records: original and design cross-sections, and final (as built) cross-sections. (Figure 13 shows the relative position of the records in the station file; Figure 14 shows the layout of the first type records; and Figure 15 shows the layout of the second.) Each record has a two-word key, 1 and the station number for the

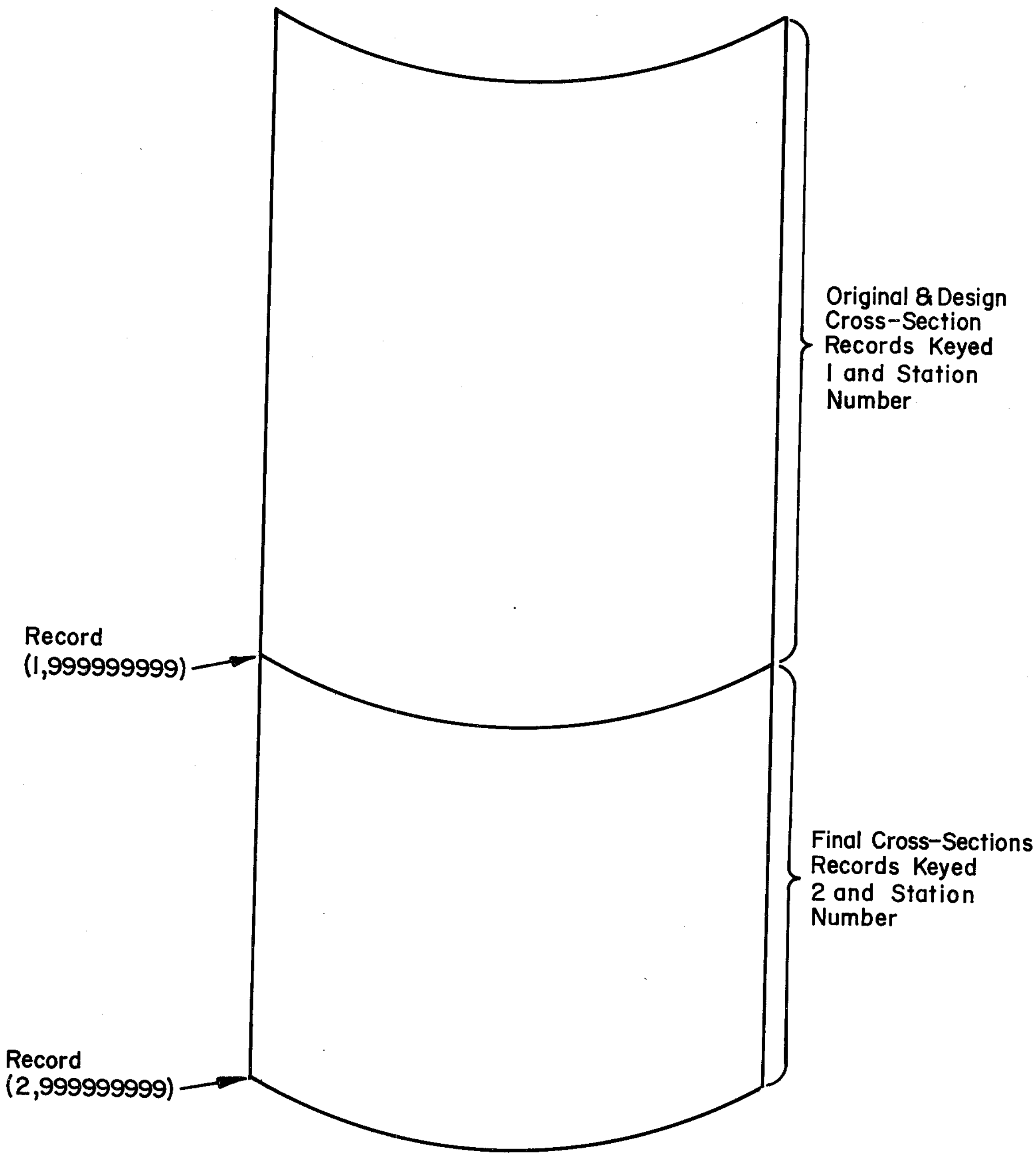


Figure 13. LAYOUT OF STATION FILE

Form X20-1702-0
Printed in U.S.A.

RECORD FORMAT

Application TIES STATION FILE Record Name STFIL By ______ Date April 20, 1972 Page ___ of ___

FIELD NAME	BASELINE STATION (BACK)	BASELINE STATION (FORWARD)		TERR ELEV (1)	TERR DIST (1)	← MAXIMUM OF 200 SETS OF TERRAIN CROSS-SECTION POINTS →	TERR ELEV (200)	TERR DIST (200)	DESIGN ELEV (1)	DESIGN DIST (1)	← MAXIMUM OF 150 SETS OF DESIGN CROSS-SECTION POINTS →	DESIGN ELEV (150)	DESIGN DIST (150)
CHARACTERISTICS*	INT	INT		INT	INT		INT	INT	INT	INT		INT	INT
RELATIVE POSITION	1	2	3	4	5		402	403	404	405		702	703

ROADWAY # 1																ROADWAY # 2
TEMP. STA. (BACK)	TEMP. STA. (FWD.)	CATCH & MEDIAN POINTS (2)		SHOULDER POINTS (2)		PROFILE GRADE POINT	CENTER LINE POINT	SUPER RATE	WIDEN LEFT	WIDEN RIGHT	TEMP. OFFSET	TEMP. SKEW	CUT AREA	FILL AREA		
INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT		
704	705	706	707	708	709	710	711	712	713	714	715	716	717	718		719 … 733

