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CONTROL DATA

ICEM FACILITIES
VERSION 1
REFERENCE MANUAL

CDC OPERATING SYSTEMS

NOS

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LIST OF EFFECTIVE PAGES

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PREFACE

This manual describes the Integrated Computer-Aided Engineering and Manufacturing Facilities software (ICEM Facilities) which is executed under the control of the Network Operating System (NOS). ICEM Facilities is an application of ICEM Design/Drafting, formerly known as CD/2000, utilities which aid in the creation of facilities layout drawings. The ICEM Facilities release includes:

- Six customized user-defined tablet overlays.
- A set of GPL programs.
- ICEM Design/Drafting pattern libraries.
- FORTRAN 5 program report generator.
- NOS procedure files for program execution.
- Example layouts.
- HVAC capability.

AUDIENCE AND ORGANIZATION

The following sections support the facility designer and manager.

Section 1, INTRODUCTION, provides lists featuring ICEM Facilities software program capabilities and the design and drafting functions required by facility planners.

Section 2, ICEM FACILITIES EXAMPLE LAYOUT, provides an annotated, executable example as a training tool for program users. The example, which is contained on a trace file, differs markedly from the normal operation of ICEM Facilities in that the tablet pages are not attached to ICEM Facilities at the time the trace file is used. Therefore, the trace file cannot run when the tablet pages are attached. This section also includes a step-by-step description for creating a facility layout.

Section 3, OPERATOR INTERFACE, describes the design and drafting functions available to the planner on each of the six tablet overlays. MGR1 and MGR2 tablet overlays are intended to support the facility manager.

The general procedure to execute ICEM Facilities is located in Appendix L rather than the main body of the text.

The appendixes contain supplementary information for the support programmer as well as the facility designer and manager.

RELATED PUBLICATIONS

Publication	Publication Number
ICEM Design/Drafting Introduction and System Controls	60457130
ICEM DDN System Programmer's Reference Manual for NOS	60458560
ICEM Design/Drafting Data Management	60461410
ICEM Design/Drafting Basic Construction	60461420
ICEM Design/Drafting Drafting Functions	60461440
ICEM Design/Drafting GPL Programming Language	60462520
ICEM Design/Drafting User's Guide	60456940
NOS Version 2 Reference Set: Vol. 1 Introduction to Interactive Usage	60459660
Vol. 2 Guide to System Usage	60459670
Vol. 3 System Commands	60459680
NOS Full Screen Editor User's Guide	60460420
ICEM Tablet Overlay	60458080

CONVENTIONS

Since ICEM Facilities is based on ICEM Design/Drafting, knowledge of ICEM Design/Drafting is assumed for this manual. Refer to the ICEM Design/Drafting manual set for further explanation.

ICEM Design/Drafting, on which ICEM Facilities operates, is a menu driven product. The ICEM Design/Drafting manual set uses the same menu structure in organizing the product description. One of the control keys in the ICEM Design/Drafting program is the letter F, which normally returns you to the master menu. In this manual most ICEM Design/Drafting command menu strings assume you are at this start point, unless the text refers to a particular prompt.

In general, all references to the ICEM Design/Drafting manual set and the ICEM DDN System Programmer's Reference Manual for NOS will be referred to without the F prefix.

In this manual, tablet pick refers to the following:

- The action of picking a tablet square.
- The tablet square itself.

The distinction between a tablet square and a tablet pick is important only when a tablet page is being programmed or a tablet overlay is being created as a drawing.

DISCLAIMER

This product is intended for use only as described in this document. Control Data Corporation cannot be responsible for the proper functioning of undescribed features or parameters.

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APPENDIXES

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FIGURES

INTRODUCTION 1

The ICEM Facilities software package:

- Creates basic building plans.
- Generates a construction cost estimate.
- Generates a bill of materials for open office components and furniture.
- Generates output plots on any of the over 150 plotter/controller combinations supported by ICEM through UNIPLOT.

The purpose of ICEM Facilities is to aid in the architectural design of office buildings and in construction drawing. The ICEM Facilities program provides the following design and drafting functions required by facility planners:

- Multilevel construction planning. ICEM Facilities allows multiple level construction (shell structure, HVAC, electrical, furniture, and so forth). This allows for:
  - Color differentiation.†
  - Blank/unblank or plotting to be performed on a specific level or combination of levels.

    A pattern library for office construction. ICEM Facilities contains a pattern library for Haworth Open Office construction. This library is easily modified to meet the needs of the customer. For example, Steelcase construction could be added to the existing library.
  - Construction macros for walls, doors, windows and other elements. Since the construction macros were developed using the ICEM Graphics Programming Language (GPL), they are easily modified. Similar capabilities can be added to the application.
  - A library of standard interior construction symbols. ICEM Facilities contains an updatable pattern library for interior construction symbols (light fixtures, new construction or remove construction indicators, and so forth).

ICEM Facilities is available for use on CYBER 170 Series 700, Series 800 and 17x computer systems with NOS. ICEM Design/Drafting is a prerequisite to, and the base application for, ICEM Facilities. Output plots can be generated on any of the over 150 plotter/controller combinations supported through UNIPLOT.

The ICEM Facilities package can be customized according to your standards of construction and design. Programs can be tailored, pattern libraries updated, and GPL functions modified or added according to your needs. Report data bases and reports may also be tailored.

†A terminal dependent feature.

A GENERAL STATEMENT OF TABLET USE

ICEM Facilities can have up to two defined tablet pages or overlays in addition to the fixed overlay present on the ICEM Design/Drafting tablet. Using the tablet pen you can activate any of the ICEM Design/Drafting overlays listed at the top of the fixed overlay (BFU, BFL, AD, DFT, N/C, DBM, DC, SC1, SC2) as well as ICEM Facilities overlays (FAC1, LAY1, HAW1, MGR1 and MGR2, and ROFF1).

As illustrated below, the tablet can contain up to three tablet overlays:

- A fixed page present on the tablet overlay.
- A user definable tablet overlay.
- A second user definable tablet overlay.

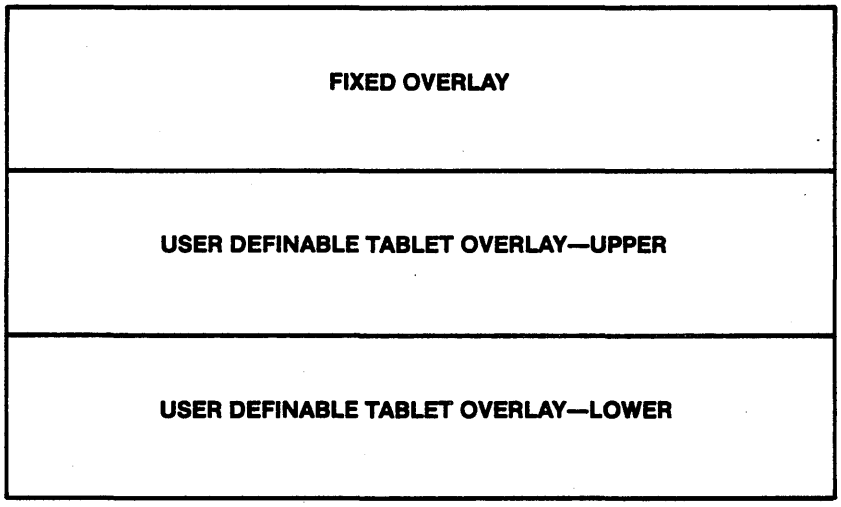


Figure 1-1. The Three Tablet Overlays on the Tablet

Examine the fixed tablet overlay. The tablet picks shown on this overlay represent key operations available through all ICEM Facilities functions.

Remove the ICEM Facilities tablet overlays located in appendix C. Use these overlays to study the tablet picks discussed in section 3. An ICEM Design/Drafting GPARTS file named FACGPRT, provided as part of ICEM Facilities, contains drawings of the tablet overlay. These drawings can be accessed using the LAY1 tablet picks RESTORE FAC1 LAY1, RESTORE ROFF1, RESTORE HAW1, and RESTORE MGR1 MGR2. Your site programmer can reproduce extra overlays when needed. Specific steps to change overlays are described in appendix L. Figure 1-2 illustrates the overlay access built into ICEM Facilities.

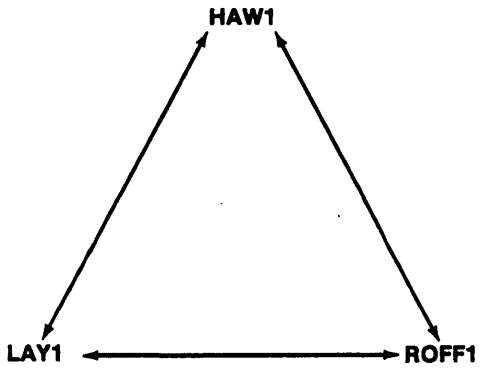


Figure 1-2. Overlay Access

ICEM Facilities software package is tablet menu driven. That is, ICEM Facility graphic programs are activated on a tablet overlay, which is placed on the tablet menu surface. (See figure 1-3.)

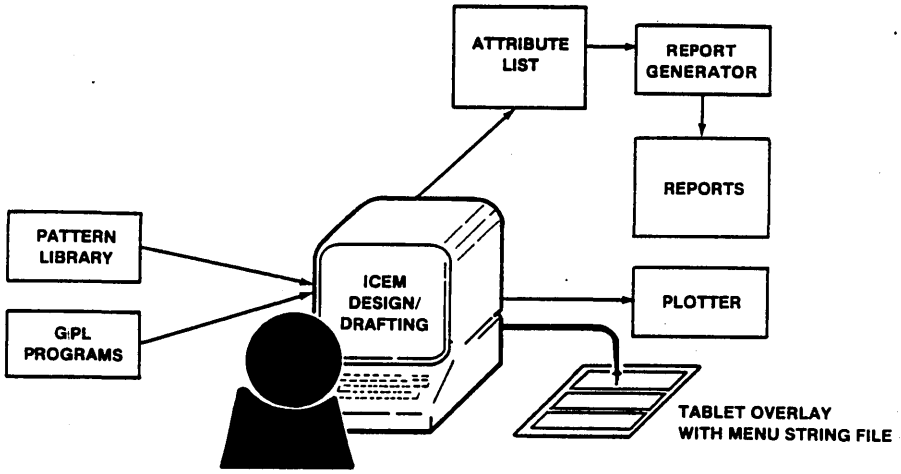


Figure 1-3. A Depiction of ICEM Components

ICEM FACILITIES EXAMPLE LAYOUT 2

GENERAL APPROACH USED

This section of the manual is composed of two subsections:

- TRACE FILE EXECUTION illustrates how a facilities layout is created.
- EXAMPLE FACILITIES LAYOUT STEP-BY-STEP DESCRIPTION demonstrates how to create the facilities layout illustrated in the TRACE FILE subsection.

The following is a description of an example facilities layout. This is only one approach to using ICEM Facilities. The general approach to this layout is first to set up the work by initializing the part. Part initialization sets the scale factor and activates the grid. When the work space is set up, the permanent structure layout is completed, and the interior walls constructed. When the permanent structure is finished, office furniture is placed on the layout. Finally new construction is planned with the addition of new construction walls and symbols.

This example has been kept simple to make it short. You can contrast this problem to some of the more complex layouts provided on the ICEM Facilities GPARTS file named FACGPRT. These layouts may be accessed using the LAY1 tablet picks RESTORE ETC DEMO and RESTORE CDC LAYOUT.

TRACE FILE EXECUTION

The following example layout has been prepared on a trace file named EXAMPLE. Refer to the ICEM Design/Drafting Introduction and System Controls manual for more information on trace files.

NOTE

This trace file is not a facility function, and a tablet overlay cannot be attached when running it.

The EXAMPLE trace file illustrates how a facilities layout is created. To run the trace file, follow these steps.

1. Log in to a graphics terminal with ICEM Facilities installed by or available to the user name. Login procedures vary with the type of installation you are using. Refer to the NOS Version 2 Reference Set, Volume 1 or 2, depending on whether your application is interactive or batch.

2. Execute the command BEGIN,EXTRACE,ICEMFAC.

NOTE

This procedure was written assuming that ICEM Design/Drafting, Version 1.60, is stored as a direct access file named ICEMDDN on user name APPLLIB. This procedure also assumes a direct access file named GOLIB is on user name APPLLIB. If these assumptions are incorrect, you must change lines 7 through 9 of the procedure EXTRACE in file ICEMFAC to specify the file name and user name in use.

3. Answer the prompts:

   a. BAUD RATE

   b. TERMINAL CONFIGURATION

      (Specific for your terminal)

      (A tablet cannot be attached when running this trace file.)

   c. ENTER PART NAME

      EXAMPLE

   d. SHEET NUMBER

      1

   e. NEW PART ASSUMED

      ---UNITS OF MEASURE

      2

   f. ---DRAFTING STANDARD

      1

4. When the main menu appears, enter the ICEM Design/Drafting command menu string:

   F.1.17.4.EXT

The trace file is now running and will pause when the part on the screen matches the figures on the following pages. Enter a carriage return to continue running the trace file.

Upon completion of the trace file, you are encouraged to experiment with the part. Different levels of the part may be viewed by using the BLANK and UNBLANK menu selections (F.2).

You may terminate the session by entering the command:

F.4.7.Y

EXAMPLE FACILITIES LAYOUT STEP-BY-STEP DESCRIPTION

The following will guide you through the process of creating a facility floor plan as simulated by the trace file. Before preceding with this section, run the trace file to see how the facility floor plan is created in this section.

Create the floor plan by following the step-by-step descriptions and the trace file illustrations in this section. Refer to section 3 of this manual for descriptions of the tablet picks. The procedure to execute ICEM Facilities is located in appendix L rather than in the main body of this reference manual.

STEP 1 - INITIALIZE PART

Enter ICEM Design/Drafting and attach the FAC1 and LAY1 tablet overlays as described in the ICEM Facilities setup procedure in appendix L, then initialize the part file (FAC1 tablet pick INITIALIZE PART FILE).

STEP 2 - SET GRID PARAMETERS

Set the grid parameters. The parameters for this example are set at 48" by 48". Activate and display the grid (FAC1 tablet picks GRID", GRID ACTIV., GRID DISP.).

STEP 3 - BUILDING PERIMETER LAYOUT

Construct the building perimeter using doors, walls, and windows. See figure 2-1 (LAY1 tablet pick BEGIN LAYOUT).

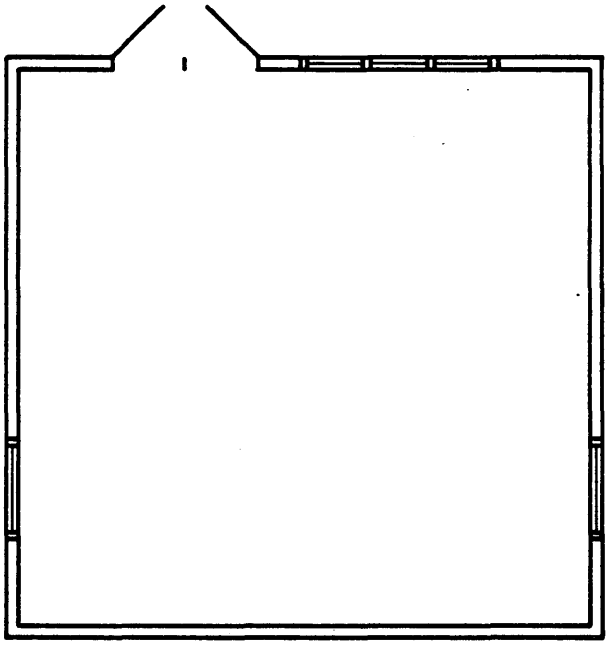


Figure 2-1. The Building Perimeter

STEP 4 - INTERIOR WALL LAYOUT

Construct the permanent interior wall layout. See figure 2-2 (LAY1 tablet pick BEGIN LAYOUT).

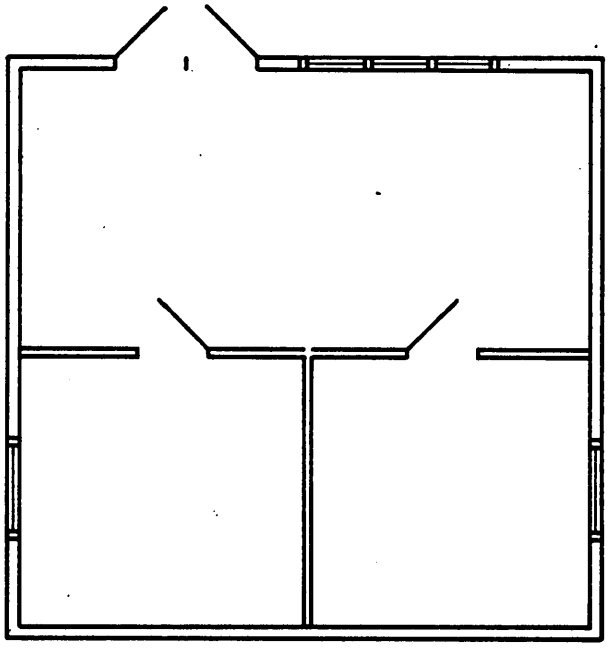


Figure 2-2. The Interior Wall Layout

STEP 5 - TRIM WALLS

Trim the line entities that make up the interior walls. See figure 2-3 (FAC1 tablet pick TRIM CURVES MIDDLE). Connect line entities to complete the tee in the wall. See figure 2-3 (FAC1 tablet pick LINE JOIN CURVES).

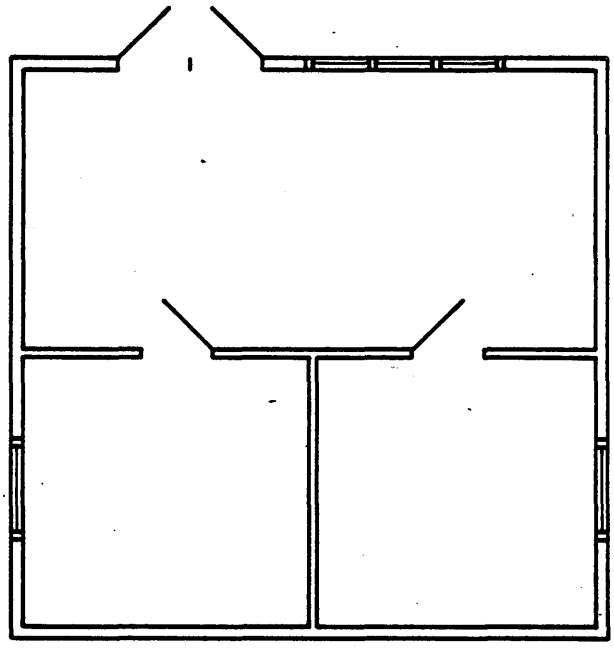


Figure 2-3. The Interior Wall Layout with Line Entities Trimmed

STEP 6 – OFFICE FURNITURE

Place the office furniture in the office layout on level 7 by retrieving patterns from the tablet overlay ROFF1. See figure 2-4. Attach ROFF1 with tablet pick CHANGE PAGE OFFICE FURNITURE (ROFF1) from tablet overlay LAY1. Use FAC1 tablet pick SET LEVELS to change levels. Refer to the description of the ROFF1 tablet overlay picks in section 3 of this manual.

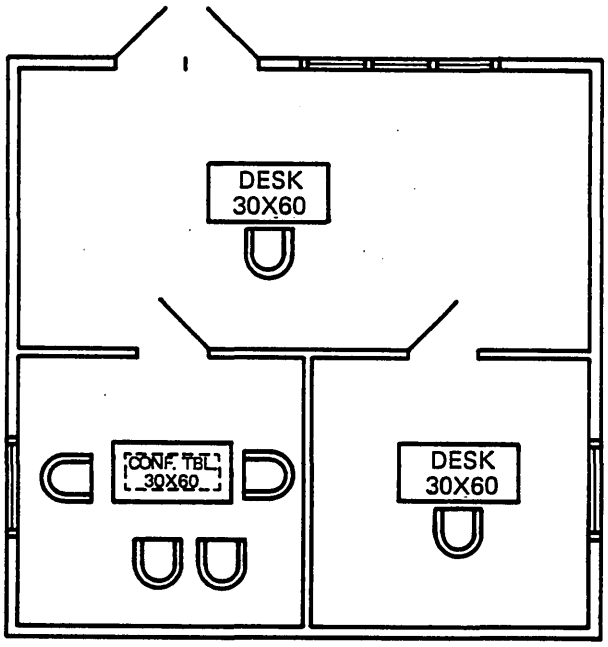


Figure 2-4. The Placement of Office Furniture

STEP 7 - NEW CONSTRUCTION WALLS

New construction walls are created and placed on level 101. See figure 2-5 (FAC1 tablet pick SET LEVELS and LAY1 tablet pick BEGIN LAYOUT).

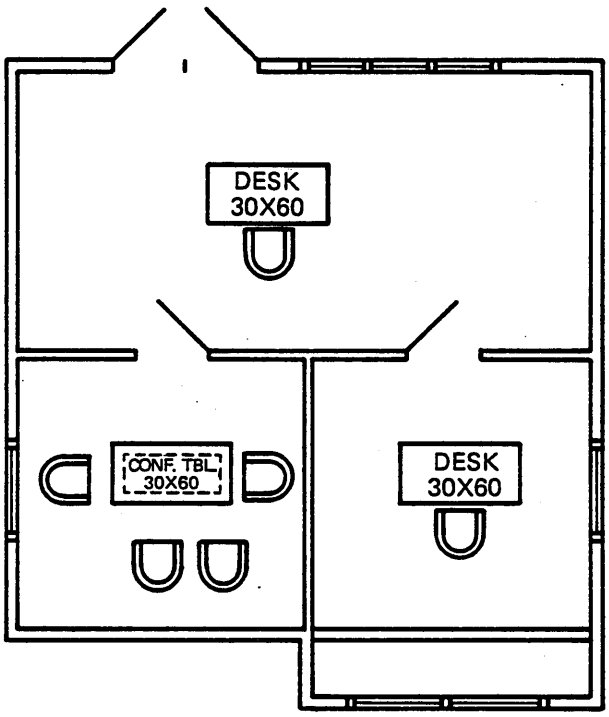


Figure 2-5. The New Construction Walls

STEP 8 - NEW CONSTRUCTION SYMBOLS

New construction symbols were added. See figure 2-6 (LAY1 tablet picks NEW WALL SYMBOLS and NEW DOOR SYMBOLS).

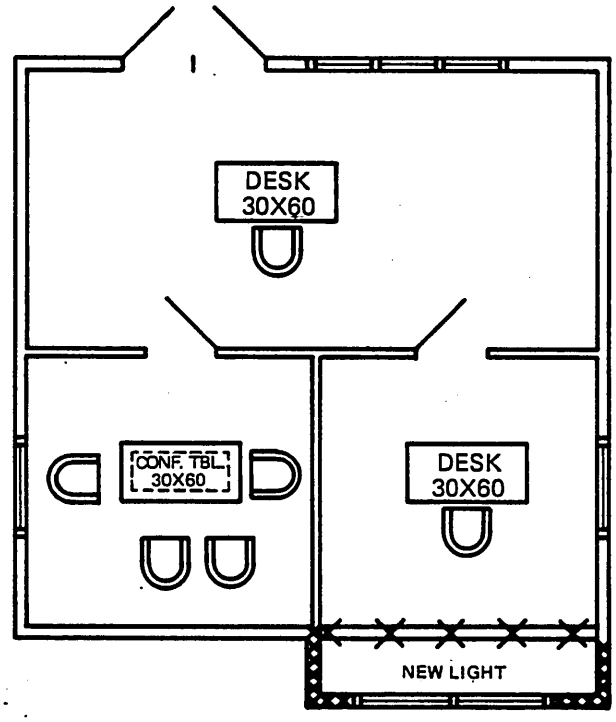


Figure 2-6. The New Construction Symbols

ICEM Facilities is organized with the ICEM Design/Drafting tablet and Graphic Programming Language (GPL) capabilities. There are six overlays in the tablet section supplied with the product.

FAC1	Facilities Functions
LAY1	Facilities Layout
HAW1	Haworth Layout
ROFF1	Office Furniture Layout
MGR1	Fac Man (Top) (Facilities Manager)
MGR2	Fac Man (Bottom) (Facilities Manager)

The LAY1 overlay section uses nonstandard ICEM Design/Drafting prompts. This manual offers the only reference available for the LAY1 prompts.

OVERLAY PAGE DESCRIPTION

The overlay is the sheet that is placed on the tablet. Each overlay may contain up to 10 rows and 20 columns of tablet pen addressable tablet picks. Overlay FAC1, in appendix C, is the best example of the use of nearly all of the tablet picks on a tablet overlay.

The page contains the list of subordinate instructions which ICEM Design/Drafting interprets and carries out. Both the overlay and the page have the same name to avoid confusion in ICEM Facilities. Each tablet pick on the overlay points to instructions corresponding to the tablet pick on the page. Appendixes B and C expand on this brief discussion.

TABLET OVERLAY PICKS

This section is organized to describe the tablet picks in each of the tablet overlays. Each description is preceded by a graphic depiction of the tablet pick, and a reduced outline of the overlay in which the location of the tablet pick is highlighted. This will help to locate the tablet pick on the overlay.

FACILITIES FUNCTIONS	BLANK ALL	BLANK LEVELS	PERM. STRUCT	DEMOUN-TABLE WALLS	ROOM NUMBER	TITLE BLOCK	FURN-ITURE	COMPO-NENTS	MECH. LAYOUT	POWER LAYOUT	CEILING GRID	LIGHT LAYOUT	FIRE ROUTES	SPACE ACCTG.	ALL CURENT LAYOUT	ALL CURRENT LAYOUT		BLANK ALL POINTS	DISPLAY	FILE NO TERM.
	UNBLNK ALL	UNBLNK LEVELS		NEW CONST. WALLS	N.C. ROOM NO.S	N.C. TITLE BLOCK	N.C. FURN-ITURE	N.C. COMPO-NENTS	N.C. MECH. LAYOUT	N.C. POWER LAYOUT	N.C. CEILING GRID	N.C. LIGHT LAYOUT	N.C. DIMEN-SIONS	N.C. SYMBLS	N.C. MISC. TEXT	ALL NEW CONSTRUCTION		UNBLNK ALL POINTS	2-D	3-D
	BLANK	DELETE	MODIFY LEVEL / PEN		TITLE BLOCK	MODAL STATUS	GRID DISP.	GRID PARAM	GRID ACTIV.	STRING	OFFSET CURVE	STRTCH	ENTITY MANIP.	LEFT JUST	CENTER JUST	RIGHT JUST	90° / 0° PLACE ON PATTERN LEVEL		LIST GPL	LIST ZOOMS
	SINGLE	CHAIN	SOLID	DASH	SOLID	DASH	24"	30"	TRANS-LATE	DUPL. AND TRANS.	DRAG	DUPL. AND DRAG	MIRROR	NOTE	TEXT ANG CTRL PARLEL	TEXT ANG CTRL NONE	180°	270°	LIST GLOBAL PARTS	LIST LOCAL PARTS
	DELETE		FONT		MODIFY FONT		GRID													
	REG/ IN	REG/ OUT	PHANT.	C-LINE	PHANT.	C-LINE	48"	60"	ROTATE	DUPL. AND ROTATE	RECT-ANGLAR ARRAY	GROUP	OTHER CURVES	LABLE	1/8" CHAR. SIZE	1/4"	GPL	RUN GPL	LIST PRIM PATTRN	LIST SEC PATTRN
	DELETE A LEVEL	DELETE ALL POINTS	CONST. MODAL	SINGLE FROM GROUP	MENU/ CURSOR MODE	MODALS	LINE	LINE SCRN POS	LINE JOIN CURVES	LINE PARLEL	LINE JOIN 2 PTS	ATTRIB INTERO GATE	ATTRIB COUNT	DRFTNG	3/8" CHAR. SIZE	1/2"	BALLOON CREATE	BALLOON MODIFY	LIST VARS.	LIST ENTITY INFO.
	ONE END	TWO ENDS	ENTITY DRAG ON		DATA VERIFY ONE ENT.	TWO ENT.	POINT	POINT SCRN POS	POINT CURVE END	POINT DELTA	POINT CURVE INTER	ATTRIB	IND. ATTRIB	DRFTNG MODALS	CHAR. SIZE	NEW ORIGIN	90° / 0° PLACE ON CURRENT LEVEL		PART	PATTRN
	TRIM CURVES MIDDLE	TRIM CURVES TWO CURVES	ENTITY DRAG OFF				CIRCLE	CIRCLE POS./ RAD.	CIRCLE CENTER RAD.	HEXA-GON	RECT-ANGLE	BILL OF MATRL.	FIND TOTAL	CANON	MODIFY TEXT	NEW DISP VALUES	180°	270°	PATTERN RETR	PATTERN CREATE
	SET LEVELS			N.C. WALLS	N.C. ROOM NO.S	N.C. TITLE BLOCK	N.C. FURN-ITURE	N.C. COMPO-NENTS	N.C. MECH. LAYOUT	N.C. POWER LAYOUT	N.C. CEILING GRID	N.C. LIGHT LAYOUT	N.C. DIMEN-SIONS	N.C. SYMBLS	N.C. MISC. TEXT		SPECL. FUNCT.		INITIALIZE PART FILE	
NAME: FAC1			PERM. STRUCT	DEMOUN-TABLE WALL	ROOM NO.S	TITLE BLOCK	FURN-ITURE	COMPO-NENTS	MECH. LAYOUT	POWER LAYOUT	CEILING GRID	LIGHT LAYOUT	FIRE ROUTES	SPACE ACCTG.	MISC. TEXT		CALCU-LATE	PLOT		

FAC1

TABLET OVERLAY

General purpose for level management and ICEM Design/Drafting operations used throughout ICEM Facilities.

FAC1 TABLET OVERLAY

This section describes how to use the FAC1 tablet overlay selections.

Activation

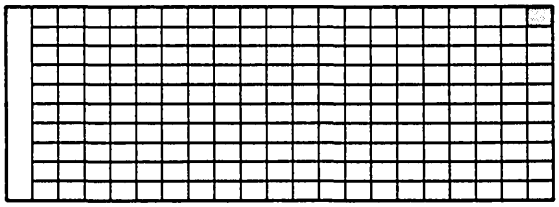
Follow the steps outlined in appendix L for use of the FAC1 tablet overlay.

Use

The overlay is divided into 32 sections.

- FILE NO TERMINATION
- LINE
- POINT
- CIRCLE
- SPECIAL FUNCTIONS
- CALCULATE
- PLOT
- PART and PATTERN
- GPL
- DRAFTING
- LIST
- BALLOON
- CANON
- MENU/CURSOR MODE, MODALS, DATA VERIFY
- ENTITY DRAGGING
- FONT
- TITLE BLOCK, MODAL STATUS
- MODIFY LEVEL/PEN
- TRIM CURVES
- DELETE
- ENTITY MANIPULATION

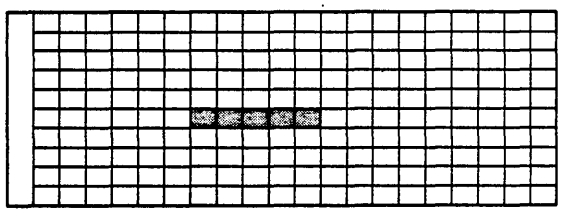
- OFFSET CURVE
- STRING
- ATTRIBUTE, BILL OF MATERIALS
- SET LEVELS
- BLANK/UNBLANK LEVELS
- BLANK/UNBLANK POINTS
- SINGLE SELECT FROM GROUP
- DISPLAY, LIST ZOOMS
- GRID
- INITIALIZE PART FILE
- CONSTRUCTION MODAL



FILE
NO
TERM.

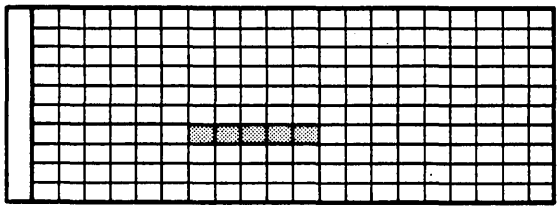
The tablet pick FILE NO TERM. (refer to the ICEM Design/Drafting Introduction and System Controls manual for more information on File/Terminate) files the current part under the current name without terminating ICEM Facilities. Use this tablet pick frequently to ensure minimal loss in time should the system go down.

LINE	LINE SCRN POS	LINE JOIN CURVES	LINE PARLEL	LINE JOIN 2 PTS



The tablet picks above create a line using various options. The tablet pick LINE selects the main option menu. You may choose some of the options listed there by selecting the tablet picks to the right of LINE. The tablet picks are described in the ICEM Design/Drafting Basic Construction manual.

Tablet Pick	Section in Chapter 2
LINE	Using Menu 10
LINE SCRN POS	10.1 SCREEN POSITION
LINE JOIN CURVES	10.4 TANTO 2 CURVES
LINE PARLEL	10.10 PARLEL TO LINE
LINE JOIN 2 PTS	10.3 JOIN 2 PTS



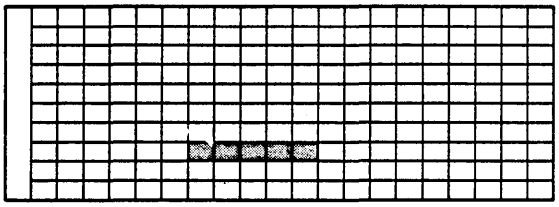
POINT	POINT SCRN POS	POINT CURVE END	POINT DELTA	POINT CURVE INTER

The tablet picks above create a point using various options. The tablet pick POINT selects the main option menu. You may choose some of the options listed there by selecting the tablet picks to the right of POINT. The tablet picks are described in the ICEM Design/Drafting Basic Construction manual.

Tablet Pick	Section in Chapter 1
POINT	Using Menu 9
POINT SCRN POS	9.1 SCREEN POSITION
POINT DELTA	9.4 DELTA
POINT CURVE END	9.8 CURVE END
POINT CURVE INTER	9.9 INTERSECT 2 CURVES

Each point entity is marked on the screen by a small x.

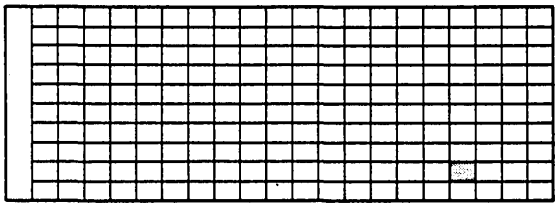
CIRCLE	CIRCLE POS./ RAD.	CIRCLE CENTER RAD.	HEXA-GON	RECT-ANGLE



The tablet picks above provide three options in creating a circle and the methods to construct a hexagon and rectangle. CIRCLE (chapter 3 of the ICEM Design/Drafting Basic Construction manual) lists the master menu. The master menu includes the other circle related menu options. CIRCLE POS./RAD. allows you to use the screen to pick the center (chapter 3, section 11.1 of the ICEM Design/Drafting Basic Construction manual). CIRCLE CENTER RAD, requires that you provide the center coordinates of the circle to be constructed (chapter 3, section 11.2 of the ICEM Design/Drafting Basic Construction manual).

The HEXAGON tablet pick allows creation of a hexagon in a plane. The hexagon is defined so that the opposite sides are parallel to either the X transform axis or the Y transform axis. Prompts are discussed in chapter 4, section 12.7.3 of the ICEM Design/Drafting Basic Construction manual.

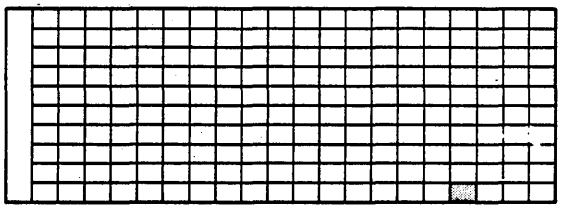
The RECTANGLE tablet pick defines a rectangle in the plane of definition. The sides of the rectangle are parallel to the X and Y transform axes. The position and dimensions of the rectangle are determined by user-specified positions of the two diagonal vertices. Prompts are discussed in chapter 4, section 12.7.2 of the ICEM Design/Drafting Basic Construction manual.



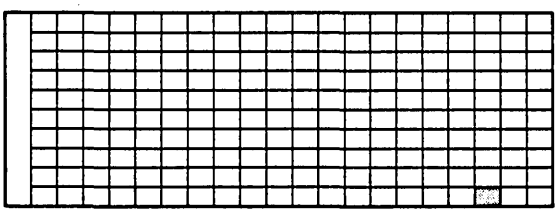
SPECL.
FUNCT.

The tablet pick SPECL. FUNCT. selects functions as listed in chapter 1 of the ICEM Design/Drafting Data Management manual. Included are the areas of GPL, Management of Variables, Level Management, Attribute Management, and Misc. Construction.

CALCU-
LATE



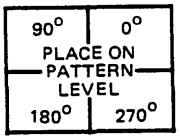
The tablet pick CALCULATE allows you to input a series of numbers as you would on a manual calculator, using the numbers and numeric operators (*,+,-,/) located at the top third of the tablet. A small GPL program evaluates the expression and prints out the result. You can continue calculations until you enter], [, or a carriage return.

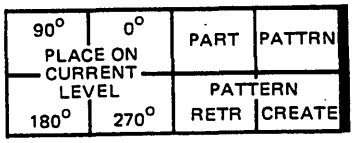


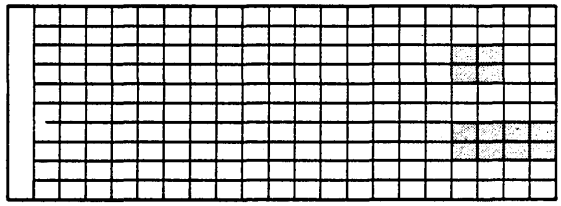
PLOT

Tablet pick PLOT produces a plot file that can be sent to a plotter to produce a hardcopy of the drawing you produced on the screen, at a scale you specify. For further information on prompts, refer to chapter 3 and appendix B of the ICEM Design/Drafting Data Management manual and appendix B.

The plot file is stored on a local file named TAPE9. After the ICEM Facilities session is ended, you can either make this a permanent file or copy it to tape.





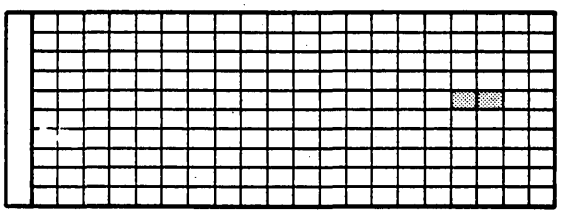


The tablet pick PART displays the main parts menu (chapter 2, section 6.1 of the ICEM Design/Drafting Data Management manual) in which you can provide back up services for your parts. Tablet pick PATTRN places you at the master menu of Pattern Management. See chapter 2, section 6.2 of the ICEM Design/Drafting Data Management manual for further information. Chapter 2, section 6.2 of the ICEM Design/Drafting Data Management manual discusses the various pattern management options.

Tablet pick PATTERN CREATE allows you to create a pattern. See chapter 2, section 6.2.2 of the ICEM Design/Drafting Data Management manual for prompts. The tablet pick PATTERN RETR allows you to retrieve a pattern by name. The prompts displayed are described in chapter 2, section 6.2.3 of the ICEM Design/Drafting Data Management manual. The two sets of 4 tablet picks, PLACE ON PATTERN LEVEL, and PLACE ON CURRENT LEVEL are intended for use in placing patterns at right angle orientations. The pattern may retain the original level it was stored on or be changed to the current level or any other level.

NOTE

The PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL picks can only be used immediately after the PATTERN RETR pick.

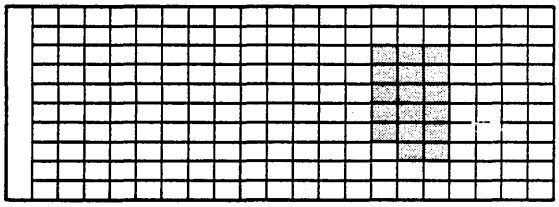


GPL	RUN GPL

With the tablet pick GPL you can access the GPL programming function within ICEM Design/Drafting. The ICEM Design/Drafting GPL Programming Language manual describes those functions in detail.

The tablet pick RUN GPL allows you to run a named GPL program. See the ICEM Design/Drafting GPL Programming Language manual for specific responses and operations. Appendix D of this manual lists GPL programs you may execute.

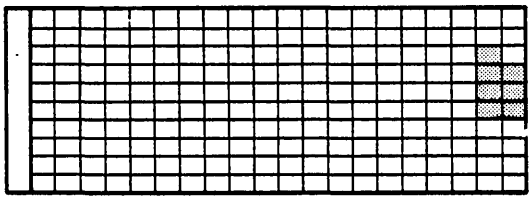
LEFT JUST	CENTER JUST	RIGHT JUST
NOTE	TEXT ANG CTRL PARLEL	NONE
LABLE	1/8"	1/4"
	CHAR. SIZE	
DRFTNG	3/8"	1/2"
DRFTNG MODALS	CHAR. SIZE	NEW ORIGIN
	MODIFY TEXT	NEW DISP VALUES

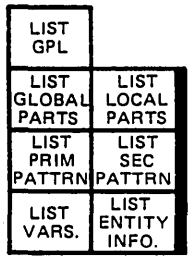


The tablet picks above allow you to place notes, labels, and dimensions on your drawing. The tablet picks NOTE, LABEL, DRFTNG select the menus suitable for these purposes. The drafting functions assume various settings which you may adjust by picking DRFTNG MODALS. Text placement, one of these modals, is normally located relative to a beginning point. The relationship between the point and text is determined by using LEFT JUST, CENTER JUST, and RIGHT JUST tablet picks. TEXT ANG CTRL tablet picks allow you to write a note parallel to a line or arc (tablet pick PARLEL) or write all text horizontally (tablet pick NONE). Four character sizes have been pre-programmed into the tablet picks 1/8", 1/4", 3/8", and 1/2". You may optionally choose to use tablet pick CHAR. SIZE to set your own text size. If a note is written over, for example by new construction, simply use the tablet pick NEW ORIGIN to move the text location. Likewise, if the wording of the text needs to be changed, select MODIFY TEXT. The tablet pick NEW DISP VALUES allows the display and modification of the text and dimensions values. The various entities subject to modification are affected selectively by these display values so the modals displayed will vary with the entity selected.

The tablet picks are described in the ICEM Design/Drafting Drafting Functions manual.

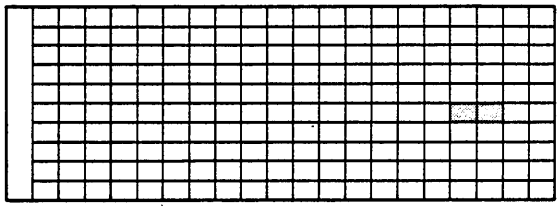
Tablet Pick	Section in Chapter 1
LEFT, RIGHT, CENTER JUST	16.1.2 TEXT JUSTIFICATION
NOTE	16.10 NOTE
TEXT AND CTRL PARLEL NONE	16.1.5 TEXT ANGLE CONTROL
LABEL	16.11 LABEL
DRFTNG	Using Menu 16
DRFTNG MODALS	16.1 DRAFTING MODALS
CHAR. SIZE	16.1.1.1 CHARACTER SIZE
NEW ORIGIN	16.13.1 NEW TEXT ORIGIN
MODIFY TEXT	16.13.6 MODIFY TEXT
NEW DISP VALUES	16.13.5 NEW DISPLAY VALUES



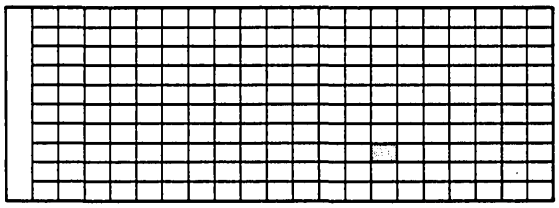


Each of the respective tablet picks is a request for a listing of the subject indicated. The tablet picks are described in the ICEM Design/Drafting Data Management manual.

Tablet Pick	Section in Chapters 1 and 2
LIST GPL	5.13.4 LIST GPL NAMES
LIST GLOBAL PARTS	6.1.2.3 LIST
LIST LOCAL PARTS	6.1.3 LIST ON-LINE PART FILE
LIST PRIMARY PATTERN	6.2.5.1 LIST PRIMARY LIBRARY
LIST SEC PATTERN	6.2.5.2 LIST SECONDARY LIBRARY
LIST VARS.	5.3.4 LIST RUN TIME LIBRARY VARIABLES
LIST ENTITY INFO.	6.6.1 ENTITY INFORMATION

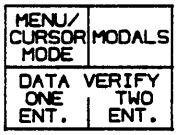


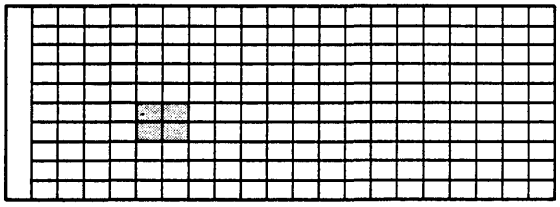
The tablet pick BALLOON allows you to create and modify a balloon symbol. A balloon symbol is a drafting shaped balloon which may contain a name and sheet reference pointing to an area of the drawing. Answer the prompts requested. References to these tablet picks are in chapter 1 of the ICEM Design/Drafting Drafting Functions manual (section 16.4 BALLOON and 16.13.13 BALLOON MODIFICATION).



CANON

CANON is intended for advanced users and your programmer. With it, you can examine an entity and read and modify the contents of Tables 2 and 3 of a selected graphics entity. This function is described in chapter 1, section 5.1 of the ICEM Design/Drafting Data Management manual. You may also dump the current part to inspect the values of COMMON which includes Tables 1, 4, and 5 (chapter 2, section 6.7 of the ICEM Design/Drafting Data Management manual). These tools are intended to allow the advanced user and programmer to directly access the data base containing the entities.

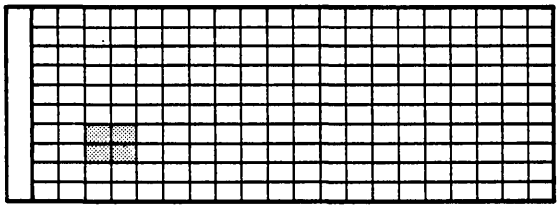




The MENU/CURSOR MODE tablet pick allows you to select two of the following for input: the keyboard, tablet or the crosshairs. Select from the menu displayed. Refer to chapter 3, section 1.15.1 of the ICEM Design/Drafting Introduction and System Controls manual for more information.

The MODALS tablet pick selects the master menu option for Modals and Fonts. Refer to chapter 3 of the ICEM Design/Drafting Introduction and System Controls manual for options.

The DATA VERIFY tablet picks provide two options in the data verify mode. ONE ENT. displays the geometry data associated with a single entity, as well as attributes. The numerous data formats of the various kinds of entities are not reproduced here. Refer to chapter 6, section 14.1 of the ICEM Design/Drafting Basic Construction manual for more information. TWO ENT. allows you to choose two geometric entities (points and lines only) and display related information. Refer to chapter 6, section 14.2 of the ICEM Design/Drafting Basic Construction manual for more information and specific formats displayed.

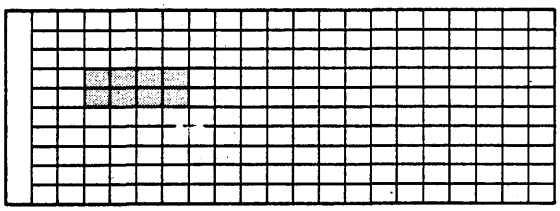


ENTITY DRAG ON

ENTITY DRAG OFF

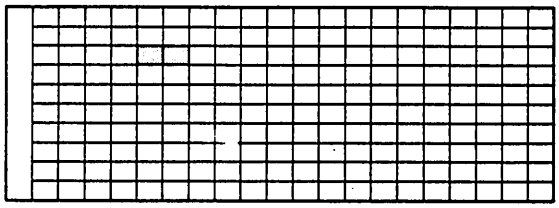
The entity dragging function allows you to locate the origin of entities either with the cursor or by placing a copy of the entity in its exact position. This second method is called entity dragging and is used in 13.5 TRANSLATE and 13.8 DUPLICATE AND TRANSLATE. Refer to chapter 3, section 1.14.3 of the ICEM Design/Drafting Introduction and System Controls manual for further information.

SOLID	DASH	SOLID	DASH
FONT		MODIFY FONT	
PHANT.	C-LINE	PHANT.	C-LINE



The left four tablet picks under the heading FONT specify the font used to display subsequently created lines, arcs, conics, 2-dimensional splines, 3-dimensional splines, strings, and Bezier curves in the drawing. See chapter 3, section 1.5 of the ICEM Design/Drafting Introduction and System Controls manual for further information on the various options as indicated on the tablet picks.

The right four tablet picks under the heading MODIFY FONT allow you to change the display font of an existing line or curve. A repaint (using the control key) allows you to display the new font. See chapter 3, section 1.6 of the ICEM Design/Drafting Introduction and System Controls manual for further information. Since you are modifying the existing entity displayed, you will have to answer the prompts and indicate the entities you desire to change.

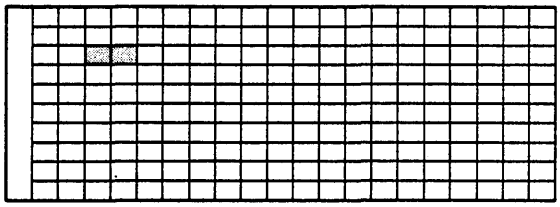


TITLE BLOCK	MODAL STATUS

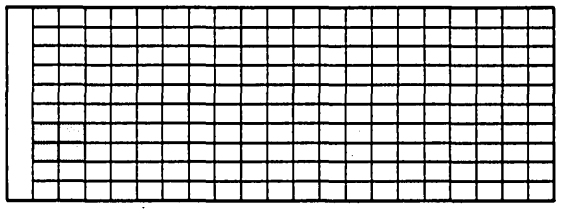
The two tablet picks above temporarily display information about the current part and modal setting status. The TITLE BLOCK tablet pick displays a block of information regarding the drawing you are working on. The drawing will be printed out after you indicate, with the cursor, where you want the block displayed. See chapter 3, section 1.13 of the ICEM Design/Drafting Introduction and System Control manual for a listing.

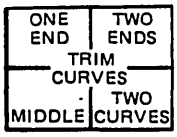
The MODAL STATUS tablet pick displays a number of modal settings. By subsequently entering], you may see more modals. See chapter 3, section 1.12 of the ICEM Design/Drafting Introduction and System Control manual for further information.

MODIFY
LEVEL / PEN



The tablet pick MODIFY LEVEL/PEN allows you to change the level number of a particular entity. Since you are selecting entities you must decide how it is done. Follow the prompts. You can change the pen number (the line thickness) at this point also. See chapter 3, section 1.7 of the ICEM Design/Drafting Introduction and System Controls manual for prompt options and more information.