ROADWAY # 3	ROADWAY # 4
734 … 748	749 … 763

ROADWAY # 5	ROADWAY # 6
764 … 778	779 … 793

ROW DIST. LEFT	ROW DIST. RIGHT	CURVE RADIUS (±)	NUMBER OF TERRAIN POINTS	NUMBER OF DESIGN POINTS				ORDER OF ROADWAYS IN DESIGN SECTION						MAX SLOPE INTCPT LEFT	MAX SLOPE INTCPT RIGHT
INT	INT	INT	INT	INT				INT	INT	INT	INT	INT	INT	INT	INT
794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809

REFERENCE HUBS											
HUB 1		HUB 2		HUB 3		HUB 4		HUB 5		HUB 6	
ELEV.	DIST.	ELEV.	DIST.	ELEV.	DIST.	ELEV.	DIST.	ELEV.	DIST.	ELEV.	DIST.
INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT
810	811	812	813	814	815	816	817	818	819	820	821

CUT-FILL-MEDIAN CONDITION CODES											
ROADWAY 1		ROADWAY 2		ROADWAY 3		ROADWAY 4		ROADWAY 5		ROADWAY 6	
LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT
INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT	INT
822	823	824	825	826	827	828	829	830	831	832	833

File Description INDEX SEQUENTIAL
Recording Mode ______
Records per Block ______
Characters per Record ______
Label Records are ______
File Identification ______
File Serial Number ______
Reel Sequence Number ______
Creation Date ______
Retention Cycle ______

Remarks ______

SORTING FIELDS
Major 1 ______
2 ______
3 ______
4 ______
5 ______
6 ______
7 ______
8 ______
9 ______
10 ______
11 ______

FOOTNOTES

* Characteristics
Alphabetic or Blank ___ A
Alphanumeric ___ X
Numeric ___ 9
Assumed Decimal Point ___ V
Examples of Signed Fields
X9999 9999X
X999V99 9999V9X

REVISIONS

Date	By

Figure 14. LAYOUT OF ORIGINAL AND DESIGN CROSS-SECTION RECORDS

← Fold to Here

Form X20-1702-0
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RECORD FORMAT

Application TIES FINAL FILE Record Name STFIL By ______ Date July 1, 1971 Page ___ of ___

FIELD NAME	BASELINE STATION (BACK)	BASELINE STATION (FORWARD)	FINAL ELEV (1)	FINAL DIST (1)	← MAXIMUM OF 200 SETS OF FINAL CROSS-SECTION POINTS →	FINAL ELEV (200)	FINAL DIST (200)	NUMBER OF FINAL POINTS
CHARACTERISTICS*	INT	INT	INT	INT		INT	INT	INT
RELATIVE POSITION	1	2	3	4		401	402	403

File Description INDEX SEQUENTIAL
Recording Mode ______
Records per Block ______
Characters per Record ______
Label Records are ______
File Identification ______
File Serial Number ______
Reel Sequence Number ______
Creation Date ______
Retention Cycle ______

Remarks ______

SORTING FIELDS
Major 1 ______
2 ______
3 ______
4 ______
5 ______
6 ______
7 ______
8 ______
9 ______
10 ______
11 ______
12 ______

FOOTNOTES

* Characteristics
Alphabetic or Blank ___ A
Alphanumeric ___ X
Numeric ___ 9
Assumed Decimal Point ___ V
Examples of Signed Fields
X9999 9999X
X999V99 9999V9X

REVISIONS

Date	By

Figure 15. LAYOUT OF FINAL CROSS-SECTION RECORDS

Fold to Here

original records, and 2 and the station number for the final records. Each of the types of records ends with a dummy record with station number 999999999. The baseline equation table is stored on the dummy original record.

In the event that there are no station file records of any type, the station file (&&STAF) is not created (i.e., there is no dummy station file in the case where there are no cross-sections). However, if there are records of one type, but not another, there would be at least a dummy record for each type.

System Files

The System Files required by the Roadway Design System consist of a card reader, card punch, and line printer. There are several printer files generated by the system. A core dump facility is also provided.

+ FT05F001 (SYSIN)

This is the system card reader. Many routines read cards from this file.

+ FT06F001 (SYSER)

Error and processing messages are printed on this unit in order to keep them separate from the "formal" data printout. All of the records in this file are 133 bytes long. The records are stored and printed sequentially in the order generated. Many routines write on this file.

+ FT10F001 (SYSOT)

This is the system line printer, and is used to print out most of the "formal" reports generated by the Roadway Design System. Many routines write on this file. Each record is 133 bytes long.

+ FT11F001 (SYSAP)

This is an auxiliary print file used to print out auxiliary reports that are generated at the same time as other "formal" reports. Use of this file eliminates massive storage of print data. Each record is 133 bytes long. Several routines write on this file.

+ FT13F001 (SYPLT)

This is a plot information print file used to print out information generated by the plotting routines. Use of this file permits plot reports to be printed in one location, instead of being dispersed among other formal reports. Each record is 133 bytes long. Several routines write on this file.

+ SYSUDUMP

This is a system core dump facility. Using this facility, only the portion of core occupied by the program is dumped.