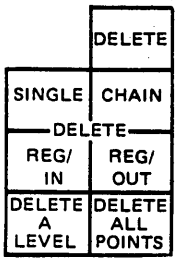


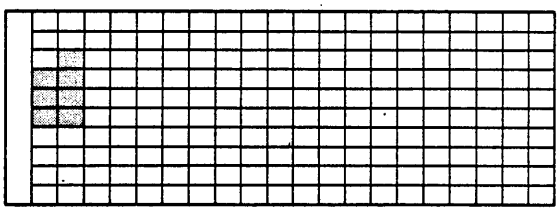
The tablet pick TRIM CURVES allows you to trim one or more existing lines, arcs, conics, and 2-dimensional splines along a curve specified. The TRIM operation deletes a segment of an entity and redefines one or both end points of the entity. It extends an entity to the prescribed boundary if the entity does not already reach the boundary. See chapter 4, section 12.8 of the ICEM Design/Drafting Basic Construction manual for illustrations, prompts, and lists of entities which you may trim.

The tablet picks are described in the ICEM Design/Drafting Basic Construction manual.

Tablet Pick	Section in Chapter 4
ONE END	12.8.2 ONE END
TWO ENDS	12.8.4 TWO ENDS
MIDDLE	12.8.6 MIDDLE
TWO CURVES	12.8.7 TWO CURVES AT INTERSECTION

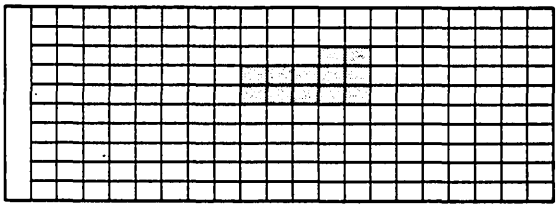
Each option is discussed in detail.





The tablet pick DELETE displays the DELETE menu in the dialogue area of the terminal. See chapter 5 of the ICEM Design/Drafting Introduction and System Controls manual for specific options. The tablet picks SINGLE, REG/IN, REG/OUT, and CHAIN are specific selection options from that master menu. The tablet picks are described in the ICEM Design/Drafting Introduction and System Controls manual.

Tablet Pick	Section in Chapter 5
DELETE	Using Menu 3
SINGLE	3.1 SELECT (Menu String 3.1.1)
CHAIN	3.1 SELECT (Menu String 3.1.2)
REG/IN	3.1 SELECT (Menu String 3.1.3)
REG/OUT	3.1 SELECT (Menu String 3.1.6.4)
DELETE A LEVEL	3.2 LEVEL RANGE
DELETE ALL POINTS	3.3 ALL POINTS



			STRTCH	ENTITY MANIP.
TRANS-LATE	DUPL. AND TRANS.	DRAG	DUPL. AND DRAG	MIRROR
ROTATE	DUPL. AND ROTATE	RECT-ANGLAR ARRAY	GROUP	OTHER CURVES

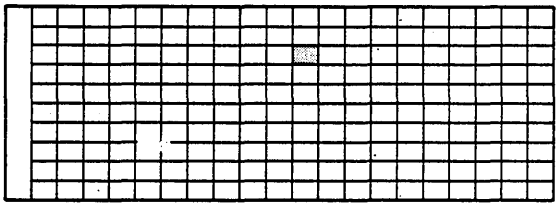
The above tablet picks are the entity manipulation operations. The tablet pick ENTITY MANIP. lists the main menu for all of the above picks except the tablet pick OTHER CURVES, which is itself a main menu.

The tablet picks are described in the ICEM Design/Drafting Basic Construction manual.

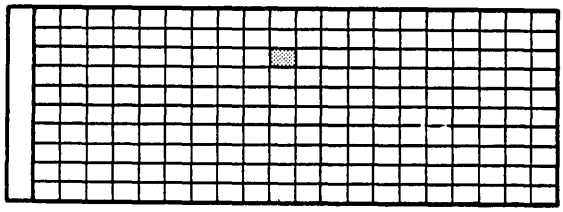
Tablet Pick	Section in Chapter 5
STRTCH	13.11 STRETCH
TRANSLATE	13.5 TRANSLATE
DUPL. AND TRANS.	13.8 DUPL AND TRANSLATE
DRAG	13.5 TRANSLATE (Entity Dragging On)
DUPL. AND DRAG	13.8 DUPL AND TRANSLATE (Entity Dragging On)
MIRROR	13.4 MIRROR
ROTATE	13.6 ROTATE
DUPL. AND ROTATE	13.9 DUPL AND ROTATE
RECTANGULAR ARRAY	13.1 RECT ARRAY
GROUP	13.3 GROUP

The main menu references for OTHER CURVES and ENTITY MANIP. are in chapters 4 and 5, respectively, of the ICEM Design/Drafting Basic Construction manual.

OFFSET CURVE



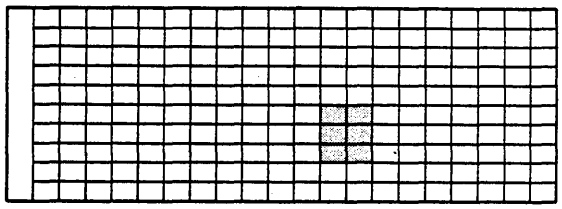
The OFFSET CURVE tablet pick enables you to create a curve (lines may be selected) offset from a line or a series of contiguous lines. Use your cursor position on the screen to select the entity and indicate direction and side of the curve when prompted to do so. For further information, refer to chapter 4, section 12.2 of the ICEM Design/Drafting Basic Construction manual.



STRING

A string is a single entity that appears on the display as though it were a connected set of lines and arcs. Tablet pick STRING creates a string through the screen select option. See chapter 4, section 12.4.1 of the ICEM Design/Drafting Basic Construction manual for specific instructions. ICEM Design/Drafting prompts you whether or not to constrain line segments parallel to the x and y axes. The nonconstrained mode allows you to draw a string line segment in any direction. If you make a string in the constrained mode, only the longer of the x or y components is picked up by the ICEM Facilities. See chapter 4, sections 12.9 and 12.10 of the ICEM Design/Drafting Basic Construction manual for instructions on how to convert a string into lines.

ATTRIB INTERO GATE	ATTRIB COUNT
ATTRIB	IND. ATTRIB
BILL OF MATRL.	FIND TOTAL

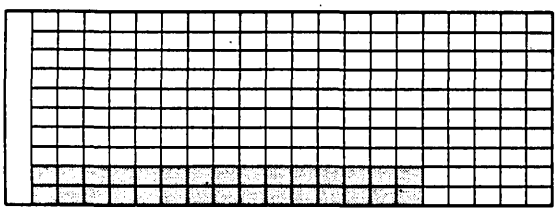


The above tablet picks are concerned with the input or output of attributes. Attributes are qualities assigned to an entity or another attribute and may be used to represent length, depth, identifying name or number. Each attribute may be assigned a value.

Picking the tablet pick ATTRIB displays the ATTRIBUTE MANAGEMENT menu (chapter 1, section 5.6 of the ICEM Design/Drafting Data Management manual). To find out what attributes are specified, pick ATTRIB INTEROGATE and answer the prompts (chapter 1, section 5.6.7 of the ICEM Design/Drafting Data Management manual). The tablet pick ATTRIB COUNT will count the number of entities in the part having an attribute specified in subsequent prompts (chapter 1, section 5.6.7.1 of the ICEM Design/Drafting Data Management manual). The tablet pick IND. ATTRIB displays on the screen the first 20 characters of the attributes/subattributes of the displayed entities. Each attribute is temporarily displayed close to the entity (chapter 1, section 5.6.6 of the ICEM Design/Drafting Data Management manual). The tablet pick FIND TOTAL is used to find the total value of attributes selected via the prompts (chapter 1, section 5.6.7.4 of the ICEM Design/Drafting Data Management manual).

The tablet pick BILL OF MATRL. is used to create a dump of all attributes and their values suitable for subsequent processing. This data is obtained as a file named LIST and is in a format suitable for postprocessing when the ICEM Facilities session is ended. See chapter 1, section 5.6.8 of the ICEM Design/Drafting Data Management manual for further information and the format of the output file LIST. See appendix I regarding the sequence of events and options available to you for postprocessing the LIST file.

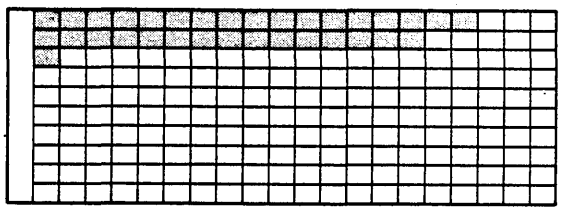
SET LEVELS		N.C. WALLS	N.C. ROOM NO.S	N.C. TITLE BLOCK	N.C. FURN-ITURE	N.C. COMPO-NENTS	N.C. MECH. LAYOUT	N.C. POWER LAYOUT	N.C. CEILING GRID	N.C. LIGHT LAYOUT	N.C. DIMEN-SIONS
	PERM. STRUCT	DEMOUN -TABLE WALL	ROOM NO.S	TITLE BLOCK	FURN -ITURE	COMPO-NENTS	MECH. LAYOUT	POWER LAYOUT	CEILING GRID	LIGHT LAYOUT	FIRE ROUTES



The SET LEVELS tablet picks set the current working level. All entities created will go on to the current working level. First touch the pen to the SET LEVELS tablet pick. Then touch the pen to the tablet pick with the discipline you want to work on. All new entities will be created on the level assigned to that discipline. See chapter 1, section 5.5 of the ICEM Design/Drafting Data Management manual for further explanation of levels.

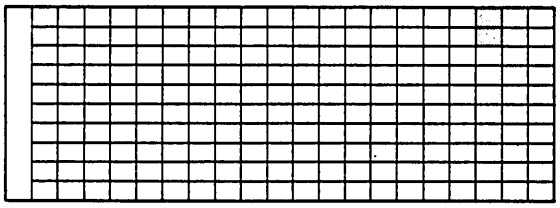
Using levels is like drawing transparencies in the same drawing. The various facility disciplines are separated by the various levels. You create individual levels as a separate activity using the tablet pick SET LEVELS. Display the menu addressing the level used and follow the ICEM DDN prompts to establish usage level, or use one of the two level conventions established in ICEM Facilities. Select NEW CONSTRUCTION (N.C.) from one of the tablet picks to the right of SET LEVELS. See appendix G for a listing of levels set by the tablet picks. Select EXISTING CONSTRUCTION from one of the thirteen tablet picks located on the line below the N.C. tablet picks to right of SET LEVELS. See appendix G for a listing of levels set by the tablet picks.

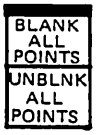
BLANK ALL	BLANK LEVELS	PERM. STRUCT	DEMOUN -TABLE WALLS	ROOM NUMBER	TITLE BLOCK	FURN- ITURE	COMPO- -NENTS	MECH. LAYOUT	POWER LAYOUT	CEILING GRID	LIGHT LAYOUT	FIRE ROUTES	SPACE ACCTG.	ALL CURENT LAYOUT	ALL CURRENT LAYOUT
UNBLNK ALL	UNBLNK LEVELS		NEW CONST. WALLS	N.C. ROOM NO.S	N.C. TITLE BLOCK	N.C. FURN- ITURE	N.C. COMPO- NENTS	N.C. MECH. LAYOUT	N.C. POWER LAYOUT	N.C. CEILING GRID	N.C. LIGHT LAYOUT	N.C. DIMEN- SIONS	N.C. SYMBLS	N.C. MISC. TEXT	ALL NEW CONSTRUCTION
BLANK															



The above tablet picks allow you to view selected disciplines by levels on the screen. First touch the pen to the BLANK LEVELS or UNBLNK LEVELS tablet pick. Then touch the pen to the tablet pick with the discipline you want to blank or view. (See chapter 4 of the ICEM Design/Drafting Introduction and System Controls manual for further explanation of BLANK/UNBLNK.)

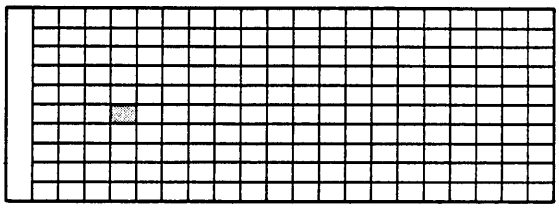
Individual levels may be blanked (caused not to be displayed), or unblanked (displayed). A single tablet pick may cause all levels not to be displayed. There are three modes of operation as presented in the tablet. You may display the BLANK and UNBLNK menu to establish your specific usage conventions. The new construction and existing facilities conventions built into the tablet require the selection of BLANK LEVELS or UNBLNK LEVELS prior to their use. The level conventions are listed in appendix G.





All points may be blanked or unblanked. Select tablet picks BLANK ALL POINTS or UNBLNK ALL POINTS (chapter 4, sections 2.3 and 2.7, respectively, of the ICEM Design/Drafting Introduction and System Controls manual) to do so.

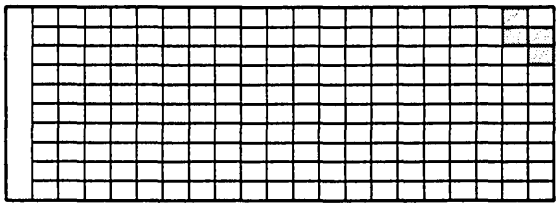
SINGLE FROM GROUP

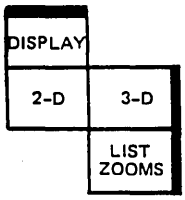


The tablet pick SINGLE FROM GROUP allows you to select an entity from an existing group. The tablet pick turns on the menu display (see chapter 3, section 1.1 of the ICEM Design/Drafting Introduction and System Controls manual) and selects and displays the single select from the GROUP MODAL menu. You may turn the option on or off. (See chapter 3, section 1.11.3 of the ICEM Design/Drafting Introduction and System Controls manual.)

Most patterns are retrieved as groups. That is, most patterns are treated as one entity rather than the lines, points, and arcs that were used to create the pattern. To identify a single entity (usually a reference point) within a grouped pattern, turn on the SINGLE FROM GROUP function.

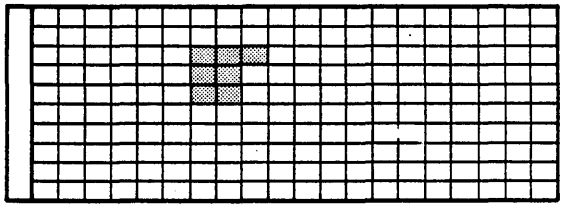
When using the tablet pattern overlay, most of the patterns are retrieved as groups. To create an open plan layout, the SINGLE FROM GROUP function must be turned on. This allows you to select the reference points on the patterns. If you want to delete or move an entire pattern, the SINGLE FROM GROUP function should be turned off. Then you can select the entire pattern with a single touch of the pen.





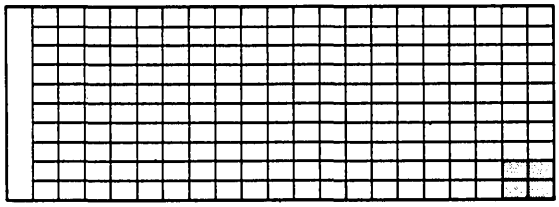
You are encouraged at this point to read the Suggestions for Using This Menu section of chapter 4 in the ICEM Design/Drafting Data Management manual to understand the terms listed in the menu produced when using tablet pick DSPLAY. The terms View, Depth, Zoom, Window, View Layout, Work View, Global Zoom Scale are defined in detail there. The menu items Change Depth and Zoom (chapter 4, sections 8.2 and 8.6, respectively of the ICEM Design/Drafting Data Management manual) may be changed using the tablet pick DSPLAY. The function control keys D and Z described in the ICEM Design/Drafting Introduction and System Controls manual perform the same function. Like values saved in the Run Time Library (RTL), views of the drawings may be renamed and saved (chapter 4, section 8.8 of the ICEM Design/Drafting Data Management manual). They may also be listed by using tablet pick LIST ZOOMS. Use chapter 4, section 8.6.13 of the ICEM Design/Drafting Data Management manual to save a zoom scale under a name and to retrieve a zoom scale. Tablet picks 2-D and 3-D are used only if an auxiliary view has been created. See chapter 4, section 8.9 of the ICEM Design/Drafting Data Management manual. The auxiliary view must be assigned to view number 9. The 2D tablet pick automatically maximizes view 1 (plan view) on the screen. The 3D tablet pick automatically maximizes view 9 on the screen.

GRID DISP.	GRID PARAM	GRID ACTIV.
24"	30"	
GRID		
48"	60"	



GRID activation is controlled by the function control key G described in the Introduction of the ICEM Design/Drafting Introduction and System Controls manual. Toggling the G control key activates or deactivates the grid. The tablet pick GRID DISP. activates or deactivates display of the grid. See chapter 3, section 1.18.4 of the ICEM Design/ Drafting Introduction and System Controls manual for specific menu option descriptions. To select one of the grids provided by ICEM Facilities, use one of the tablet picks marked 24", 30", 48", or 60". If you wish to enter another grid size, select GRID PARAM and answer the prompts described in the ICEM Design/Drafting Introduction and System Controls manual.

GRID is an easy way of locating positions at known locations using the screen select option. ICEM Design/Drafting will automatically select the nearest grid point when using the screen select mode. The grid is, for all practical purposes, a quadrilateral grid at a user selectable spacing.

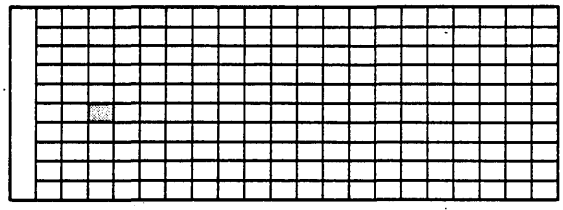


INITIALIZE
PART
FILE

The INITIALIZE PART FILE tablet pick serves a number of purposes. It initializes values of the Run Time Library used in GPL programs. It sets a scale of 1"=4' on your terminal screen and attaches the secondary pattern file. The color by level modal is also set at this time.

This tablet pick should only be selected when beginning a new layout. It should not be used when work is resumed on a previously saved layout.

CONST.
MODAL



The above tablet pick displays the CONSTRUCTION MODAL menu 1.2. When activated, the construction modal causes the system to return to the last operation performed so it can be executed again. If the option is off, ICEM Design/Drafting returns to the next highest menu option. Refer to chapter 3, section 1.2 of the ICEM Design/Drafting Introduction and System Controls manual for further information.

FACILITIES LAYOUT																
	BEGIN LAYOUT		2"	3"	4"	5"	TOP		YES	NO		SQUARE FOOTAGE	NEW WALL SYMBOL	REMOVE WALL SYMBOL	
			6"	WALL WIDTH 8"	10"	12"	MID						NEW DOOR SYMBOL	REMOVE DOOR SYMBOL	
							BOT		UP	DOWN		DUPLICATE NOTE	NEW LIGHT SYMBOL	REMOVE LIGHT SYMBOL	
	SCRN POS	KEY IN	LINE END	DELTA	SCRN POS	KEY IN	LINE END	TO LINE	ANGLE/ DIST	LEFT	RIGHT			NEW SWITCH SYMBOL	REMOVE SWITCH SYMBOL	
	BEGINNING REF. POINT					NEXT REF. POINT MODE										
	POINT	DELTA LINE	DELTA POINT	DELTA S.P.	POINT	DELTA LINE	DELTA POINT	DELTA	DELTA S.P.					NEW OUTLET SYMBOL	REMOVE OUTLET SYMBOL	
														NEW AIR SUP. SYMBOL	REMOVE AIR SUP. SYMBOL	
	WALL	DOOR	WINDOW		24"	30"	135°	90°	45°		RESTORE HAWORTH PATS		RESTORE OFFICE PATS			
	CLOSE WALL	TRIM	CHANGE WIDTH	DOOR TRIM	DOOR SIZE 36"	48"	180°	ANGLE	0°		RESTORE ETC DEMO		RESTORE WING LAYOUT			
	TEE	END WALL	COLMNS	EXIT			225°	270°	315°		RESTORE CDC LAYOUT		RESTORE FAC1 LAY1			CHANGE PAGE OFFICE FURN (ROFF1)
NAME: LAY1	ZOOM	REPAINT	DELETE	WALL SEG							RESTORE ROFF1		RESTORE HAW1	RESTORE MGR1 MGR2		CHANGE PAGE HAWORTH COMP (HAW1)

LAY1

TABLET OVERLAY

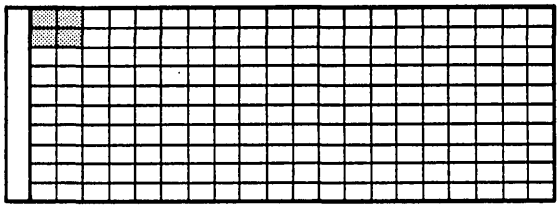
Used for layout of permanent structural components: e.g., walls, doors and windows. Includes operations for construction drawings.

LAY1 TABLET OVERLAY

This section describes how to use the LAY1 tablet overlay selections.

Activation

The Facilities Layout tablet overlay is thoroughly integrated with the ICEM Facilities GPL programs. GPL is a graphics programming language within ICEM DDN. Routines are available to draw walls, doors, windows, and structural columns. The tablet overlay or page named LAY1 is available to assist you in using these GPL programs. In order to begin a facilities layout, touch the tablet square labeled BEGIN LAYOUT. This tablet pick runs the GPL program FACGPL.



BEGIN LAYOUT

Use

The tablet squares blocked out below should only be executed when the GPL program FACGPL is run. Follow the prompts generated by the GPL program. You may use [, YES, NO, or] to answer prompts as required. The blocked out tablet squares are described in subsequent pages. During the operation of the FACGPL program, entering [will terminate the current operation and allow you to return to the previous operation. Entering] brings you to the NEXT REFERENCE POINT menu. The WALL STRING operation must be terminated by an END WALL or a CLOSE WALL operation.

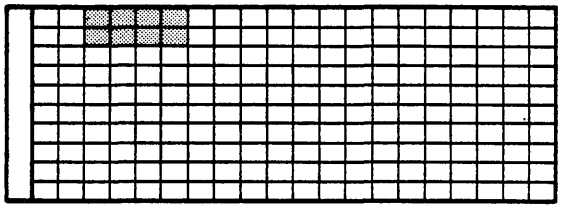
FACILITIES LAYOUT	BEGIN LAYOUT		2"	3"	4"	6"	TOP			YES	NO		SQUARE FOOTAGE	NEW WALL SYMBOL	REMOVE WALL SYMBOL	
			6"	8"	10"	12"	MID							NEW DOOR SYMBOL	REMOVE DOOR SYMBOL	
							BOT			UP	DOWN		DUPLICATE NOTE	NEW LIGHT SYMBOL	REMOVE LIGHT SYMBOL	
	SCRN POS	KEY IN POINT	LINE END	DELTA	SCRN POS	KEY IN NEXT REF. POINT	LINE END MODE	TO LINE	ANGLE/ DIST	LEFT	RIGHT			NEW SWITCH SYMBOL	REMOVE SWITCH SYMBOL	
	BEGINNING REF. POINT	DELTA LINE	DELTA POINT	DELTA S.P.	POINT	DELTA LINE	DELTA POINT	DELTA	DELTA S.P.					NEW OUTLET SYMBOL	REMOVE OUTLET SYMBOL	
														NEW AIR SUP. SYMBOL	REMOVE AIR SUP. SYMBOL	
	WALL	DOOR	WINDOW		24"	30"	135°	90°	45°		RESTORE HAWORTH PATS		RESTORE OFFICE PATS			
	CLOSE WALL	TRIM	CHANGE WIDTH	DOOR TRIM	36"	48"	180°	ANGLE	0°		RESTORE ETC DEMO		RESTORE WING LAYOUT			
	TEE	END WALL	COLUMNS	EXIT			225°	270°	315°		RESTORE CDC LAYOUT		RESTORE FAC1 LAY1			CHANGE PAGE OFFICE FURN (ROFF1)
NAME: LAY1	ZOOM	REPAINT	DELETE	WALL SEG							RESTORE ROFF1		RESTORE HAW1	RESTORE MGR1 MGR2		CHANGE PAGE HAWORTH COMP (HAW1)

DOOR SIZE

WALL WIDTH

01428

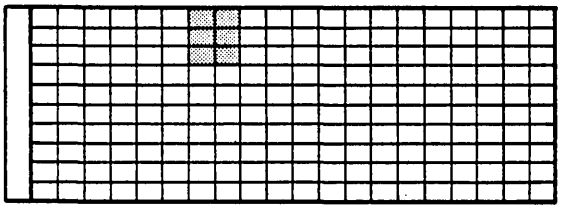
2"	3"	4"	5"
	WALL WIDTH		
6"	8"	10"	12"

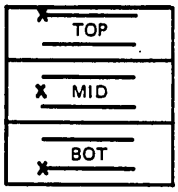


The first prompt will be for wall thickness. This includes window and door jamb thicknesses also. Windows are drawn at the same width as adjacent walls. A number of wall widths are programmed onto the tablet page, or the wall width may be keyed in using the keyboard. The WALL THKNS prompt displays:

```
CONSTRUCTION MODULE
WALL THKNS = 0.0000
```

Note that the Construction Module retains the most recently entered value or wall thickness and displays it after the WALL THKNS prompt. The first time you use this module, the wall thickness value will be zero.





After the wall width is entered, the next prompt is for offset mode. The OFFSET MODE menu displays:

```
OFFSET MODE
1.TOP
2.CENTER
3.BOTTOM
```

Make a menu selection. Walls, doors, and windows are located by reference points and the offset mode tells ICEM Facilities how to position them at the reference point. There are three offset modes: top, center, and bottom. The TOP mode uses the top edge of the wall when oriented at zero degrees, CENTER is in the center of the wall, and BOTTOM is at the bottom edge of the wall (see figure 3-1).

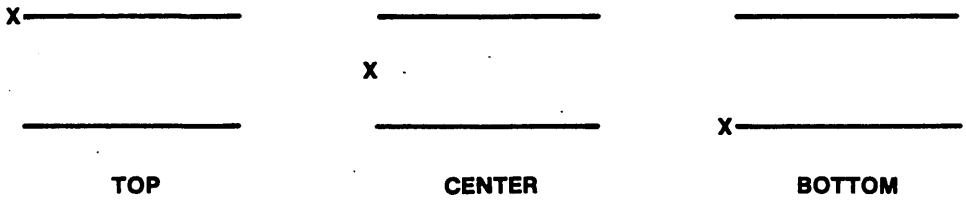


Figure 3-1. The Three Offset Modes

The offset mode affects how corners are drawn. (See figure 3-2.)

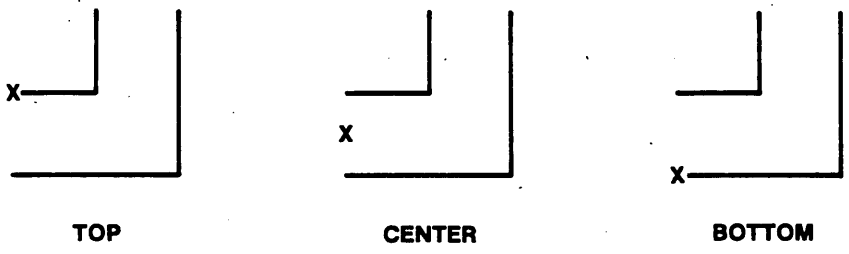


Figure 3-2. The Offset Modes on Curves

When a wall is oriented at 180 degrees and the top offset mode is selected, the reference point will be on the bottom edge of the wall. (See figure 3-3.)

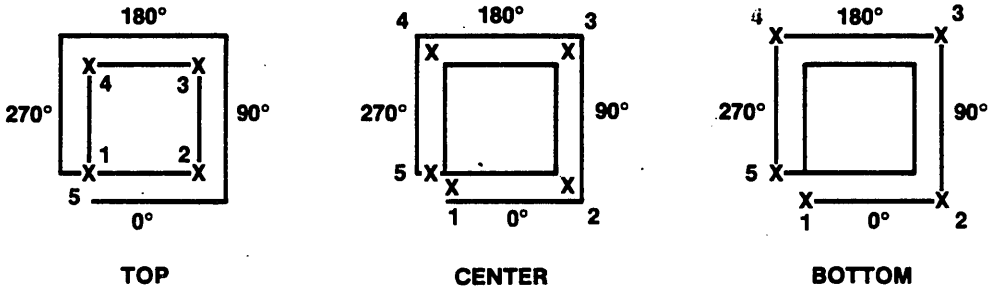
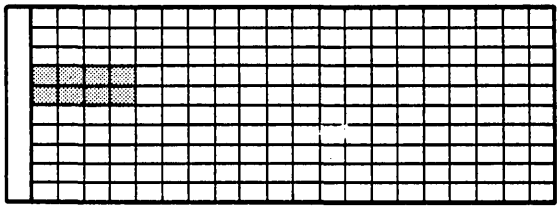


Figure 3-3. Reference Points

1,2,3,4 and 5 are the reference points selected. The last operation is assumed to be a CLOSE WALL.



SCRN POS	KEY IN	LINE END	DELTA
BEGINNING REF. POINT			
POINT	DELTA LINE	DELTA POINT	DELTA S.P.

After the offset mode is selected, the next prompt is for the beginning reference point. This is the reference point from which a drawing will begin. There are eight ways of selecting the beginning reference point: SCREEN POS, KEY-IN, LINE END, POINT, DELTA LINE DELTA POINT, DELTA, and DELTA S.P.

The BEGINNING REFERENCE POINT menu displays:

```
BEGINNING REFERENCE POINT
1.SCREEN POS
2.KEY-IN
3.LINE END
4.POINT
5.DELTA FROM LINE END
6.DELTA FROM POINT
7.DELTA
8.DELTA S.P.
```

Each of these menu choices is described in the following paragraphs:

1. SCREEN POSITION

This mode is used to establish the beginning reference point if exact coordinates are not necessary. You should begin a drawing at a known point. Currently, screen position selections in GPL do not snap to the grid. The SCREEN POSITION prompt displays:

```
ENTER POSITION
```

2. KEY-IN

KEY-IN specifies beginning coordinates. The system prompts for the x and y coordinates of the desired point. Entering [allows you to select another Beginning Reference Point mode. The KEY-IN prompt displays:

```
ENTER POSITION
1.X     = 0.0000
2.Y     = 0.0000
```

3. LINE END

This mode selects a line end as the beginning reference point. Walls are represented in this package by two parallel lines. You can select either end of either line. If you select this mode, you must indicate the line as well as which line end you will work with. This menu selection will only work for ICEM Design/Drafting lines (not arcs, circles, or other
entities). The LINE END prompt displays:

```
INDICATE LINE

INDICATE END
```

4. POINT

Point is used to select an existing point as the beginning reference point. The system prompts you to select the point with this display:

```
INDICATE POINT
```

5. DELTA FROM LINE END

Using this mode, you are prompted to indicate which line and which end of that line you wish to work with. You are then prompted to enter a delta value. The delta value is a distance in the x and y directions from the selected line end. The LINE END prompt displays:

```
INDICATE LINE

INDICATE END

DELTA
1.DX = 0.0000
2.DY = 0.0000
```

6. DELTA FROM POINT

Using this mode, you are prompted to select a point and indicate a delta value. The delta value is the distance in the x and y directions from the initial point. The DELTA FROM POINT prompt displays:

```
INDICATE POINT

DELTA
1.DX = 0.0000
2.DY = 0.0000
```

7. DELTA

Using this mode allows you to begin where you left off in a previous session or to indicate a new delta x and y from the current reference point. The DELTA prompt displays:

```
DELTA
1.DX = 0.0000
2.DY = 0.0000
```

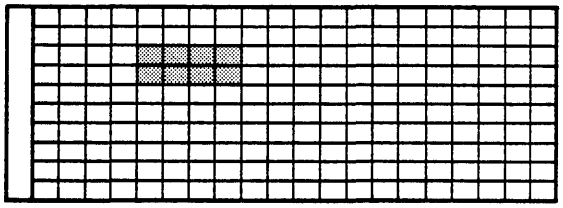
8. DELTA S.P.

DELTA FROM SCREEN POSITION allows you to specify a reference point at a delta x and y distance from a screen position selection. The DELTA FROM SCREEN POSITION prompt displays:

```
ENTER POSITION

DELTA
1.DX = 0.0000
2.DY = 0.0000
```

SCRN POS	KEY IN	LINE END	TO LINE	ANGLE/ DIST
	NEXT REF. POINT MODE			
POINT	DELTA LINE	DELTA POINT	DELTA	DELTA S.P.



After the beginning reference point is defined, the system draws a point at that location. The point displayed is a visual feedback which indicates that the location has been registered. This point is not permanently retained in the database.

Next, the system prompts for the next reference point mode. This is the mode that will determine how subsequent reference points are entered. At present, the next reference point mode is used only in creating walls. There are ten modes of specifying the next reference point. Eight are identical to those for entering the beginning reference point.

The NEXT REFERENCE POINT MODE menu displays:

```
NEXT REFERENCE POINT MODE
 1.SCREEN POS
 2.KEY-IN
 3.LINE END
 4.POINT
 5.DELTA FROM LINE END
 6.DELTA FROM POINT
 7.TO A LINE
 8.DELTA
 9.ANGLE/DISTANCE
10.DELTA S.P.
```

The new menu selections are described in the following paragraphs:

7. TO A LINE

In this mode, the next reference point will be defined on a selected line. You are prompted to enter the angle at which to proceed from the current reference point to that line, and, to select the desired line. The orientation of the wall to be generated must not be parallel to the selected line. The TO A LINE prompt displays:

```
ENTER ANGLE
1.ANGLE      = 0.0000

INDICATE LINE

IS SELECTION OK?
```

8. DELTA

In this mode, the next reference point will be defined as an x and y offset from the current reference point. The prompts request the x and y offset values. Entering [returns you to the NEXT REFERENCE POINT MODE menu. The DELTA prompt displays:

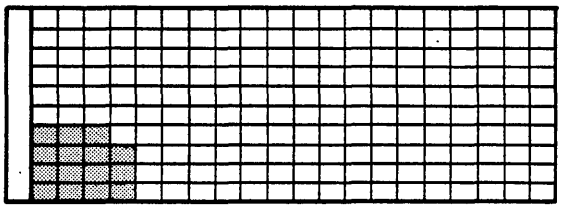
```
DELTA
1.DX = 0.0000
2.DY = 0.0000
```

9. ANGLE/DISTANCE

In this mode, the next reference point will be defined at the distance specified along the angle entered. You are prompted for the angle and the distance. The angle is measured from the positive x-axis in a counterclockwise direction. Entering [returns you to the NEXT REFERENCE POINT menu. The ANGLE/DISTANCE prompt displays:

```
ENTER
1.ANGLE     = 0.0000
2.DISTANCE  = 0.0000
```

WALL	DOOR	WINDOW	
CLOSE WALL	TRIM	CHANGE WIDTH	DOOR TRIM
TEE	END WALL	COLMNS	EXIT
ZOOM	REPAINT	DELETE	WALL SEG



Once you have entered the next reference point mode, you will be prompted for the operation to perform at the current reference point. When you select an operation, you may be prompted for additional information. The operation is then completed and you are prompted to enter another operation. If you want to change the next reference point mode when the OPERATION menu is being displayed, enter [. You will be prompted from the NEXT REFERENCE POINT MODE menu again.

There are fifteen operations from which you may choose. The OPERATION menu displays:

```
OPERATION
 1.WALL STRING
 2.DOOR
 3.WINDOW
 4.CLOSE WALL
 5.WALL TRIM
 6.CHANGE WALL THICKNESS
 7.TEE
 8.END WALL
 9.COLUMNS
10.DOOR TRIM
11.NEW BEG REF PT
12.ZOOM
13.REPAINT
14.DELETE
15.WALL SEGMENT
```

Each OPERATION menu choice is described in the following paragraphs:

1. WALL STRING

This operation allows you to draw multiple walls. You are prompted to enter the next reference point according to the mode previously selected. When the next reference point is defined, a point is drawn at its location. If a top or bottom offset mode is in effect, a line will also be drawn from the first point to the second. The second line will not be drawn until the next reference point is selected. The second line is not drawn because a corner requires three reference points. If center offset mode is in effect, only the reference points are displayed until the third reference point is entered. Then the first two lines are drawn. Prompts for next reference point will continue until the WALL STRING operation is ended by [. If you enter], you will return to the OPERATION menu.

After the WALL STRING operation has been completed, you must select either the END WALL or the CLOSE WALL operation to complete the wall drawing. No other operation may be selected until you complete the END WALL or CLOSE WALL operation. The current reference point is updated each time a new reference point is selected.

2. DOOR

This operation allows you to draw a door at any orientation at the current reference point. It is drawn at the current width and with the offset mode currently in effect. The door may be drawn with or without a door swing arc (see figure 3-4.)

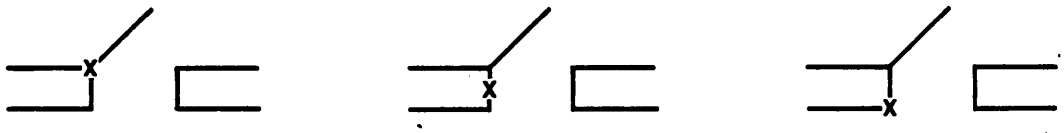


Figure 3-4. Door Orientation

When you select the DOOR operation, the first prompt displays the current status of the door swing modal and also requests the orientation angle, size, and swing angle.

```
DOOR WITH SWING ANG
ENTER DOOR PARAMETERS
1.ORIENTATIN  = 0.0000
2.SIZE        = 0.0000
3.SWING ANGL  = 0.0000
```

This prompt retains the last set of door parameters you entered. When you create a new drawing using the DOOR operation, the parameters are zero.

Orientation angle is the orientation of the door jambs measured from the positive x-axis. Size is the size of the door opening. Swing angle is the angle at which the door is drawn ajar. A zero degree swing angle means that the door is drawn closed. You may enter any swing angle, size, and orientation angle. The swing arc modal must be changed before entering] to complete the door parameter selections. It is changed by entering [when prompted for the door parameters. If you enter [, this menu displays:

```
SWING ARC
1.WITHOUT
2.WITH
```

After you have made the desired Swing Arc modal selection, you are returned to the ENTER DOOR PARAMETERS menu. You may enter door parameters or enter] if they are already entered. Once you enter the door parameters, you are prompted for the end of the door which will be hinged. Indicate an area near the current reference point or the far end of the door for hinge location. You are then prompted to indicate whether the door opens in or out, the swing direction, by screen selection. Indicate a point on one side of the door to define the swing direction. After the door is drawn, the reference point is updated to the opposite side of the door.

3. WINDOW

This operation allows you to define windows by pane size, mullion width, and number of panes. Only an integral number of panes may be drawn. The first mullion drawn is centered on the current reference point. The updated reference point is centered on the last drawn mullion. The window is also drawn according to the current offset mode.

You are prompted for angle, number, size, and mullion width:

```
WINDOWS
1.ANGLE      = 0.0000
2.NUMBER     = 0.0000
3.LENGTH     = 0.0000
4.MUL. SIZE = 0.0000
```

Angle is the orientation angle, number is the number of panes, length is the length of each pane, and mul. size is mullion width. Once these parameters are entered, the number of panes selected are drawn at the entered orientation angle and the reference point is updated.

4. CLOSE WALL

This operation can only be executed after a WALL STRING operation. CLOSE WALL causes the remaining wall line or lines to be drawn and closes the open end. There are no prompts for this operation (see figure 3-5).

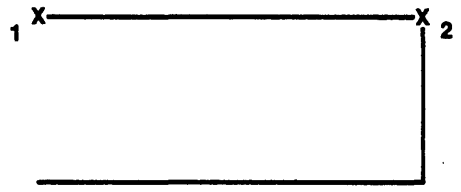


Figure 3-5. The CLOSE WALL Operation.

5. WALL TRIM

This operation deletes the line segment from the beginning or end of a wall. The length of the segment trimmed out is determined by the current wall width. The segment location is determined by the current offset mode. The WALL TRIM prompt displays:

```
ENTER TRIM ANGLE
ANGLE = 0.0000

INDICATE LINE

IS SELECTION OK?
```

The first prompt is for the orientation angle. This is the angle that the intersecting wall segment will make with the positive x-axis. If the wall has a west-to-east orientation, the intersection angle is zero degrees. If the wall has an east-to-west orientation, the intersection angle is 180 degrees (see figures 3-6 and 3-7).

Once the orientation angle is entered, you are prompted to indicate the line to be trimmed. Once you have entered the selection, trimming occurs and you are returned to the OPERATION menu. The lines are redrawn on the screen over the old lines. Either a local or host repaint is required to erase the previous lines. The WALL TRIM operation may be done either before or after the wall segment is drawn.

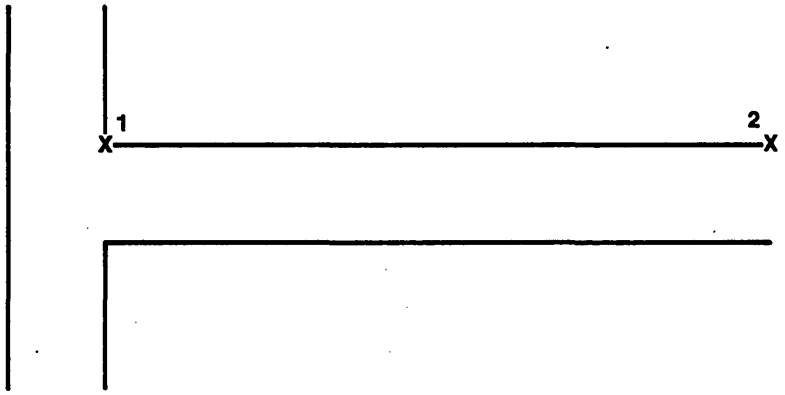


Figure 3-6. Top Offset Mode. 0° Orientation Angle.

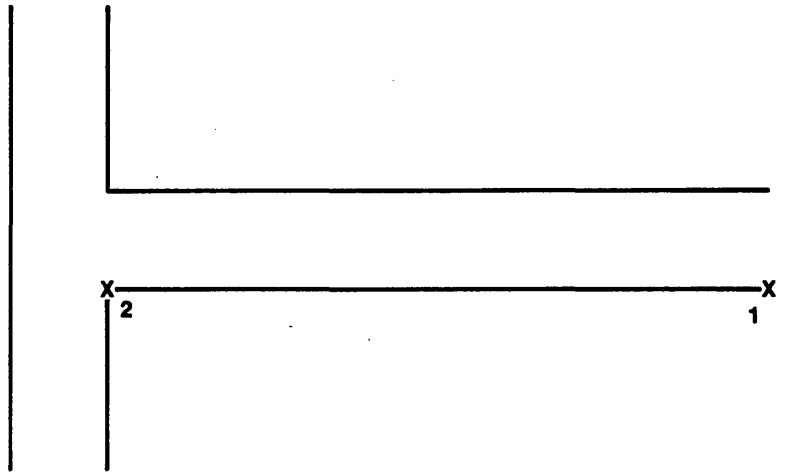


Figure 3-7. Top Offset Mode. 180° Orientation Angle.

6. CHANGE WALL THICKNESS

This operation changes the wall, door, and window thickness. You are prompted to enter the new width. The system stores this value. The system displays:

```
CHANGE THICKNESS
NEW THKNS = 0.0000.
```

7. TEE

The TEE operation draws wall intersections where more than two walls intersect in a single operation. The intersections are in multiples of 90 degree angles. For other angles, use the trim function. There are five parameters that govern the drawing of a TEE:

- Main angle.
- Main distance.
- Leg width.
- Distance at minus 90 degrees.
- Distance at plus 90 degrees.

The main leg of the tee is drawn at the current width in the direction specified by main angle with a length of main distance plus leg width (see figure 3-8). The reference point is updated to this location after the operation is complete. If the main distance is zero, only the side legs are drawn. The side legs are drawn with a wall width entered for the leg width parameter. If either leg length is zero, that leg is not drawn. Angles are measured in counterclockwise direction. You may obtain a variety of wall intersections by varying the parameters. The TEE prompt displays:

```
TEE PARAMETERS
1.MAIN ANGLE = 0.0000
2.DISTANCE   = 0.0000
3.LEG THKNS  = 0.0000
4.DIST @-90  = 0.0000
5.DIST @+90  = 0.0000
```

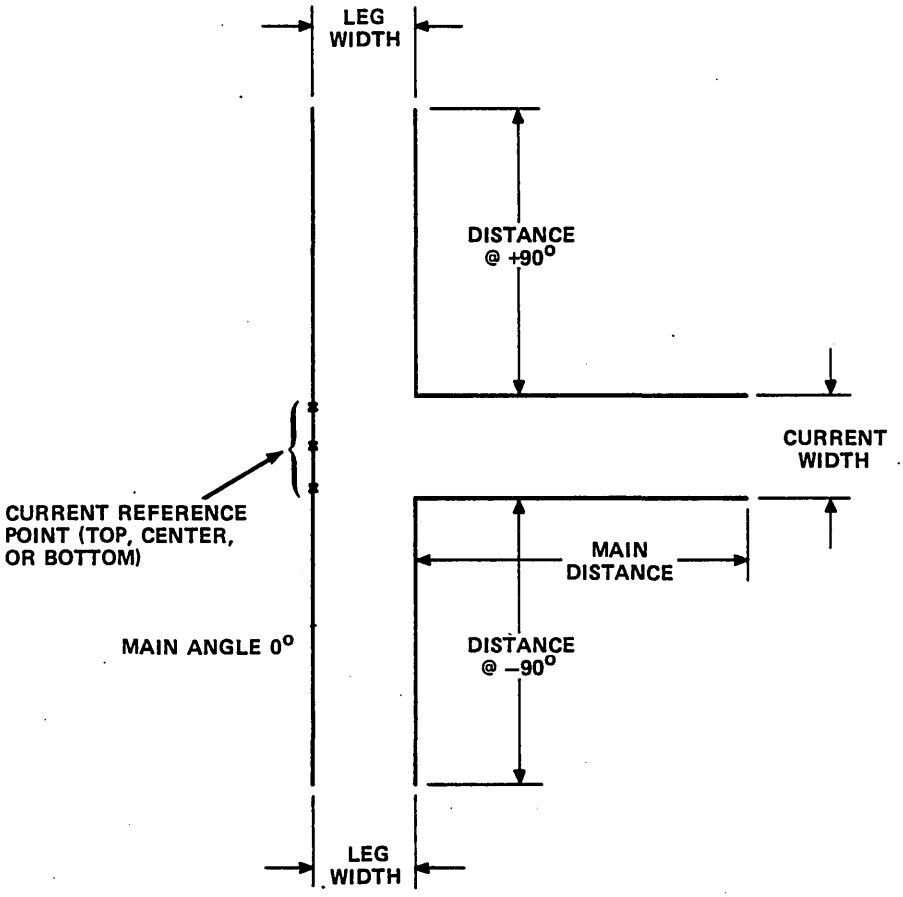


Figure 3-8. The TEE Operation.

8. END WALL

This selection can only be used after a WALL STRING operation. It causes the remaining wall line or lines to be drawn. There are no prompts for this operation.

9. COLUMNS

This is the COLUMN operation which allows you to draw a column layout. You are prompted for the column size, horizontal spacing, horizontal number of columns, vertical spacing, and vertical number of columns. The COLUMN LAYOUT prompt displays:

```
COLUMN PARAMETERS
1.COL. SIZE  = 0.0000
2.HOR. SPCNG = 0.0000
3.HOR. NO.   = 0.0000
4.VERT. SPC  = 0.0000
5.VERT. NO.  = 0.0000
```

The column layout begins at the current reference point. The column drawn there is in the upper left corner of the array. The first column is centered on the current reference point. The column size defines both the length and width of each column. The column spacing values are measured from center to center.

10. DOOR TRIM

This operation automatically trims the wall to create a door opening. This operation can only be selected immediately after a door has been placed on the drawing. You are prompted to select the two lines representing the wall to be trimmed. The system then automatically trims the lines to the door jamb lines.

The DOOR TRIM prompt displays:

```
INDICATE WALL

OTHER WALL SIDE
```

11. NEW BEG REF PT

This operation takes you back to the BEGINNING REFERENCE POINT menu. This allows you to work on another area of the drawing without exiting the Construction Module. The prompts are the same as for the BEGINNING REFERENCE POINT menu:

```
NEW BEG REF PT
1.SCREEN POS
2.KEY-IN
3.LINE END
4.POINT
5.DELTA FROM LINE END
6.DELTA FROM POINT
7.DELTA
8.DELTA S.P.
```

12. ZOOM

This operation allows you to display enlarged drawing details (zoom) without exiting from the Construction Module. The ZOOM prompt displays:

```
ZOOM TYPE
1.AUTO MAX/MIN
2.DIAG. POS.
3.SCALE
4.NEW CENT/SCALE
```

Each of the ZOOM menu choices are described in the following paragraphs:

1. AUTO MAX/MIN

This selection does an auto max/min of your drawing.

2. DIAG. POS.

This choice allows you to zoom by diagonal position. You will be prompted for the opposite corners of the area you want to zoom. These prompts are displayed:

INDICATE CORNER

OPPOSITE CORNER

3. SCALE

This choice allows you to rescale your drawing by a selected scale factor. This prompt displays:

ZOOM
SCALE = 1.0000

Enter the desired scale. For example, a scale of .5 will redraw your drawing at one half of the current scale.

4. NEW CENT/SCALE

This selection allows you to recenter your drawing and, at the same time, to optionally rescale it. After being prompted for the zoom scale, you will be prompted to select the new center by screen position. These prompts are displayed:

ZOOM
SCALE = 1.0000

NEW CENTER

13. REPAINT

The REPAINT operation allows you to do a host repaint of the screen. There are no prompts for this operation.

14. DELETE

This operation allows you to delete without leaving the Construction Module. These prompts are displayed:

INDICATE ENTITY

IS SELECTION OK?

If the entity selected is a group, you will be prompted:

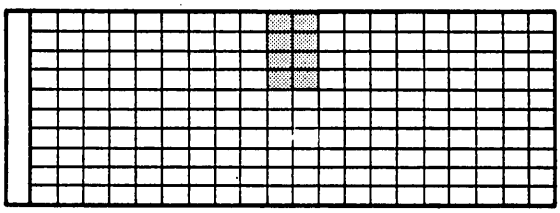
DELETE ENTITIES IN GROUP?

Enter Y to delete the entities in the group or enter N to delete only the group status of the group.

15. WALL SEGMENT

This operation draws a single wall segment consisting of two parallel lines. The segment is drawn from the current reference point to the next reference point as defined by the current offset mode and wall thickness settings. The next reference point mode in effect specifies the reference point. The prompts reflect the next reference point mode in effect.

To terminate the Construction Module of the facilities layout process, enter] at any point before or within the OPERATION menu.



YES	NO
UP	DOWN
LEFT	RIGHT

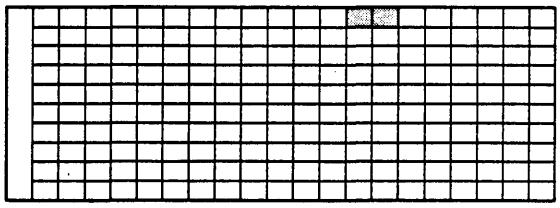
The YES and NO tablet picks will allow you to enter an answer from the LAY1 tablet overlay.

The word page can have two meanings in ICEM Design/Drafting.

- The tablet page with which you are familiar.
- The page associated with the amount of design on the screen at the current scale.

With the UP, DOWN, LEFT, RIGHT tablet picks you can control the display as if the design were a sequence of different pages. This function is useful when you want to move gradually around the total display at the same magnified scale. One half of the current screen will be retained. Refer to chapter 4, section 8.6.15 of the ICEM Design/Drafting Data Management manual for further information.

SQUARE FOOTAGE



The SQUARE FOOTAGE tablet pick calculates the square feet lying in the rectangle as determined by two opposite corners of a rectangle. The two points are chosen using the cursor. The rectangle assumes the sides are vertical and horizontal to the picture displayed.

The first prompt,

INDICATE ONE CORNER OF THE RECTANGLE.

is followed by the request for the opposite corner,

INDICATE OPPOSITE CORNER.

The GPL program, SQFEET, temporarily outlines the chosen area with a dashed line and displays the four values indicated as follows:

HOR. LEN. = xxx

VERT. LEN. = xxx

PERIMETER = xxx

SQ. FEET = xxx

At this point you should enter an]. All other responses are ignored. The system then prompts:

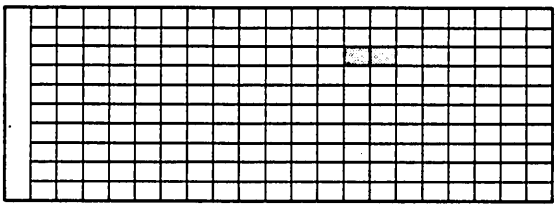
ENTER SQ. FT.

for the note to be generated. You may enter a carriage return or [, or during subsequent steps you will terminate the note generation process. You must enter the square footage and other information at this point. A carriage return will generate a new line. You may continue to add lines until you terminate the note generation process.

Having completed the note generation process, the system then prompts:

DO YOU WANT TO CALCULATE MORE?

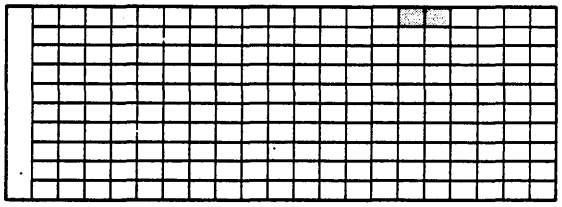
A YES will restart the above process. A NO will terminate the GPL program.



DUPLICATE NOTE

The DUPLICATE NOTE tablet pick invokes a GPL program which duplicates copies of a note at different locations. The first prompt is to enter the text of the note. The note may have multiple lines. When you are finished entering the text of the note, enter]. You are prompted to select the position of the note on the drawing by screen position. When the location is selected, the note is printed on the screen and you are again prompted to enter another location. This process will continue until you enter] or [. If [is entered, you may enter another note text. If] is entered, you are asked if you want to enter another sequence. If you answer YES, you are prompted to enter the note text. If your answer is NO, the program terminates.

NEW WALL SYMBOL



The NEW WALL SYMBOL pick generates a fill pattern inside the wall indicated. The system automatically calculates the length of the new wall and saves it in memory for report generation. (See BILL OF MATRL. tablet pick.) The system prompts are as follows:

NEW WALL SYMBOL

WALL WIDTH = 4.000

Enter the thickness of the wall to be filled.

INDICATE END OF NEW WALL

Use the crosshairs to indicate a position in the middle of the wall at one end. The system then prompts:

INDICATE OPPOSITE END

After you have indicated the opposite end, the system will generate a fill pattern inside the indicated wall. The system then prompts:

IS SYMBOL PLACEMENT OK?

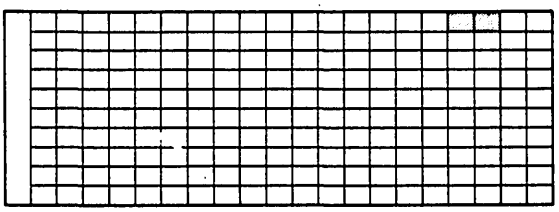
Answer the prompt with Y or N. If the placement is incorrect, the fill pattern will be deleted and you should try again. If the placement is correct, the system prompts:

MORE NEW WALLS

A YES answer begins the prompts again. A NO answer terminates the selection process.

NOTE

Turn GRID ACTIVATE off before using this tablet pick.



REMOVE WALL SYMBOL

The REMOVE WALL SYMBOL tablet pick generates a fill pattern over the wall to be removed. The system automatically calculates the length of the wall and saves it in memory for report generation. (See BILL OF MATRL. tablet pick.) The system displays these prompts:

INDICATE END OF WALL TO BE REMOVED

Use the crosshairs to indicate a position in the middle of the wall at one end. The next prompt is:

INDICATE OPPOSITE END.

After you've done this, the system will draw a fill pattern over the wall to be removed. The next prompt is:

IS SYMBOL PLACEMENT OK?

Answer the prompt with Y or N. If the placement is incorrect, the fill pattern will be deleted and you can begin again. If the placement is correct, the system will prompt:

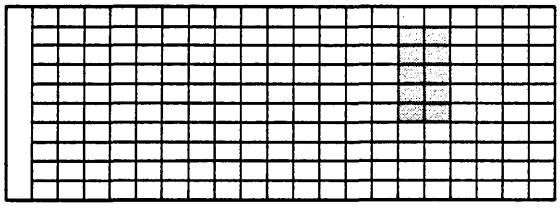
REMOVE MORE WALLS?

A YES answer will begin the prompts again; a NO answer will terminate the process.

NOTE

Turn GRID ACTIVATE off before using this tablet pick.

NEW DOOR SYMBOL
NEW LIGHT SYMBOL
NEW SWITCH SYMBOL
NEW OUTLET SYMBOL
NEW AIR SUPPLY SYMBOL



In the following description, XXXX may stand for:

DOOR

LIGHT

SWITCH

OUTLET

AIR SUPPLY

The NEW XXXX SYMBOL tablet pick generates a note, NEW XXXX on the indicated xxxx. The system automatically counts the number of xxxxs to be new in a layout. The total can be written out on a report. (See BILL OF MATRL. tablet pick.) These system prompts are displayed:

INDICATE NEW XXXX

Place the crosshairs on the xxxx. NEW XXXX will be written over the xxxx. The next prompt is:

IS NOTE PLACEMENT OK?

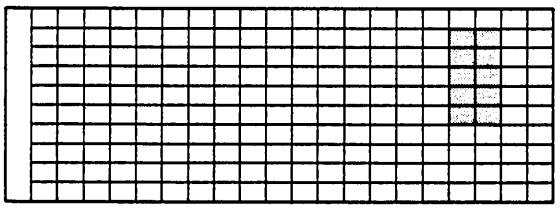
Answer the prompt with Y or N. If the placement is incorrect, the note will be deleted and you can begin again. If the placement is correct, the system will prompt:

MORE NEW XXXXS?

A YES answer will begin the prompts again; a NO answer will terminate the process.

NOTE

Turn GRID ACTIVATE off before using these tablet picks.



REMOVE DOOR SYMBOL
REMOVE LIGHT SYMBOL
REMOVE SWITCH SYMBOL
REMOVE OUTLET SYMBOL
REMOVE AIR SUP. SYMBOL

In the following description, XXXX may stand for:

DOOR

LIGHT

SWITCH

OUTLET

AIR SUPPLY

The REMOVE XXXX SYMBOL tablet pick generates a note, REMOVE XXXX on the indicated xxxx. The system automatically counts the number of xxxxs to be removed in a layout. The total can be written out on a report. (See BILL OF MATRL. tablet pick.) The system prompts are as follows:

INDICATE XXXX TO BE REMOVED.

Places the crosshairs on the xxxx. REMOVE XXXX will be written over the xxxx. The next prompt is:

IS NOTE PLACEMENT OK?

Answer the prompt with Y or N. If the placement is incorrect, the note will be deleted and you can begin again. If the placement is correct, the system will prompt:

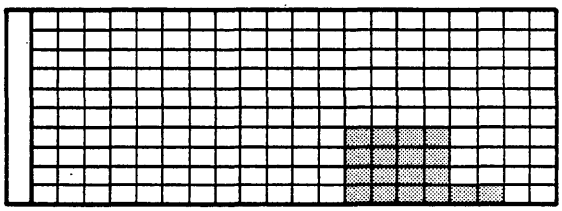
REMOVE MORE XXXXS?

A YES answer will begin the prompts again; a NO answer will terminate the process.

NOTE

Turn GRID ACTIVATE off before using these tablet picks.

RESTORE HAWORTH PATS	RESTORE OFFICE PATS	
RESTORE ETC DEMO	RESTORE WING LAYOUT	
RESTORE CDC LAYOUT	RESTORE FAC1 LAY1	
RESTORE ROFF1	RESTORE HAW1	RESTORE MGR1 MGR2



The RESTORE tablet picks restore example layouts, tablet overlay drawings, and pattern descriptions to your drawing file (see ICEM Design/Drafting Data Management manual, section 6.1.2.1). These tablet picks are described as follows:

RESTORE HAWORTH PATS--This tablet pick restores a part named FACPAT1 which consists of pattern descriptions and diagrams for the FACPAT1 pattern library.

RESTORE OFFICE PATS--This tablet pick restores a part named FACPAT2 which consists of pattern descriptions and diagrams for the FACPAT2 pattern library.

RESTORE ETC DEMO--This tablet pick restores a part named ETC2 DEMO which is an example layout. You are encouraged to experiment with unblanking and scaling this part.

RESTORE WING LAYOUT--This tablet pick restores a part named WING which is an example of a three dimensional layout.

RESTORE CDC LAYOUT--This tablet pick restores a part named TOWER which is an example layout. You are encouraged to experiment with unblanking and scaling this part.

RESTORE FAC2 LAY1--This tablet pick restores a part named FULL TABLET which is a drawing of the FAC1 and LAY1 tablet overlays.

RESTORE ROFF1--This tablet pick restores a part named OFFICE FURNITURE TABLET OVERLAY which is a drawing of the ROFF1 tablet overlay.

RESTORE HAW1--This tablet pick restores a part named HAWORTH which is a drawing of the HAW1 tablet overlay.

RESTORE MGR1 MGR2--This tablet pick restores a part named MGR TAB OL which is a drawing of the MGR1 and MGR2 tablet overlays.

HAWORTH LAYOUT	HAWORTH FABRIC PANELS LENGTH		HEIGHT	HAWORTH VIDENE PANELS LENGTH		HEIGHT	HAWORTH WORK SURFACE LENGTH		HEIGHT	HW SHELF	HW FLIP DOOR	HW LAT FILE	HW LIGHT	HW TACK BOARD	HW PEN DRAWER	HW TYPE TABLE	HW ROUND TABLE 36 DIA	HW ROUND TABLE 42 DIA	HW COUNT TOP	HW BILL OF MTLS
	5'-0	66"	80"	5'-0	42"	66"	5'-0	24"	30"	5'-0	5'-0	5'-0	5'-0	5'-0	WS A		WS C		WS E	
	4'-0	66"	80"	4'-0	42"	66"	4'-0	24"	30"	4'-0	4'-0	4'-0	4'-0	4'-0	WS B		WS D		WS F	
	3'-0	66"	80"	3'-0	42"	66"	3'-0	24"	30"	3'-0	3'-0	3'-0	3'-0	3'-0						
	2'-6	66"	80"	2 -6	42"	66"														
	2'-0	66"	80"	2'-0	42"	66"														
	1'-0	66"	80"	1'-0	42"	66"														
	DOOR UNIT																		CHANGE PAGE OFFICE FURN (ROFF1)	
NAME: HAW1																			CHANGE PAGE FAC. LAYOUT (LAY1)	

HAW1

TABLET OVERLAY

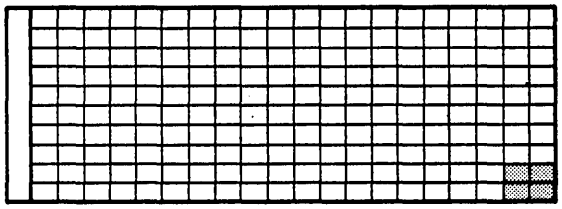
Used for placement of Haworth components.

HAW1 TABLET OVERLAY

This section describes how to use the HAW1 tablet overlay selections.

Activation

The Component Furniture tablet overlay is activated by touching the pen to the CHANGE PAGE HAWORTH COMP tablet pick on any of the tablet pattern retrieval overlays. Place the Component Furniture overlay directly over the lower third of the tablet. The HAW1 overlay is ready to use.



CHANGE PAGE HAWORTH COMP (HAW1)
CHANGE PAGE FAC. LAYOUT (LAY1)

Use

To begin a new HAW1 layout, place a reference point on the screen. See chapter 1 of the ICEM Design/Drafting Basic Construction manual for point creation.

To add to or revise an existing component furniture layout, reference points must be made visible by unblanking all points. See chapter 4, section 2.7 of the ICEM Design/ Drafting Introduction and System Controls manual or select the UNBLANK ALL points tablet pick on the FAC1 overlay.

After a reference point has been chosen as the layout origin, select the panel or component you want to place on the layout. Panels and components will henceforth be referred to as patterns. Your options are in the top row of the HAW1 overlay. Each pattern type is pictured on the tablet overlay. The origin point on the pattern is shown as a small x. This x will correspond to the x (reference point) that was chosen as the layout origin. The x, on the pattern, also serves as a base point for rotation, if you need to place the item in an orientation other than that shown on the tablet overlay.

To choose a pattern, touch the pen to the tablet pick which describes the item you want to place in the layout. For example, suppose you wish to choose a Haworth Fabric Panel three feet long and eighty inches high. Under the Haworth Fabric Panel section of the HAW1 tablet, touch the pen to the tablet pick 80" in the row corresponding to the three foot length. If you wish to choose a Haworth counter top, touch the pen to the COUNT TOP tablet pick. The system then prompts you for the following Modify Modals:

```
--MODIFY MODALS
 1.ORIGIN METHOD
 2.SCALE FACTOR
 3.ROTATION ANGLE
 4.ROTATION AXIS
 5.ORIENTATION
 6.
 7.ENTITY GROUPING
 8.LEVEL
 9.PEN
10.COLOR
11.ENTITY NAME
```

Each of the previous choices is described in the following list:

1. ORIGIN METHOD--This modal has a default setting of EXISTING POINT. This setting is required for placement of Haworth components.

2. SCALE FACTOR--You may set a new scale factor if desired.

3. ROTATION ANGLE--You may rotate the pattern in a counterclockwise direction around its origin.

4. ROTATION AXIS--This modal should not be changed from Z/ZT-AXIS.

5. ORIENTATION--This modal should not be changed.

7. ENTITY GROUPING--The default setting is OFF. Placement of Haworth patterns requires this modal to be off.

8. LEVEL--You may place the pattern on the level at which it was created, the current level, or any other level.

9. PEN--You may assign to the pattern the pen number with which it was originally created, the current pen number, or any other pen number.

10. COLOR--The color modal does not need to be changed.

11. ENTITY NAME--The entity name modal does not need to be changed.

After modifying the modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks). The system then prompts:

INDICATE POINT

Position the cursor over the reference point that has been chosen as the origin. After the pattern has been placed on the layout, the system will prompt:

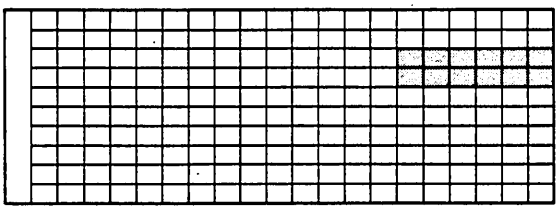
INDICATE POINT

You can place the same pattern again by indicating a new reference point. If you do not want to use this pattern, you may exit the routine by touching the pen to the main menu tablet pick or by typing F.

The round table, typing table, and pen drawer patterns are placed in the layout by screen position, not by reference point. The first prompt after choosing the pattern is:

INDICATE POSITION

With the cursor or crosshairs, indicate where on the layout the center of the round table or origin point of the typing table or pen drawer should be located. The remaining prompts are the same as with the other Haworth patterns.



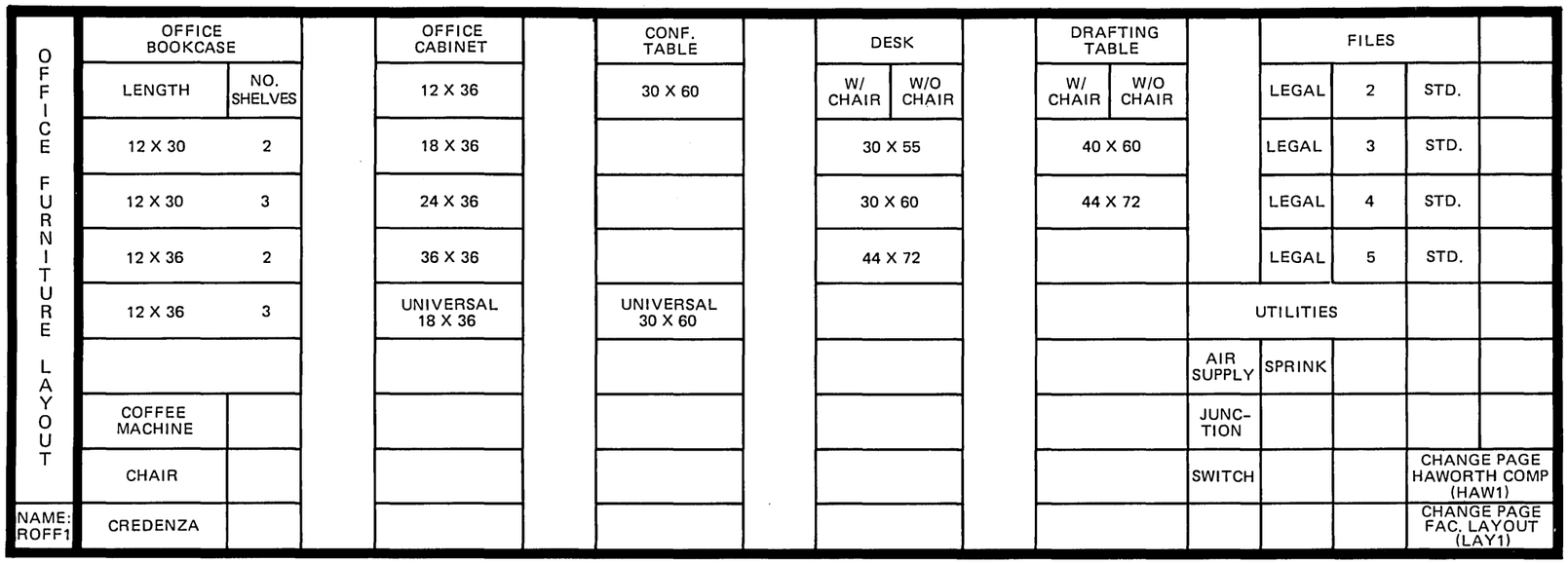
WS A	WS C	WS E
WS B	WS D	WS F

These tablet squares retrieve the six Control Data standard component furniture work stations. Each pattern is retrieved as a group. The patterns are placed by screen position with the origin in the lower left corner. Pictures of each workstation should be studied before using in a layout (see appendix F). The prompts for these patterns are the same as the other component furniture patterns.

To obtain a bill of materials for a component furniture layout shown on the screen, touch the pen to the BILL OF MATRL. tablet pick, then file and terminate the ICEM Facilities. See appendix I for further instructions on obtaining the bill of materials.

NOTE

This tablet overlay was custom built for Control Data Corporation Facilities Planning Department. It includes 2 portions of the Haworth Component Furniture Product Line. If other products are needed in the design process, they can easily be incorporated into a custom overlay. The BILL OF MATRL. format and content can also be customized to meet specific needs.



ROFF1

TABLET OVERLAY

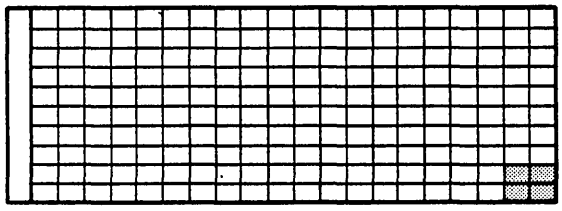
Used for the placement of office furniture.

ROFF1 TABLET OVERLAY

This section describes how to use the ROFF1 tablet overlay selections.

Activation

ROFF1 is activated by touching the pen to the CHANGE PAGE OFFICE FURN tablet pick on any of the tablet pattern retrieval overlays. The ROFF1 overlay is placed directly over the lower third of the tablet overlay. The ROFF1 overlay is ready to use.



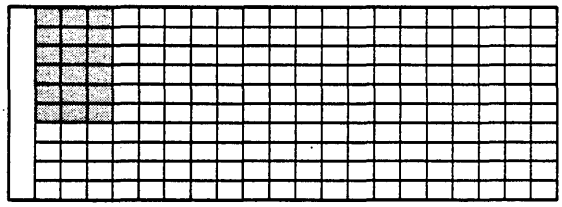
CHANGE PAGE OFFICE FURN (ROFF1)
CHANGE PAGE FAC. LAYOUT (LAY1)

Use

The overlay is divided into eight sections.

- OFFICE BOOKCASE
- OFFICE CABINET
- CONF. TABLE
- DESK
- DRAFTING TABLE
- FILES
- MISC.
- UTILITIES

OFFICE BOOKCASE	
LENGTH	NO. SHELVES
12 X 30	2
12 X 30	3
12 X 36	2
12 X 36	3



This section retrieves patterns of office bookcases onto a layout. Touch the pen to the tablet pick that indicates the size and number of shelves for the bookcase. The next prompt is:

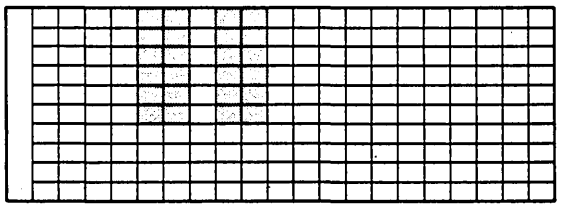
MODIFY MODALS

Modal modification is described in the HAW1 tablet overlay section of this manual except for ORIGIN METHOD and ENTITY GROUPING. The origin method has been preset to SCREEN POSITION and the entity grouping has been preset to ON. You can change these modals if you desire.

When you finish setting the modify modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks).

Position the cursor or crosshairs on the layout where you want to place a bookcase. The crosshair position will be positioned in the upper left corner of the bookcase.

Place the same pattern in the layout again or return to the main menu by entering F and a carriage return.



OFFICE CABINET	CONF. TABLE
12 X 36	30 X 60
18 X 36	
24 X 36	
36 X 36	
UNIVERSAL 18 X 36	UNIVERSAL 30 X 60

Touch the pen to the tablet pick that indicates the size of the office cabinet or conference table. The next prompt is:

MODIFY MODALS

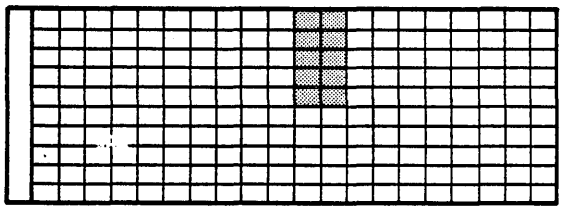
Modal modification is described in the HAW1 tablet overlay section of this manual except for ORIGIN METHOD and ENTITY GROUPING. The origin method has been preset to SCREEN POSITION and the entity grouping has been preset to ON. You can change these modals if you desire.

When you finish setting the modify modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks).

Position the cursor or crosshairs on the layout where you want to place the pattern. The crosshair position will be positioned in the upper left corner of the pattern.

Place the same pattern on the layout again or return to the main menu by entering F and a carriage return.

DESK	
W/ CHAIR	W/O CHAIR
30 X 55	
30 X 60	
44 X 72	



This section retrieves patterns of office desks with or without chairs. Touch the pen to the tablet pick that indicates the size of the desired desk. By touching the pen to the left side of the size tablet pick a desk with a chair will be retrieved. By touching the pen to the right side of the size tablet pick a desk without a chair will be retrieved. The next prompt is:

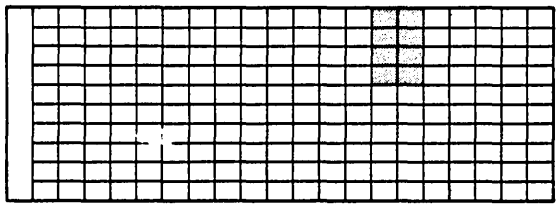
MODIFY MODALS

Modal modification is described in the HAW1 tablet overlay section of this manual except for ORIGIN METHOD and ENTITY GROUPING. The origin method has been preset to SCREEN POSITION and the entity grouping has been preset to ON. You can change these modals if you desire.

When you finish setting the modify modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks).

Position the cursor or crosshairs on the layout where you want to place a pattern. The crosshair position will be positioned in the upper left corner of the pattern.

Place the same pattern on the layout again or return to the main menu by entering F and a carriage return.



DRAFTING TABLE	
W/ CHAIR	W/O CHAIR
40 X 60	
44 X 72	

This section operates in the same way as the desk section of the ROFF. Touch the pen to the tablet pick that indicates the size of the desired table. By touching the pen to the left side of the size tablet pick a desk with a chair will be retrieved. By touching the pen to the right side of the size tablet pick a desk without a chair will be retrieved. The system prompts:

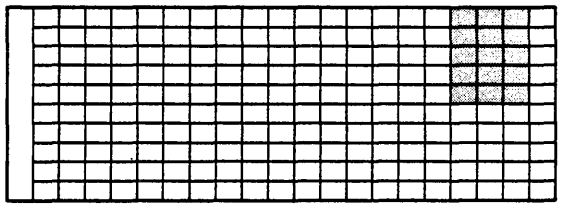
MODIFY MODALS

Modal modification is described in the HAW1 tablet overlay section of this manual except for ORIGIN METHOD and ENTITY GROUPING. The origin method has been preset to SCREEN POSITION and the entity grouping has been preset to ON. You can change these modals if you desire.

When you finish setting the modify modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks).

Position the cursor or crosshairs on the layout where you want to place a pattern. The crosshair position will be positioned in the upper left corner of the pattern. Place the same pattern on the layout again or return to the main menu by entering F and a carriage return.

FILES		
LEGAL	2	STD.
LEGAL	3	STD.
LEGAL	4	STD.
LEGAL	5	STD.



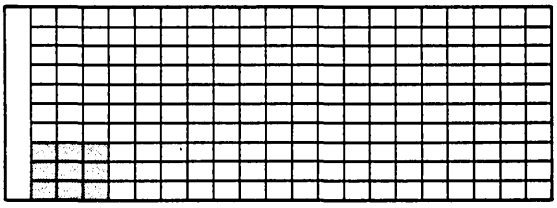
This section retrieves patterns of standard and legal file cabinets. Touch the pen to the tablet pick that states either LEGAL or STD. The numbers 2, 3, 4, 5 in the center column indicate the number of drawers in the file cabinet. The next prompt is:

MODIFY MODALS

Modal modification is described in the HAW1 tablet overlay section of this manual except for ORIGIN METHOD and ENTITY GROUPING. The origin method has been preset to SCREEN POSITION and the entity grouping has been preset to ON. You can change these modals if you desire.

When you finish setting the modify modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks).

Position the cursor or crosshairs on the layout where you want to place a pattern. The crosshair position will be positioned in the upper left corner of the pattern. Place the same pattern on the layout again or return to the main menu by entering F and a carriage return.



COFFEE MACHINE	
CHAIR	
CREDENZA	

This section retrieves patterns of a coffee machine, chair, or credenza. Placement of the patterns is the same as with the other office furniture patterns. Touch the pen to the appropriate tablet pick. The next prompt is:

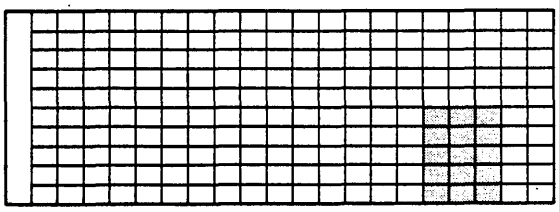
MODIFY MODALS

Modal modification is described in the HAW1 tablet overlay section of this manual except for ORIGIN METHOD and ENTITY GROUPING. The origin method has been preset to SCREEN POSITION and the entity grouping has been preset to ON. You can change these modals if you desire.

When you finish setting the modify modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks).

Position the cursor or crosshairs on the layout where you want to place a pattern. The crosshair position will be positioned in the upper left corner of the pattern. Place the same pattern on the layout again or return to the main menu by entering F and a carriage return.

UTILITIES		
AIR SUPPLY	SPRINK	
JUNC-TION		
SWITCH		



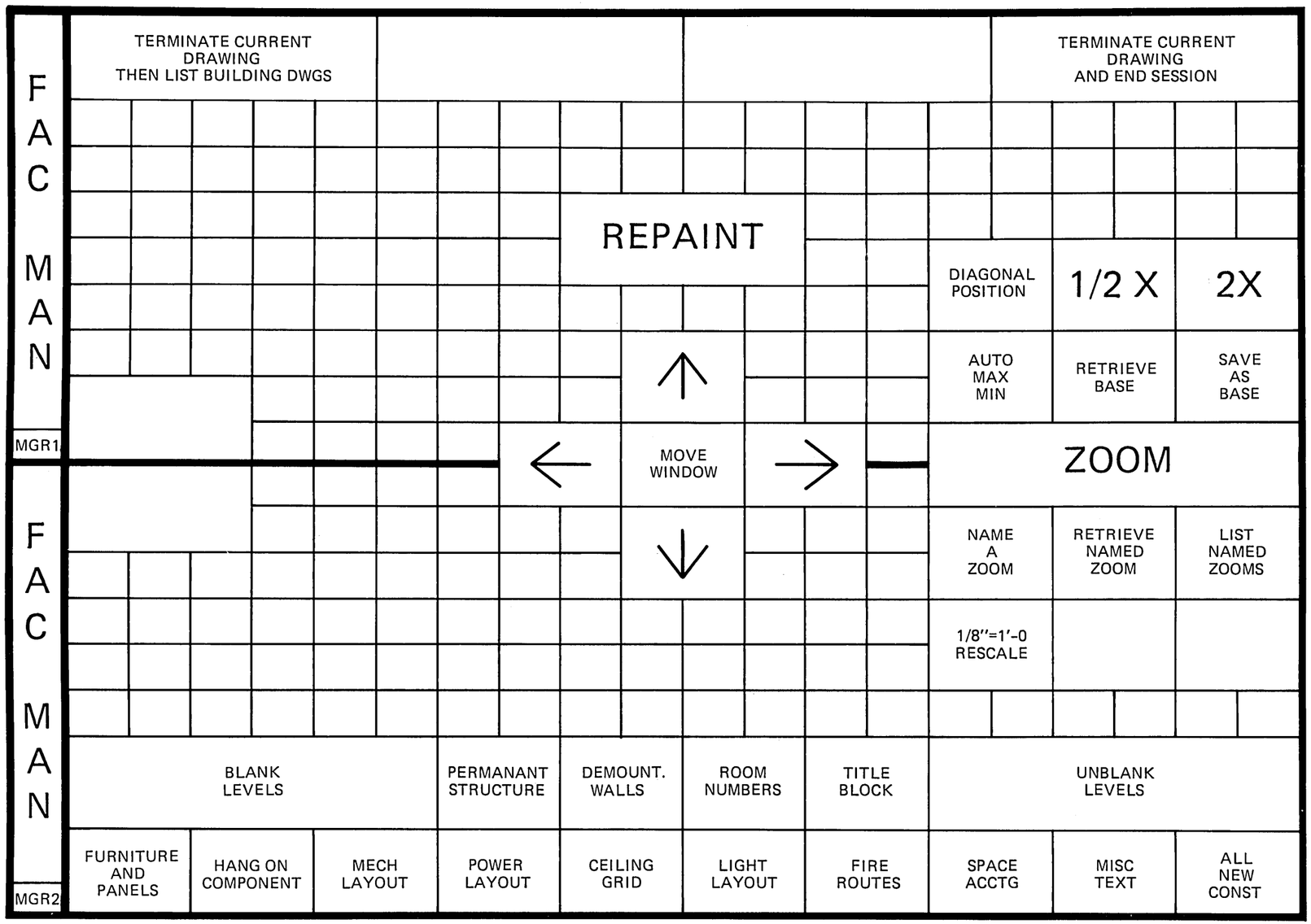
This section retrieves patterns of some common electrical and mechanical symbols. Placement of the patterns is the same as with the office furniture patterns. See appendix F for a picture of the patterns and the location of the reference point patterns. Touch the pen to the appropriate tablet pick. The next prompt is:

MODIFY MODALS

Modal modification is described in the HAW1 tablet overlay section of this manual except for ORIGIN METHOD and ENTITY GROUPING. The origin method has been preset to SCREEN POSITION and the entity grouping has been preset to ON. You can change these modals if you desire.

When you finish setting the modify modals, enter]. The FAC1 tablet contains picks which automatically set modals to common settings (see the PLACE ON PATTERN LEVEL and PLACE ON CURRENT LEVEL tablet picks).

Position the cursor or crosshairs on the layout where you want to place a pattern. The crosshair position will be positioned in the upper left corner of the pattern. Place the same pattern on the layout again or return to the main menu by entering F and a carriage return.



MGR1 & MGR2

TABLET OVERLAYS

Functions provided for facilities manager. These two overlays must be used together.

MGR1 AND MGR2 TABLET OVERLAYS

This section describes how to use the MGR1 and MGR2 tablet overlay selections.

Activation

The Facilities Managers Tablet Overlay is activated when the same procedures illustrated in appendix L are followed. Select the TAPE3 file containing the drawing you want. After you type in your user name, password, and application, the NOS slash will appear on the work station screen. At this time you should type in the same sequence of events to activate the FAC1 and LAY1 tablet page/overlay. Type in MGR1 and MGR2 instead of typing in FAC1 and LAY1 respectively. This procedure will initialize the system, the software, and activate the Facilities Manager Tablet Overlay. To review the TAPE3 drawings, type in the word LIST when the prompt ENTER PART NAME appears. A list of building drawings will appear on the screen. The prompt appears below the list:

```
ENTER PART NAME
```

Type in a name from the list to view a building drawing. The sheet number can also be obtained from this list:

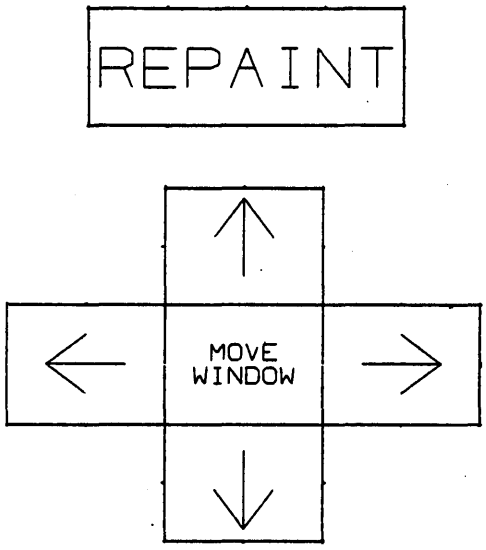
```
SHEET NUMBER
```

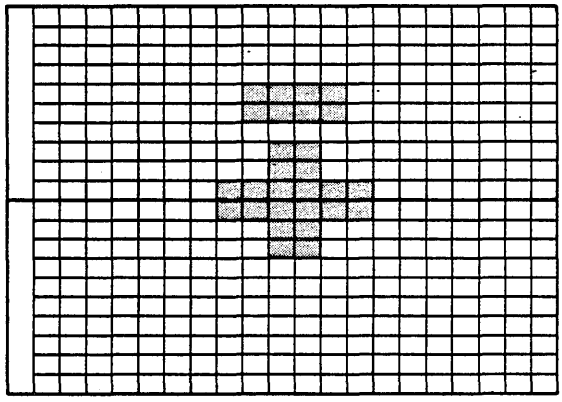
Use

There are 4 main sections to the facilities managers tablet overlay:

1. REPAINT/MOVE WINDOW
2. ZOOM
3. BLANK/UNBLANK LEVELS
4. TERMINATE DRAWING

REPAINT/MOVE WINDOW

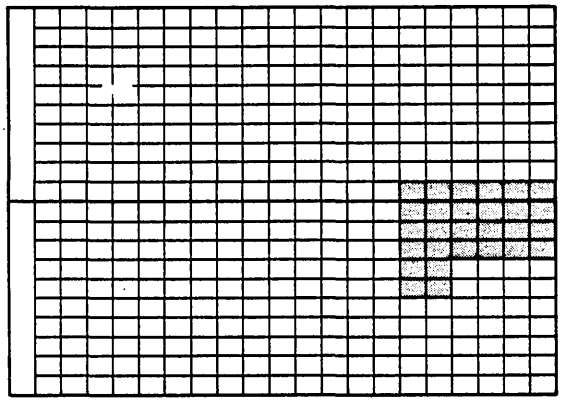


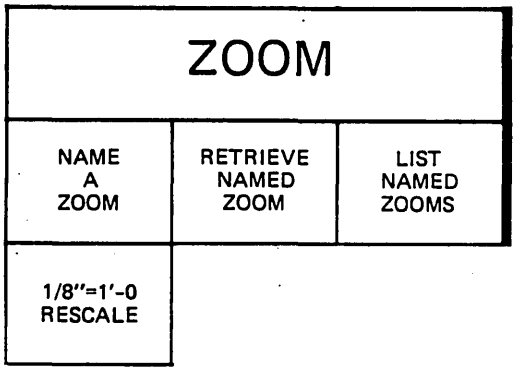


Repaint all that is currently displayed on the workstation screen by touching the pen to the REPAINT rectangle.

You can move the viewing window of the screen by touching the pen to one of the arrows surrounding the MOVE WINDOW tablet pick. The options for scrolling the viewing window are UP, DOWN, RIGHT, and LEFT.

ZOOM

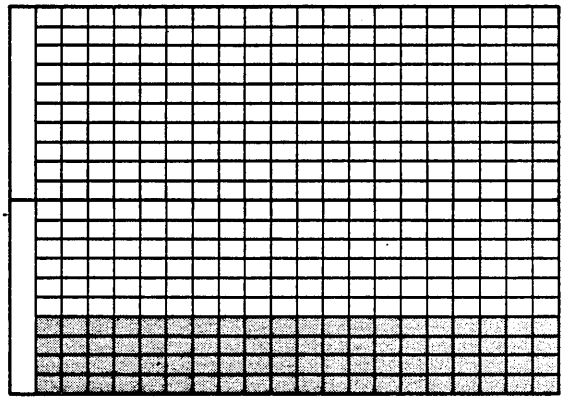




See chapter 4, sections 8.6, 8.8.5, and 8.6.14 of the ICEM Design/Drafting Data Management manual.

BLANK/UNBLANK WINDOWS

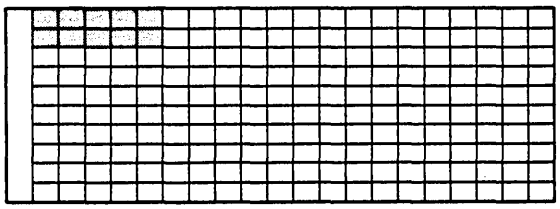
BLANK LEVELS			PERMANANT STRUCTURE	DEMOUNT. WALLS	ROOM NUMBERS	TITLE BLOCK	UNBLANK LEVELS		
FURNITURE AND PANELS	HANG ON COMPONENT	MECH LAYOUT	POWER LAYOUT	CEILING GRID	LIGHT LAYOUT	FIRE ROUTES	SPACE ACCTG	MISC TEXT	ALL NEW CONST



The UNBLANK levels section allows you to view or not to view any facilities discipline (for example wall layouts, light layouts, ceiling grids, fire routes) or combination of disciplines. To view a facilities discipline on the screen, touch the pen to the UNBLANK/BLANK rectangular. Then touch the pen to the tablet pick with the discipline you want to display on the screen.

To erase a discipline from the display, touch the pen to the BLANK LEVELS rectangle, then touch the pen to the tablet pick with the discipline you want to erase from the screen. To display the new levels pick REPAINT.

TERMINATE DRAWING



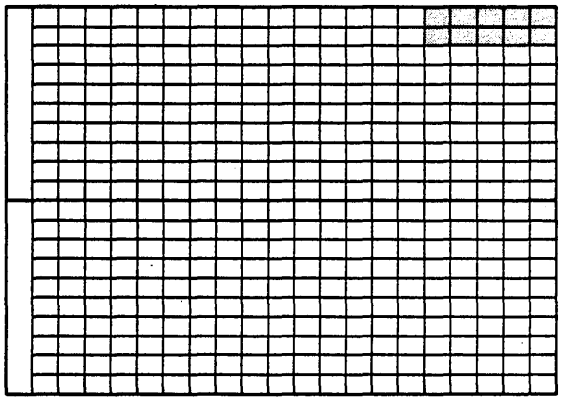
TERMINATE CURRENT
DRAWING
THEN LIST BUILDING DWGS

By touching the pen to the rectangle, the drawing displayed on the work station screen is terminated, and a list of building drawings will appear on the screen. The prompt will appear below the list:

ENTER PART NAME

Type in a name from the list to view a building drawing.

TERMINATE CURRENT
DRAWING
AND END SESSION



The drawing displayed on the workstation screen is terminated and the session is ended by touching the pen to the rectangle. To begin a new session, repeat the procedure outlined in ACTIVATION.

GLOSSARY A

Angle

In ICEM Facilities, angles are entered in response to prompts according to the following conventions:

- Positive rotation angle is measured counterclockwise from the positive horizontal axis.
- Negative rotation is measured clockwise from the positive horizontal axis.

Arc

An entity which is defined as any part of a circle. Since graphics display devices can only draw straight lines, an arc on the screen is drawn as a series of line segments. The number of segments displayed may be controlled by the display tolerance modal.

Depth

A preset value for ZT that references the work space associated with a view. Two-dimensional entities (arcs, conics, strings, and 2-dimensional splines) are defined in the work space on the ZT plane determined by the value of depth. Each work space has its own depth value. Thus, changing views can change the depth, in addition to the work space.

Global Zoom Scale

The magnification and the region of display of a view layout. Normally, a view layout is displayed without magnification. However, you can choose to magnify specific regions of the layout for more detailed display.

Group

A collection of entities which can be selected with one tablet pick. Groups are formed either during pattern retrieval or by the group operation.

HVAC

Heating, ventilation, and air conditioning.

Line

An entity which is a straight line. Many facilities components are composed of lines such as doors, walls, and windows. In the facilities package, it is usually possible to select only the basic entities such as points, lines and arcs rather than collections of entities that may be used to define a wall, door, or window. The only exception is when the collection of entities forms a group. It is useful to think in terms of the basic entities rather than what they represent. Thus one prompt reads LINE END rather than WALL END because a wall is represented by two parallel lines.

Pattern

One or more entities which have been previously stored on the pattern library. Almost anything which can be created in ICEM Facilities can be stored as a pattern. The pattern may then be recalled and placed on a drawing any number of times, saving the work of recreating the entities each time. Patterns may be stored as solely local patterns (local to the current drawing file) or as global patterns. (See chapter 2, section 6.2 of the ICEM Design/Drafting Data Management manual.)

ICEM Facilities has predefined a global pattern library. It may be accessed by many users simultaneously and may be updated by the user.

Point

An entity with X, Y and Z coordinates and represented by an X on a drawing. It may be selected and used in defining other entities. The facilities management system only uses the X and Y coordinates. The Z value is set to zero.

Tablet Overlay

The physical sheet placed on the tablet which describes the action programmed in a tablet square. The names in the tablet page correspond to the names on the tablet overlay. Three overlays may be present on the tablet at a time:

- The fixed tablet overlay placed at the top of the tablet.
- The upper user definable tablet overlay.
- The lower user definable tablet overlay.

Tablet Page

One of three areas on the tablet, the lower two of which may be reprogrammed at your discretion. A page is made up of 200 tablet squares that can be called as a unit, and may be assigned to one of the lower two areas of the tablet. The tablet page contains the programming code that is read by the tablet pick on the tablet overlay. The tablet overlay is the physical plastic overlay which is placed on the tablet, the tablet page is the programming code counterpart.

Tablet Pick

The action of selecting a tablet square with the tablet pen.

Tablet Square

The smallest programmable unit on the tablet page, associated with a physical square on a tablet overlay.

View

A specific way of looking at a design. Each view has a transform coordinate system associated with it. Mathematically, a view is defined as a 3-dimensional rotation of and translation away from the model space view. Every entity is defined in the coordinate system of a specific transform space. Views can be named (up to 16 characters).

View Layout

A configuration of views displayed at specified zoom scales in preassigned windows. Up to 32 views can be displayed in a layout simultaneously.

View Modals

Characteristics that can be associated with views. For example, you can specify the model space axes, the window border, and the view name that will be displayed with specific views or with all displayed views.

Window

The rectangular region on the screen in which a view is displayed. If only one view is displayed, the window is the entire screen.

Work View

The displayed view in which screen position input is active. The work space associated with the work view is the definition transform space used for data input and entity construction.

Zoom Scale

The proportionate scale by which a displayed view is enlarged or reduced.

NOTES FOR THE SUPPORT PROGRAMMER B

All the parts of ICEM Facilities can be customized to your particular needs. This appendix provides a brief introduction to customization. References to manuals for other products used by ICEM Facilities are included as needed.

In all cases, the data and files provided as a part of ICEM Facilities can be modified, or new data and files can be generated.

TABLET OVERLAYS

Each square of the tablet page can be programmed to execute a specific function. The function is defined by a sequence of menu selections and/or text. This sequence is called the menu string. The menu string for each square is stored in a local text file named MSTRING. The string name is stored in coded form in the local file named TFILE.

ICEM Facilities TFILE and MSTRING data is provided in permanent files FACTFIL and FACMSTR, respectively. These files are attached as local files named TFILE and MSTRING while ICEM Facilities is executing.

Refer to chapter 3, section 7.13 of the ICEM Design/Drafting Data Management manual for instructions on tablet programming.

All tablet picks in ICEM Facilities use the following conventions. Each square for the six ICEM Facilities tablet overlays points to an MSTRING name. There are two hundred squares on each of the six tablets, that is, ten rows by twenty columns. Each MSTRING name consists of one or two letters and a number between 1 and 200. The letters define the tablet overlay (F for FAC1, H for HAW1, L for LAY1, R for ROFF1, MT for MGR1, MB for MGR2). The number defines which tablet square is being defined. Column one contains squares 1 through 10, column two contains squares 11 through 20. This numbering scheme continues through column 20 which contains squares 191 through 200.

These conventions allow you to modify ICEM Facilities by editing the MSTRING file named FACMSTR.

Note that modifying the tablet page in MSTRING has no effect on any drawing of the tablet page that may exist. Changing the drawing to correspond to the page program is entirely your responsibility.

Refer to appendix C of this manual for information on drawings of tablet pages.

GPL PROGRAMS

Within ICEM Design/Drafting you can use programs in the Graphics Programming Language (GPL) to automatically execute many ICEM Design/Drafting functions.

GPL provides assignment and function statements for data manipulation, transfer-of-control statements for program control and major word statements to specify ICEM Design/Drafting operations.

GPL programs can be created and/or edited within ICEM Design/Drafting or by using a text editor outside of ICEM Design/Drafting.

GPL source code must be compiled before it can be used. The GPL source code provided with ICEM Facilities is in permanent file FACGPLS. Compiled GPL programs are in permanent file FACLIB.

Refer to the ICEM Design/Drafting GPL Programming Language manual for information on GPL use.

ATTRIBUTES

Attributes are names and numbers associated with entities in an ICEM Design/Drafting drawing. Within ICEM Facilities, attributes are used as keys or pointers for report writing. They are attached to entities to identify Haworth components, office furniture, and construction work consisting of installing and removing walls, doors, lights, switches, outlets, and air supplies.

Attributes are the only means used to transfer information from the drawings to the report writing programs. Therefore, if new components, construction operations or other things are to be included in reports, attributes must be used.

If a new component is added, an attribute must be attached to an entity in the pattern. If a new construction operation is added, an attribute must be attached by means of the GPL program.

In addition, the report writing programs and database must be modified to deal with these new attributes as desired.

Refer to appendixes D, F, and I of this manual for information on GPL programs, patterns, and report writing respectively, and to chapter 1, section 5.6 of the ICEM Design/Drafting Data Management manual for information on attribute management.

PATTERNS

Within ICEM Design/Drafting, a pattern is defined as a set of entities that are combined and stored together under a name to allow those entities to be easily reproduced at will. If the entities in a pattern have attributes attached to them, those attributes are reproduced with the entities.

ICEM Facilities uses patterns for Haworth components, office furniture, and other commonly used drawing components.

If a new pattern is added and an attribute is needed for report writing, the attribute should be attached to one entity in the set before the pattern is created. Only one attribute should be needed for each pattern, although more than one attribute and subattribute could be used.

The patterns provided with ICEM Facilities are in permanent files FACPAT1 and FACPAT2.

Refer to chapter 2, section 6.2 of the ICEM Design/Drafting Data Management manual for information on patterns.

REPORT WRITING

ICEM Facilities generates reports through the use of a FORTRAN 5 program. Three kinds of reports are generated: office bill-of-materials, Haworth bill-of-materials, and construction cost estimates.

The report generator source cod is supplied in the ICEM Facilities package (file name REPSRC). This allows the user to customize the report generator and report formats to his or her specific needs.

The ICEM Facilities report generator reads two local files before generating a report. It first reads a data base that contains the current price list for the report to be generated. These data bases (file names OFDATA, HWDATA, and CEDATA) can be updated by the user with a text editor. The report generator also reads in an attribute list (file name LIST). This is a local file generated from ICEM Design/Drafting when the user makes the BILL OF MATRL. tablet pick.

The ICEM Facilities report generator writes the reports to local files named OFBILL, HWBILL, and CEESTM.

CUSTOMIZED TERMINAL USE

Entry into ICEM Design/Drafting can be simplified by writing a NOS CCL procedure incorporating an input file for ICEM Design/Drafting. This input file should specify the baud rate and terminal type to be used, define the upper and lower tablet pages to be used, and place you at the ENTER PART NAME prompt within ICEM Design/Drafting.

Separate procedures could be provided for each terminal type commonly used by your facilities department.

Figure B-1 shows an example procedure, with notes to the right explaining some of the lines. Note that the first part of this procedure is similar to procedure ICEMFAC provided with ICEM Facilities. Copies of ICEMFAC can be edited to incorporate the input file or new procedures can be created.

Procedure	Notes
.PROC,TEK4114*I,FN"FOR DRAWING FILE".	
ATTACH,TAPE3=FN/M=W.	
ATTACH,GPLLIB=FACLIB.	
ATTACH,MSTRING=FACMSTR.	
ATTACH,TFILE=FACTFIL.	
ATTACH,GPARTS=FACGPRT.	
ATTACH,PATTERN=FACPAT1.	
ATTACH,FACPAT2.	
ATTACH,GOLIB/UN=APPLLIB.	
ATTACH,ICEMDDN/UN=APPLLIB,NA.	
ICEMDDN,I=IT4114.	
.DATA,IT4114.	
9	Specify 9600 baud
6	Specify Tektronix 4114 terminal
1	with menu area on screen,
2	Tektronix option 13 tablet,
1	local display file, and local
1	character set
ICEM Facilities	Dummy part name
1	and sheet number
2	Units
1	and drafting standard
1	Define tablet page
16	
1	upper
FAC1	as FAC1
	Define tablet page
2	lower
LAY1	as LAY1
F	Return to main menu
4	and select FILE/EXIT
6	Do not file part
Y	Terminate this part

Figure B-1. Example NOS CCL Procedure

This example specifies a Tektronix 4114 terminal operating at 9600 baud and defines FAC1 as the upper tablet page and LAY1 as the lower tablet page. Part name ICEM Facilities, and sheet 1, do not refer to a real part, but are dummy entries that get you far enough into ICEM Design/Drafting so that you can define the tablet pages. You can use any dummy name and sheet number as long as they are not the same as those for any real parts in your TAPE3 drawing file.

Refer to NOS Version 2 Reference Set, Volume 3 for information on CCL procedures and to the ICEM Design/Drafting Introduction and System Controls manual for information on terminal types and baud rates.

CUSTOMIZED MANAGER USE

Similar to customizing a procedure for terminal use described previously, a procedure can be customized for facilities manager use. The baud rate and terminal type should be as specified previously but the tablet pages should be defined to be MGR1 and MGR2.

Figure B-2 shows an example procedure specifying a Tektronix 4114 terminal operating at 9600 baud with pages MGR1 and MGR2 defined.

Procedure	Notes
.PROC,MGR4114*I,FN"FOR DRAWING FILE".	
ATTACH,TAPE3=FN/M=W.	
ATTACH,GPLLIB=FACLIB.	
GET,MSTRING=FACMSTR.	
ATTACH,TFILE=FACTFIL.	
ATTACH,GPARTS=FACGPRTR.	
ATTACH,PATTERN=FACPAT1.	
ATTACH,FACPAT2.	
ATTACH,GOLIB/UN=APPLLIB.	
ATTACH,ICEMDDN/UN=APPLLIB,NA.	
ICEMDDN,I=M4114.	
.DATA,M4114.	
9	Specify 9600 baud
6	Specify Tektronix 4114 terminal
1	with menu area on screen and
2	Tektronix option 13 tablet,
1	local display file, and local
1	character set
ICEM Facilities	Dummy part name
1	and sheet number
2	Units
1	and drafting standard
1	Define tablet page
16	
1	upper
MGR1	as MGR1
	Define tablet page
2	lower
MGR2	as MGR2
F	Return to main menu
4	and select FILE/EXIT
6	Do not file part
Y	Terminate this part

Figure B-2. Example Tektronix 4114 Terminal Procedure

TABLET OVERLAYS AND PAGES C

ICEM Facilities uses six tablet overlays and six tablet pages. Each tablet pick of each tablet page can be programmed to execute a specific function. The function is defined by a sequence of menu selections and/or text. This sequence is called the menu string. The menu string for each tablet pick is stored in coded form in a local text file named MSTRING. The string name is stored in coded form in file TFILE.

Each tablet page is stored in TFILE by name. The page names and general function of each are as follows:

Name	Function
FAC1	General purpose for level management and operations used throughout ICEM Facilities. Includes many ICEM Design/Drafting operations.
LAY1	Basic layout of permanent structural components, e.g., walls, doors, and windows. Includes operations for construction drawings.
HAW1	Placement of Haworth components.
ROFF1	Placement of office furniture.
MGR1 and MGR2	Function for the facilities manager. These two must be used together.

These overlays are provided on permanent file FACTFIL and FACMSTR. Copies are included in this appendix.

The pages corresponding to the tablet overlays are also supplied in a GPARTS format, file name FACGPRT and can be plotted out using ICEM Design/Drafting. These drawings can be retrieved using the RESTORE FAC1 LAY1, RESTORE HAW1, RESTORE ROFF1, and RESTORE MGR1 MGR2 tablet picks on the LAY1 tablet overlay. Refer to chapter 3, section 7.2 of the ICEM Design/Drafting Data Management manual and appendix B of the ICEM Design/Drafting Introduction and System Controls manual for more information.

FACILITIES FUNCTIONS

BLANK ALL	BLANK LEVELS	PERM. STRUCT	DEMOUN-TABLE WALLS	ROOM NUMBER	TITLE BLOCK	FURN-ITURE	COMPO-NENTS	MECH. LAYOUT	POWER LAYOUT	CEILING GRID	LIGHT LAYOUT	FIRE ROUTES	SPACE ACCTG.	ALL CURENT LAYOUT	ALL CURRENT LAYOUT		BLANK ALL POINTS	DISPLAY	FILE NO TERM.
UNBLNK ALL	UNBLNK LEVELS		NEW CONST. WALLS	N.C. ROOM NO.S	N.C. TITLE BLOCK	N.C. FURN-ITURE	N.C. COMPO-NENTS	N.C. MECH. LAYOUT	N.C. POWER LAYOUT	N.C. CEILING GRID	N.C. LIGHT LAYOUT	N.C. DIMEN-SIONS	N.C. SYMBLS	N.C. MISC. TEXT	ALL NEW CONSTRUCTION		UNBLNK ALL POINTS	2-D	3-D
BLANK	DELETE	MODIFY LEVEL / PEN		TITLE BLOCK	MODAL STATUS	GRID DISP.	GRID PARAM	GRID ACTIV.	STRING	OFFSET CURVE	STRTCH	ENTITY MANIP.	LEFT JUST	CENTER JUST	RIGHT JUST	90°	0°	LIST GPL	LIST ZOOMS
SINGLE	CHAIN	SOLID	DASH	SOLID	DASH	24"	30"	TRANS-LATE	DUPL. AND TRANS.	DRAG	DUPL. AND DRAG	MIRROR	NOTE	TEXT PARLEL	ANG CTRL NONE	PLACE ON PATTERN LEVEL 180°	270°	LIST GLOBAL PARTS	LIST LOCAL PARTS
DELETE REG/ IN	DELETE REG/ OUT	FONT PHANT.	C-LINE	MODIFY FONT PHANT.	C-LINE	48"	60"	ROTATE	DUPL. AND ROTATE	RECT-ANGLAR ARRAY	GROUP	OTHER CURVES	LABLE	1/8"	1/4"	GPL	RUN GPL	LIST PRIM PATTRN	LIST SEC PATTRN
DELETE A LEVEL	DELETE ALL POINTS	CONST. MODAL	SINGLE FROM GROUP	MENU/ CURSOR MODE	MODALS	LINE	LINE SCRN POS	LINE JOIN CURVES	LINE PARLEL	LINE JOIN 2 PTS	ATTRIB INTERO GATE	ATTRIB COUNT	DRFTNG	CHAR. SIZE 3/8"	1/2"	BALLOON CREATE	MODIFY	LIST VARS.	LIST ENTITY INFO.
ONE END	TWO ENDS	ENTITY DRAG ON		DATA VERIFY ONE ENT.	TWO ENT.	POINT	POINT SCRN POS	POINT CURVE END	POINT DELTA	POINT CURVE INTER	ATTRIB	IND. ATTRIB	DRFTNG MODALS	CHAR. SIZE	NEW ORIGIN	90°	0°	PART	PATTRN
TRIM CURVES MIDDLE	TWO CURVES	ENTITY DRAG OFF				CIRCLE	CIRCLE POS./ RAD.	CIRCLE CENTER RAD.	HEXA-GON	RECT-ANGLE	BILL OF MATRL.	FIND TOTAL	CANON	MODIFY TEXT	NEW DISP VALUES	PLACE ON CURRENT LEVEL 180°	270°	PATTERN RETR	CREATE
SET LEVELS			N.C. WALLS	N.C. ROOM NO.S	N.C. TITLE BLOCK	N.C. FURN-ITURE	N.C. COMPO-NENTS	N.C. MECH. LAYOUT	N.C. POWER LAYOUT	N.C. CEILING GRID	N.C. LIGHT LAYOUT	N.C. DIMEN-SIONS	N.C. SYMBLS	N.C. MISC. TEXT		SPECL. FUNCT.		INITIALIZE PART FILE	
NAME: FAC1		PERM. STRUCT	DEMOUN-TABLE WALL	ROOM NO.S	TITLE BLOCK	FURN-ITURE	COMPO-NENTS	MECH. LAYOUT	POWER LAYOUT	CEILING GRID	LIGHT LAYOUT	FIRE ROUTES	SPACE ACCTG.	MISC. TEXT		CALCU-LATE	PLOT		

FACILITIES LAYOUT

BEGIN LAYOUT		2"	3"	4"	5"	TOP		YES	NO		SQUARE FOOTAGE		NEW WALL SYMBOL	REMOVE WALL SYMBOL	
		WALL WIDTH 6"	8"	10"	12"	MID							NEW DOOR SYMBOL	REMOVE DOOR SYMBOL	
						BOT		UP	DOWN		DUPLICATE NOTE		NEW LIGHT SYMBOL	REMOVE LIGHT SYMBOL	
SCRN POS	KEY IN	LINE END	DELTA	SCRN POS	KEY IN	LINE END	TO LINE	ANGLE/ DIST	LEFT	RIGHT			NEW SWITCH SYMBOL	REMOVE SWITCH SYMBOL	
BEGINNING REF. POINT					NEXT REF. POINT MODE										
POINT	DELTA LINE	DELTA POINT	DELTA S.P.	POINT	DELTA LINE	DELTA POINT	DELTA	DELTA S.P.					NEW OUTLET SYMBOL	REMOVE OUTLET SYMBOL	
													NEW AIR SUP. SYMBOL	REMOVE AIR SUP. SYMBOL	
WALL	DOOR	WINDOW		24"	30"	135°	90°	45°		RESTORE HAWORTH PATS		RESTORE OFFICE PATS			
CLOSE WALL	TRIM	CHANGE WIDTH	DOOR TRIM	DOOR SIZE 36"	48"	180°	ANGLE	0°		RESTORE ETC DEMO		RESTORE WING LAYOUT			
TEE	END WALL	COLMNS	EXIT			225°	270°	315°		RESTORE CDC LAYOUT		RESTORE FAC1 LAY1			CHANGE PAGE OFFICE FURN (ROFF1)
NAME: LAY1	ZOOM	REPAINT	DELETE	WALL SEG						RESTORE ROFF1		RESTORE HAW1	RESTORE MGR1 MGR2		CHANGE PAGE HAWORTH COMP (HAW1)

Figure C-1. Facilities Functions and Facilities Layout Tablet

HAWORTH LAYOUT	HAWORTH FABRIC PANELS LENGTH		HEIGHT	HAWORTH VIDENE PANELS LENGTH		HEIGHT	HAWORTH WORK SURFACE LENGTH		HEIGHT	HW SHELF	HW FLIP DOOR	HW LAT FILE	HW LIGHT	HW TACK BOARD	HW PEN DRAWER	HW TYPE TABLE	HW ROUND TABLE 36 DIA	HW ROUND TABLE 42 DIA	HW COUNT TOP	HW BILL OF MTLS
	5'-0	66"	80"	5'-0	42"	66"	5'-0	24"	30"	5'-0	5'-0	5'-0	5'-0	5'-0	WS A		WS C		WS E	
	4'-0	66"	80"	4'-0	42"	66"	4'-0	24"	30"	4'-0	4'-0	4'-0	4'-0	4'-0	WS B		WS D		WS F	
	3'-0	66"	80"	3'-0	42"	66"	3'-0	24"	30"	3'-0	3'-0	3'-0	3'-0	3'-0						
	2'-6	66"	80"	2'-6	42"	66"														
	2'-0	66"	80"	2'-0	42"	66"														
	1'-0	66"	80"	1'-0	42"	66"														
	DOOR UNIT																		CHANGE PAGE OFFICE FURN (ROFF1)	
NAME: HAW1	↙	↘																	CHANGE PAGE FAC. LAYOUT (LAY1)	

Figure C-2. Haworth Layout Tablet

OFFICE FURNITURE LAYOUT

NAME: ROFF1

OFFICE BOOKCASE			OFFICE CABINET		CONF. TABLE		DESK			DRAFTING TABLE			FILES			
LENGTH	NO. SHELVES		12 X 36		30 X 60		W/ CHAIR	W/O CHAIR		W/ CHAIR	W/O CHAIR		LEGAL	2	STD.	
12 X 30	2		18 X 36				30 X 55			40 X 60			LEGAL	3	STD.	
12 X 30	3		24 X 36				30 X 60			44 X 72			LEGAL	4	STD.	
12 X 36	2		36 X 36				44 X 72						LEGAL	5	STD.	
12 X 36	3		UNIVERSAL 18 X 36		UNIVERSAL 30 X 60							UTILITIES				
												AIR SUPPLY	SPRINK			
COFFEE MACHINE												JUNC-TION				
CHAIR												SWITCH			CHANGE PAGE HAWORTH COMP (HAW1)	
CREDENZA															CHANGE PAGE FAC. LAYOUT (LAY1)	

Figure C-3. Office Furniture Layout Tablet

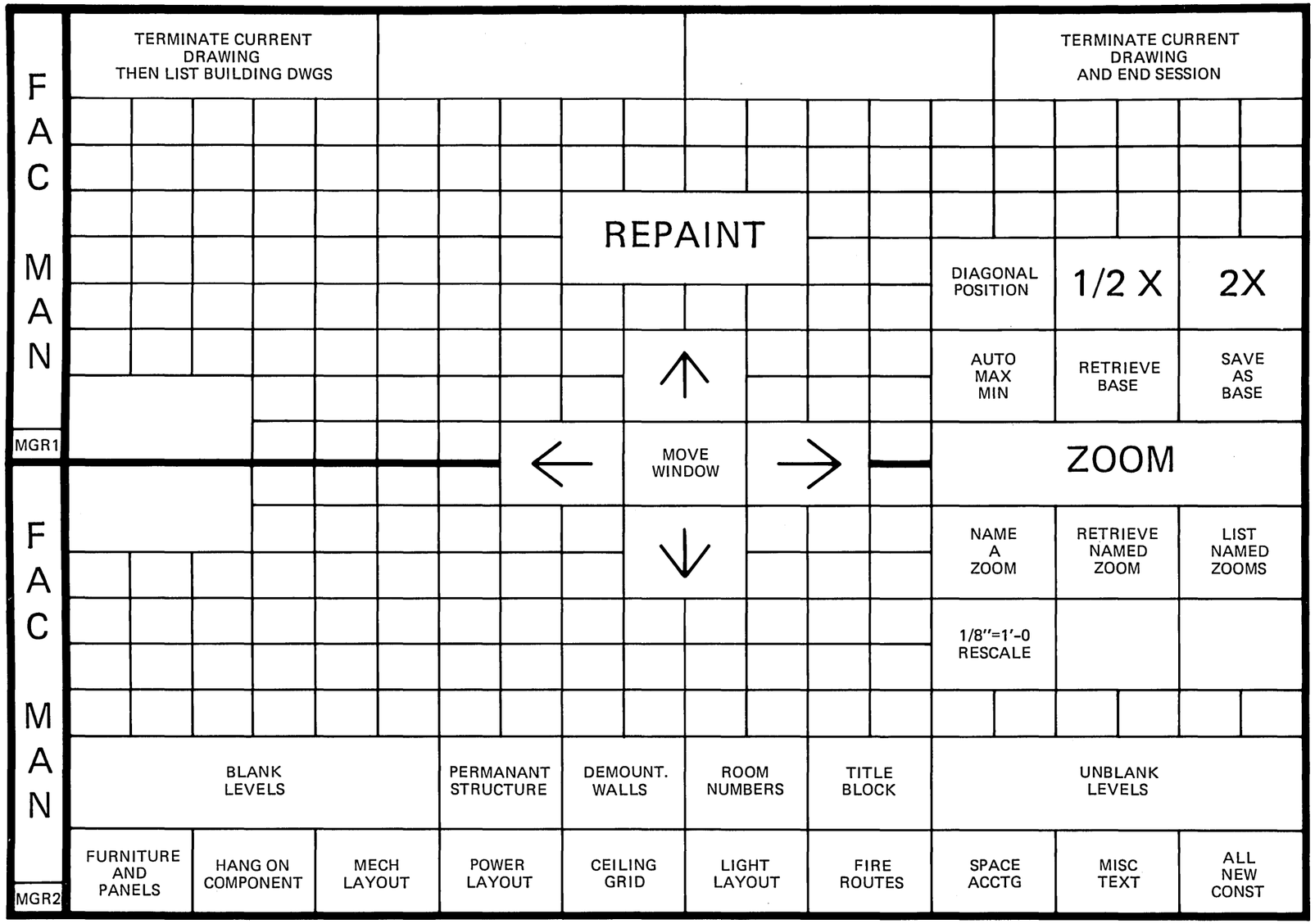


Figure C-4. Facilities Management Tablet

GPL PROGRAMS D

ICEM Facilities uses many programs written in the Graphics Programming Language (GPL) to automatically execute ICEM Design/Drafting functions. These programs are provided as source code and compiled code on files FACGPLS and FACLIB respectively.

These programs are executed by tablet picks but could also be run by name. Refer to the ICEM Design/Drafting GPL Programming Language manual for information on GPL use.

The program names and functions are as follows:

Name	Function
FACGPL	Constructs walls, doors, windows, and columns.
CALC	Functions as a calculator.
SQFEET	Computes square footage.
DUPNOTE	Places the same note at selected locations.
NEWWAL	The following 12 program names indicate installation or removal of wall,
REMWAL	door, light, air supply, switch, or outlet, respectively.
NEWDOR	
REMDOR	
NEWLIT	
REMLIT	
NEWAIR	
REMAIR	
NEWSWI	
REMSWI	
NEWOUT	
REMOUT	
OUTDOR	Removes door symbol and closes the opening with a continuous wall.
INIT	Sets variables in the Run Time Library.

ATTRIBUTES E

Attributes are names and numbers associated with entities in an ICEM Design/Drafting drawing. Within ICEM Facilities, attributes are used as keys or pointers for report writing. They are attached to entities to identify Haworth components, office furniture, and construction work for installation and removal of walls, doors, lights, switches, outlets, and air supplies.

Refer to appendix F of this manual for a list of attributes used for Haworth components and office furniture.

In addition to those attributes the following are used:

REMOVE WALL
NEW WALL
REMOVE DOOR
NEW DOOR
REMOVE LIGHT
NEW LIGHT
REMOVE AIR SUPPLY
NEW AIR SUPPLY
REMOVE SWITCH
NEW SWITCH
REMOVE OUTLET
NEW OUTLET

These attributes are self-explanatory.

PATTERNS F

Within ICEM Design/Drafting, a pattern is defined as a set of entities that are combined and stored together under a name to allow those entities to be easily reproduced at will. The patterns in this appendix have been presented with the attributes displayed at the upper right side of the pattern illustration.

ICEM Facilities uses patterns for Haworth components, office furniture, and other commonly drawn components.

There are two pattern files in the ICEM Facilities package. They are direct access files FACPAT1 and FACPAT2.

Any of these patterns can be called by name. Those marked with an asterisk before the original name can only be called by name; the others are called by making tablet picks.

The following figures illustrate these patterns:

Figures	Patterns
F-1 to F-3	Primary pattern list
F-4 to F-6	Patterns created on levels
F-7	Pattern symbols
F-8	Illustration of the north symbol
F-9	Illustration of the scale in feet symbol
F-10	Secondary pattern list
F-11 to F-13	Patterns created on levels

Figures F-1 through F-3 are a list of the patterns stored on FACPAT1.

G L O B A L   P A T T E R N   L I S T

LIBNAME= FACPAT1   14:44   7/ 3/84

ORIG. NAME	SIZE	U	N	TIME	DATE	G L O B A L N A M E
*SGL2	121	E	A	10:28	10/ 7/82	SGL2
*SGL3	121	E	A	10:28	10/ 7/82	SGL3
*SGL4	121	E	A	10:30	10/ 7/82	SGL4
*SGL5	181	E	A	10:57	10/ 7/82	SGL5
*SGL6	181	E	A	12:20	10/ 7/82	SGL6
*SGL7	181	E	A	12:22	10/ 7/82	SGL7
*SGL8	181	E	A	12:27	10/ 7/82	SGL8
*DBL1	232	E	A	10:17	10/ 7/82	DBL1
*DBL2	180	E	A	10:05	10/ 7/82	DBL2
*DBL3	181	E	A	10:00	10/ 7/82	DBL3
*DBL4	181	E	A	10:00	10/ 7/82	DBL4
*NORTH	204	E	A	12:18	2/16/83	NORTH ARROW
*CHAIR	327	E	A	10:46	8/ 9/82	CHAIR 24" CONTOUR 3-D
*1/8 SCALE	301	E	A	10:18	9/29/82	SCALE BAR
*DIFFUSER	340	E	A	10:00	9/13/82	DIFFUSER 2-0X2-0
*15 FT WALL	78	E	A	14:36	10/11/82	15 FT WALL - HQ PERIMETER WALL 4" - 15'-0 CL TO CL
*12 FT WALL	78	E	A	14:37	10/11/82	12 FT WALL-HQ PERIMETER WALL 4"- 12'-0 CL TO CL
*15 FT COL	124	E	A	15:05	10/11/82	15 FT COL-HQ PERIMETER WALL 4"- 15'-0 CL TO CL
*12 FT COL	124	E	A	15:06	10/11/82	12 FT COL-HQ PERIMETER WALL 4"- 12'-0 CL TO CL
*DESK	903	E	A	13:33	10/13/82	DESK-30"X60"- 3D
*KEY	1714	E	A	10:41	2/18/83	KEY TO SYMBOLS
*HEX	31	E	A	12:02	2/18/83	HEX - FOR NEW ROOM NUMBERS - CHAR. SIZE= 18
*18 INCH CO	749	E	A	13:45	9/30/82	18 INCH COLUMN - HQ TOWER
WS A	2584	E	A	0:03	3/23/83	WS A - STD. V.P. HAWORTH WORK STATION, 8 8' PANELS
WS C	2717	E	A	0:54	3/23/83	WS C
WS D	2895	E	A	21:38	3/22/83	WS D
WS E	1987	E	A	21:05	3/22/83	WS E
WS F	2346	E	A	20:12	3/22/83	WS F
WS A	2584	E	A	0:02	3/23/83	WS A
WS B	2831	E	A	0:16	3/23/83	WS B
SGL1	88	E	A	8:40	4/10/83	SGL1
SFC-88	187	E	A	12:28	7/ 8/83	SFC-88
SFE-88	187	E	A	12:30	7/ 8/83	SFE-88
SFC-88	187	E	A	12:44	7/ 8/83	SFC-88
SFE-88	187	E	A	13:00	7/ 8/83	SFE-88
SHC-88	187	E	A	13:08	7/ 8/83	SHC-88
SHC-88	187	E	A	13:10	7/ 8/83	SHC-88
SHER-88	187	E	A	13:12	7/ 8/83	SHER-88
SHER-88	187	E	A	13:13	7/ 8/83	SHER-88
SHEL-88	187	E	A	13:14	7/ 8/83	SHEL-88
SHEL-88	187	E	A	13:15	7/ 8/83	SHEL-88
LIGHT 2X4	248	E	A	17:12	8/29/83	LIGHT 2X4 LEVEL - 124 PEN - 2 ATTRIB= LIGHT 2X4
PF508	177	E	A	0:51	9/ 1/83	PF508 HW FABRIC PANEL 5'-0 X 80 LEV=107 PEN=1 ATT= PF-508
PF3080	134	E	A	10:28	9/ 1/83	PF3080 HW FABRIC PANEL 2'-6 X 80 LEV=107 PEN=1 ATT=PF-3080

Figure F-1. Primary Pattern List

```
                G L O B A L   P A T T E R N   L I S T
               LIBNAME= FACPAT1         14:45     7/ 3/84
ORIG. NAME      SIZE  U N  TIME    DATE    G L O B A L        N A M E
----------      ----  - -  ----    ----    ------------------------------------
PF500            177  E A  10:36  8/ 1/83  PF500  HW FABRIC PANEL 5'-0 X 80  LEV=10
                                           7 PEN=1 ATT=PF-580

PF3080           108  E A  10:48  8/ 1/83  PF3080  HW FABRIC PANEL 2'-6 X 80 LEV=10
                                           7 PEN=1 ATT=PF-3080
WS524            100  E A  11:07  8/ 1/83  WS524 HW WORK SURFACE 5'-0 X 24 LEV=100
                                           PEN=2 ATT=WS-524
PV542            177  E A  11:23  8/ 1/83  PV542 HW VIDENE PANEL 5'-0 X 42 LEV=107
                                           PEN=1 ATT=PV-542
PV3042           108  E A  11:31  8/ 1/83  PV3042  HW VIDENE PANEL 2'-6 X 30 LEV=10
                                           7 PEN=1 ATT=PV-3042
FRV5             107  E A  11:36  8/ 1/83  FRV5  HW FLIPPER DOOR-VIDENE 5'-0 LEV=10
                                           0 PEN=2 ATT=FDRV-5

CTS515           107  E A  11:44  8/ 1/83  CTS515 HW COUNTER TOP VIDENE-LT OAK LEV=
                                           100 PEN=2 ATT=CTS-515
DS3              107  E A  11:50  8/ 1/83  DS3  HW PENCIL DRAWER LEV=100 PEN=2 ATT=
                                           DS-3
TB516             97  E A  12:02  8/ 1/83  TB516  HW TACK BOARD-FABRIC LEV=100 PEN=
                                           2 ATT=TB-516
TL5               97  E A  12:08  8/ 1/83  TL5  HW TASK LIGHT 5'-0 LEV=100 PEN=2 AT
                                           T=TL-5
LBF5             130  E A  10:15  8/ 1/83  LBF5  HW LAT FILE-VIDENE 5'-0 LEV=100 PE
                                           N=1 ATT=LFBV-5

TPR36             82  E A   9:17  8/ 2/83  TPR36  HW ROUND TABLE 36 DIA LT. OAK LEV
                                           =100 PEN=2 ATT=TPR-36
TPR42             82  E A  10:16  8/ 2/83  TPR42  HW ROUND TABLE 42 DIA LT. OAK LEV
                                           =100 PEN=2 ATT=TPR-42
WS424            100  E A  10:24  8/ 2/83  WS424  HW WORK SURFACE 4'-0 X 24 LT. OAK
                                            LEV=100 PEN=2 ATT=WS-42
WS324            100  E A  10:28  8/ 2/83  WS324  HW WORK SURFACE 3'-0 X 24 LT. OAK
                                            LEV=100 PEN=2 ATT=WS-32
WS430            107  E A  10:30  8/ 2/83  WS430  HW WORK SURFACE 4'-0 X 30 LT. OAK
                                            LEV=100 PEN=2 ATT=WS-43

WS330            107  E A  10:33  8/ 2/83  WS330  HW WORK SURFACE 3'-0 X 30 LT. OAK
                                            LEV=100 PEN=2 ATT=WS-33
SR5              125  E A  10:36  8/ 2/83  SR5  HW REG. SHELF 5'-0 LEV=100 PEN=2 AT
                                           T=SR-5
SR4              125  E A  10:44  8/ 2/83  SR4  HW REG SHELF 4'-0 LEV=100 PEN=2 ATT
                                           =SR-4
SR3              125  E A  10:47  8/ 2/83  SR3  HW REG SHELF 3'-0 LEV=100 PEN=2 ATT
                                           =SR-3
FRV4             107  E A  10:51  8/ 2/83  FRV4  HW FLIPPER DOOR 4'-0 LT. OAK LEV=1
                                           00 PEN=2 ATT=FDRV-4

FRV3             107  E A  10:55  8/ 2/83  FRV3  HW FLIPPER DOOR 3'-0 LT. OAK LEV=1
                                           00 PEN=2 ATT=FDRV-3
LBF3             130  E A  11:10  8/ 2/83  LBF3  HW LAT FILE 3'-0 LT OAK LEV=100 PE
                                           N=2 ATT=LFBV-3
LBF4             130  E A  10:50  8/ 2/83  LFB4  HW LAT. FILE 4'-0 LT. OAK LEV=100
                                           PEN=2 ATT=LFBV-4
TL4               97  E A  11:20  8/ 2/83  TL4  HW TASK LIGHT 4'-0 LEV=100 PEN=2 AT
                                           T=TL-4
TL3               97  E A  11:21  8/ 2/83  TL3  HW TASK LIGHT 3'-0 LEV=100 PEN=2 AT
                                           T=TL-3

TB416             97  E A  11:26  8/ 2/83  TB416  HW TACK BOARD 4'-0 X 16 FABRIC  L
                                           EV=100 PEN=2 ATT=TB-416
```

Figure F-2. Primary Pattern List (continued)

```
                    G L O B A L   P A T T E R N   L I S T
                     LIBNAME= FACPAT1          14:43      7/ 3/84
ORIG. NAME      SIZE  U N  TIME    DATE    G L O B A L          N A M E
----------      ----  - -  ----    ----    ------------------------------------
TB316             97  E A 11:20  8/ 2/83 TB316  HW TACK BOARD 3'-0 FABRIC LEV=100
                                           PEN=2 ATT=TB-316
TTC1936           97  E A 11:54  8/ 2/83 TTC1936  HW TYPING TABLE 18 X 36 W/CASTO
                                         RS LT. OAK LEV=100 PEN=2
PAC300L          144  E A 12:01  8/ 2/83 PAC300L  HW DOOR UNIT 3'-0 X 80 LT. OAK
                                         LEV=107 PEN=1 ATT= PAC-3
PAC300R          142  E A 12:06  8/ 2/83 PAC300R  HW DOOR UNIT 3'-0 X 80 LT. OAK
                                         LEV=107 PEN=1 ATT=PAC-30

PF406            182  E A 14:31  8/ 1/83 PF406  HW FABRIC PANEL 4'-0 X 66 LEV=107
                                           PEN=1 ATT=PF406
PF206            182  E A 13:54  8/ 1/83 PF206  HW FABRIC PANEL 2'-0 X 66 LEV=107
                                           PEN=1 ATT=PF206
PF106            182  E A 13:44  8/ 1/83 PF106  HW FABRIC PANEL 1'-0 X 66 LEV=107
                                           PEN=1 ATT=PF-106
PF200            182  E A 13:57  8/ 1/83 PF200  HW FABRIC PANEL 2'-0 X 80 LEV=107
                                           PEN=1 ATT=PF-200
PF306            182  E A 14:07  8/ 1/83 PF306  HW FABRIC PANEL 3'-0 X 66 LEV=107
                                           PEN=1 ATT=PF-306

PF300            182  E A 14:10  8/ 1/83 PF300  HW FABRIC PANEL 3'-0 X 80 LEV=107
                                           PEN=1 ATT=PF-300
PV306            182  E A 14:21  8/ 1/83 PV306  HW VIDENE PANEL 3'-0 X 66 LEV=107
                                           PEN=1 ATT=PV-306
PV342            182  E A 14:25  8/ 1/83 PV342  HW VIDENE PANEL 3'-0 X 42 LEV=107
                                           PEN=1 ATT=PV-342
PF400            182  E A 14:34  8/ 1/83 PF400  HW FABRIC PANEL 4'-0 X 80 LEV=107
                                           PEN=1 ATT=PF-400
PV442            182  E A 14:38  8/ 1/83 PV442  HW VIDENE PANEL 4'-0 X 42 LEV=107
                                           PEN=1 ATT=PV-442

PV406            182  E A 14:38  8/ 1/83 PV406  HW VIDENE PANEL 4'-0 X 66 LEV=107
                                           PEN=1 ATT=PV-406
PV506            177  E A 14:43  8/ 1/83 PV506  HW VIDENE PANEL 5'-0 X 66 LEV=107
                                           PEN=1 ATT=PV-506
PF100            182  E A 14:46  8/ 1/83 PF100  HW FABRIC PANEL 1'-0 X 80 LEV=107
                                           PEN=1 ATT=PF-100
PV142            182  E A 14:48  8/ 1/83 PV142  HW VIDENE PANEL 1'-0 X 42 LEV=107
                                           PEN=1 ATT=PV-142
PV106            182  E A 14:50  8/ 1/83 PV106  HW VIDENE PANEL 1'-0 X 66 LEV=107
                                           PEN=1 ATT=PV-106

PV242            182  E A 14:54  8/ 1/83 PV242  HW VIDENE PANEL 2'-0 X 42 LEV=107
                                           PEN=1 ATT=PV-242
PV206            182  E A 14:56  8/ 1/83 PV206  HW VIDENE PANEL 2'-0 X 66 LEV=107
                                           PEN=1 ATT=PV-206
PV3066           180  E A 15:17  8/ 1/83 PV3066  HW VIDENE PANEL 2'-6 X 66 LEV=10
                                         7 PEN=1
WS530            107  E A 10:52  8/28/83 WS530  HW WORK SURFACE 5'-0 X 30 LEV=100
                                           PEN=2 ATT=WS-530
```

Figure F-3. Primary Pattern List (continued)

Figure F-4 is an illustration of the patterns from FACPAT1 that were created on original level 7. These patterns are oriented in the bottom left corner of the pattern.

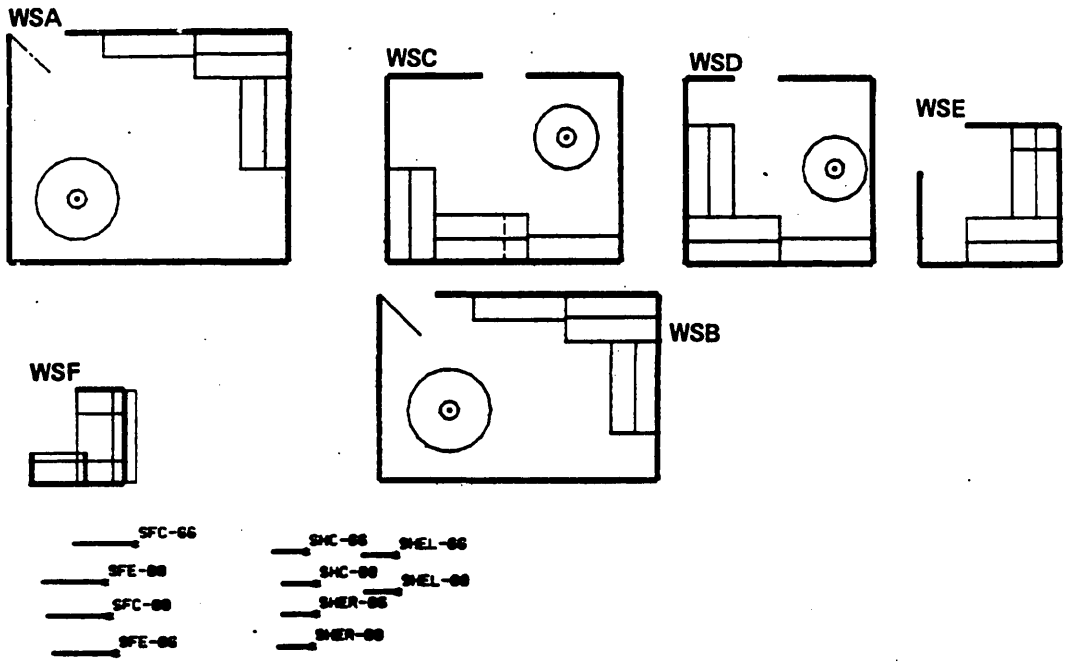


Figure F-4. Patterns Created on Original Level 7

Figure F-5 is an illustration of the patterns from FACPAT1 that were created on original level 107. These patterns are oriented in the bottom left corner of the pattern.

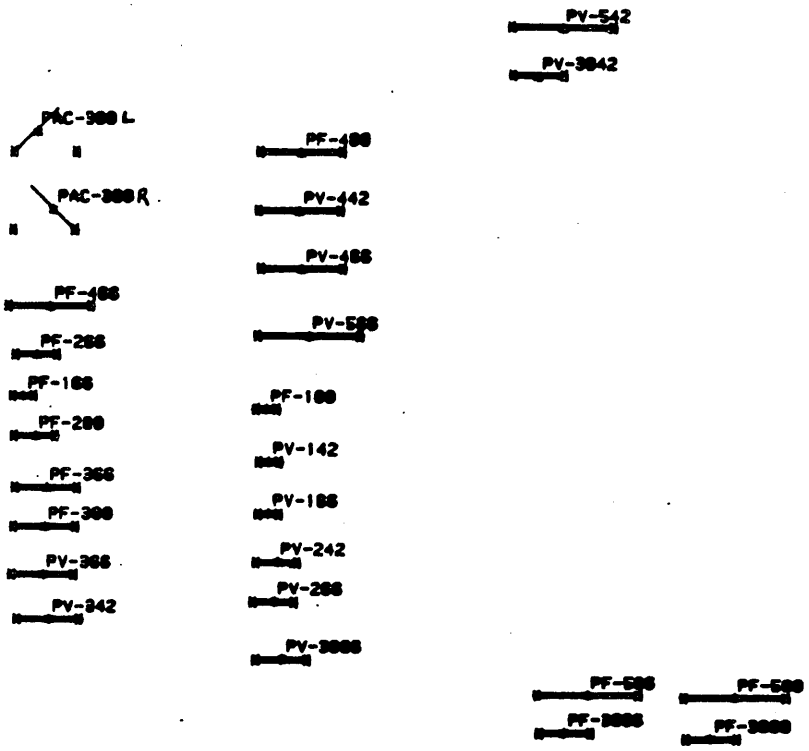


Figure F-5. Patterns Created on Original Level 107

Figure F-6 is an illustration of the patterns from FACPAT1 that were created on original level 108. These patterns are oriented in the top left corner of the pattern with the following exceptions. TPR-36, TPR-42 and TTC-1936 are oriented in the middle. CTS-515 is oriented at the middle left side. DS-3 is oriented in the middle of the bottom line.

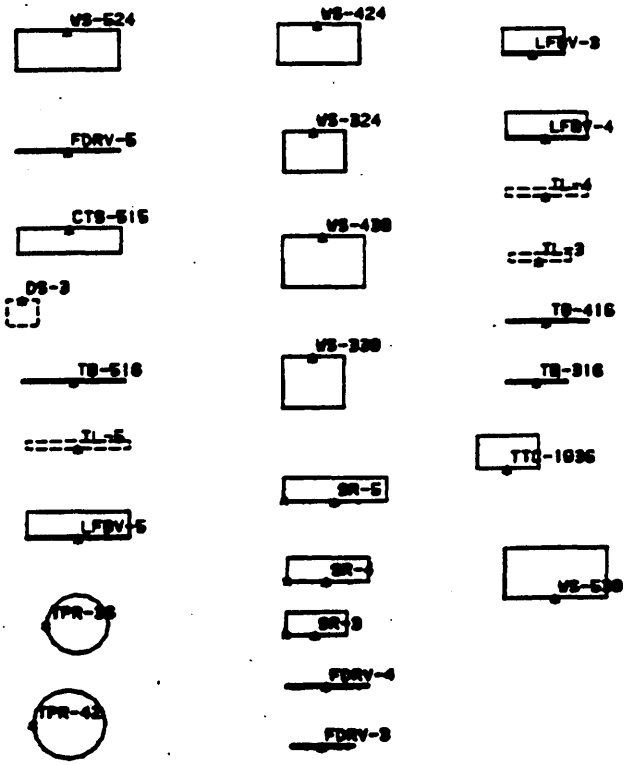


Figure F-6. Patterns Created on Original Level 108

Figure F-7 is an illustration of the key to symbol pattern. It is oriented in the top left corner of the figure. This pattern is on FACPAT1. The parts of this pattern come from several different original levels and hence, when placed on a drawing, original levels should NOT be retained.

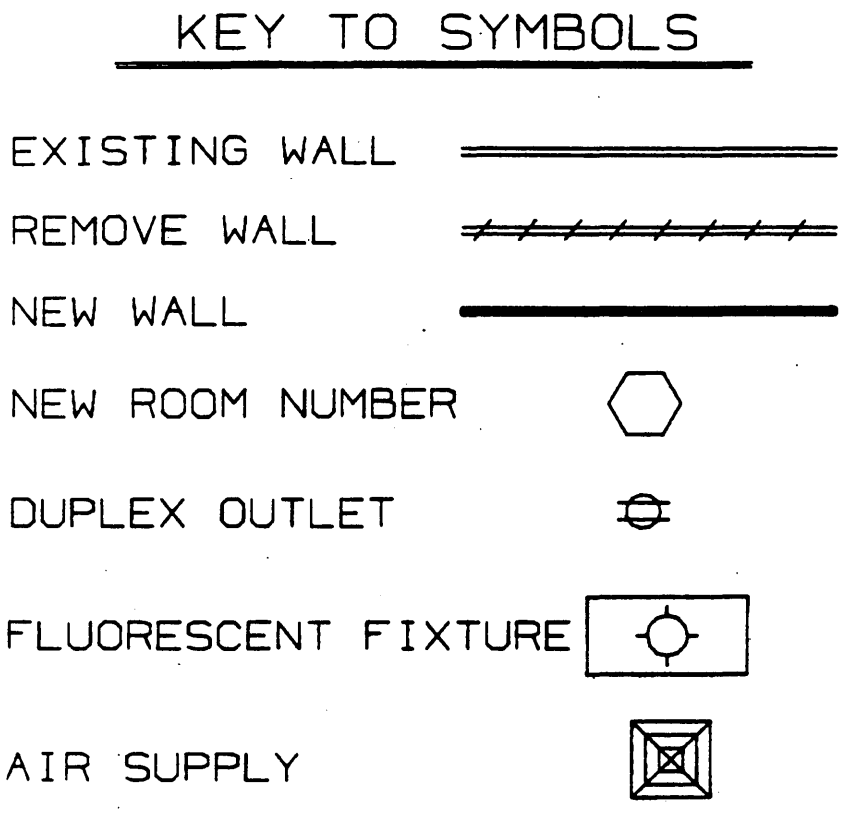


Figure F-7. Symbol Patterns

Figure F-8 is an illustration of the north symbol. It is oriented in the middle and has an original level of 37. This pattern is on FACPAT1.

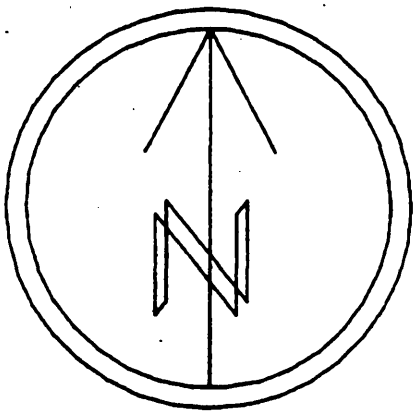


Figure F-8. Illustration of the North Symbol

Figure F-9 is an illustration of the scale in feet symbol. It is oriented at the side of the pattern and has an original level of 2. This pattern is on FACPAT1.

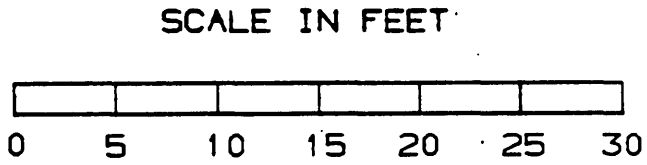
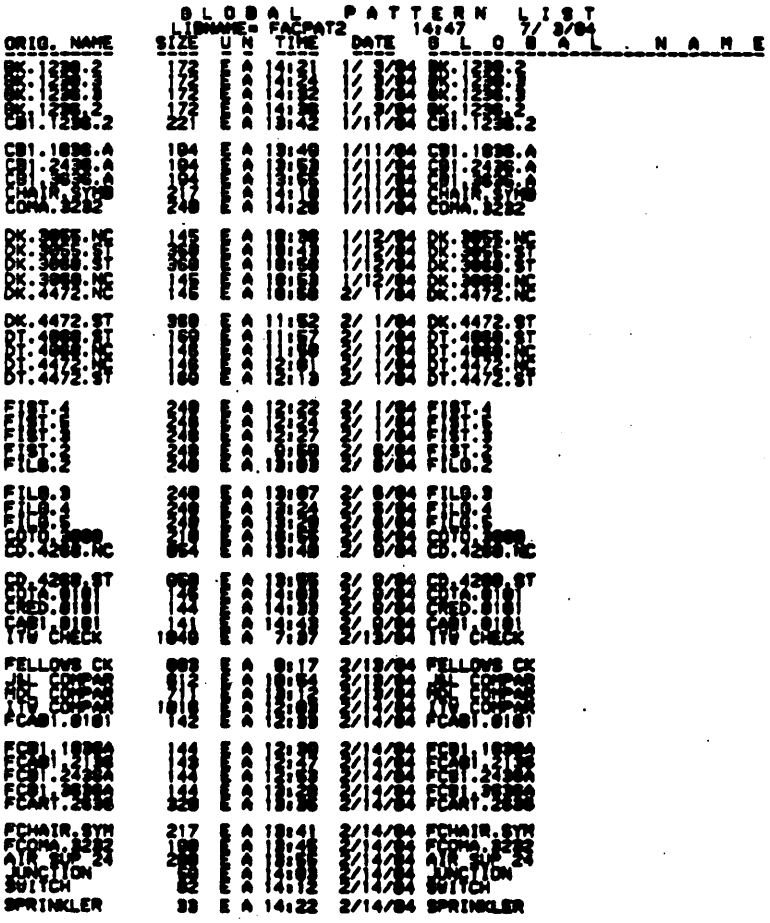


Figure F-9. Illustration of the Scale in Feet Symbol

Figure F-10 is a list of the patterns stored on FACPAT2.



GLOBAL PATTERN LIST
LIBRARY= FACPAT2 14:47 7/ 3/84

ORIG. NAME	SIZE	U	N	TIME	DATE	GLOBAL NAME
CB1.1238.2	221	E	A	13:42	1/11/84	CB1.1238.2
CB1.1838.A	194	E	A	13:40	1/11/84	CB1.1838.A
CHAIR.STM	217	E	A	14:18	1/11/84	CHAIR.STM
COMA.3282	240	E	A	14:28	1/11/84	COMA.3282
DK.4472.NC	145	E	A	11:52	2/ 1/84	DK.4472.NC
DK.4472.ST	388	E	A	11:52	2/ 1/84	DK.4472.ST
DT.4472.NC	145	E	A	12:01	2/ 1/84	DT.4472.NC
DT.4472.ST	188	E	A	12:13	2/ 1/84	DT.4472.ST
FILO.2	240	E	A	13:03	2/ 8/84	FILO.2
CB.4288.NC	864	E	A	13:48	2/ 8/84	CB.4288.NC
CB.4288.ST	968	E	A	13:55	2/ 8/84	CB.4288.ST
FCB1.8181	141	E	A	14:43	2/ 8/84	FCB1.8181
TTU CHECK	1040	E	A	7:07	2/13/84	TTU CHECK
FELLOWS CK	988	E	A	8:17	2/13/84	FELLOWS CK
FCAB1.8181	142	E	A	12:58	2/14/84	FCAB1.8181
FCHAIR.STM	217	E	A	13:41	2/14/84	FCHAIR.STM
SPRINKLER	33	E	A	14:22	2/14/84	SPRINKLER

Figure F-10. Secondary Pattern List

Figures F-11 and F-12 are illustrations of patterns from FACPAT2 that were created on original levels 30 and 31. These patterns are oriented in the top left corner of the patterns.

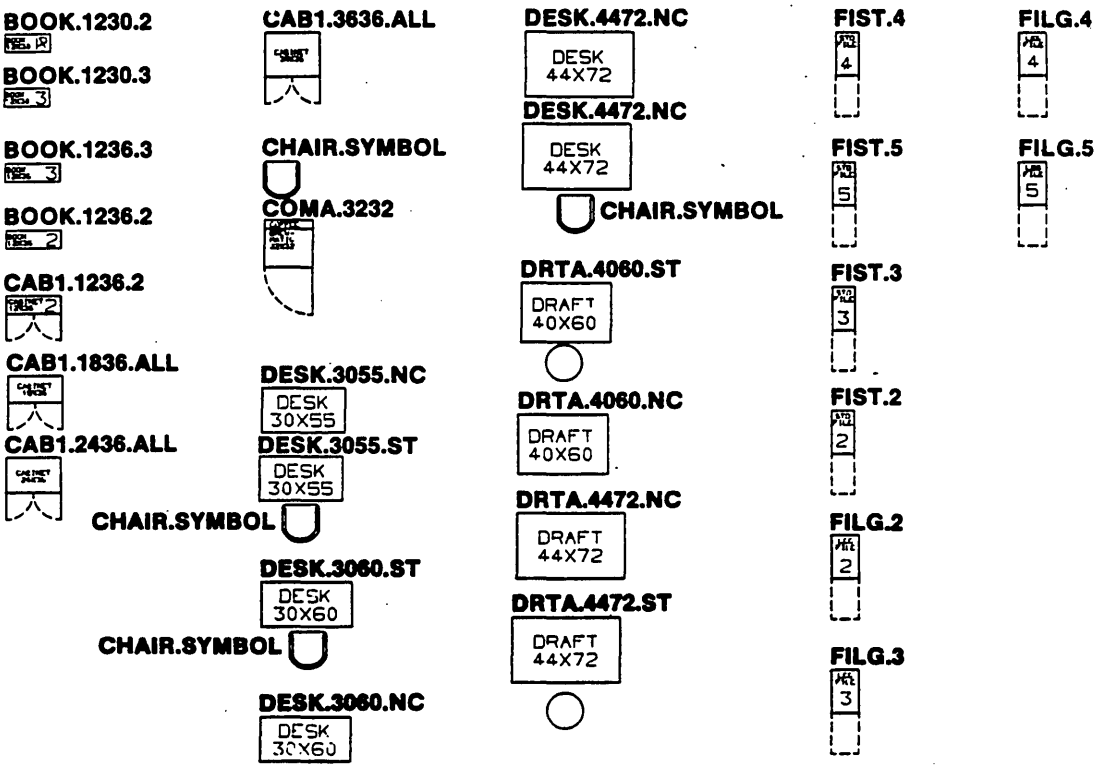


Figure F-11. Illustrations of Patterns Created on Original Level 30

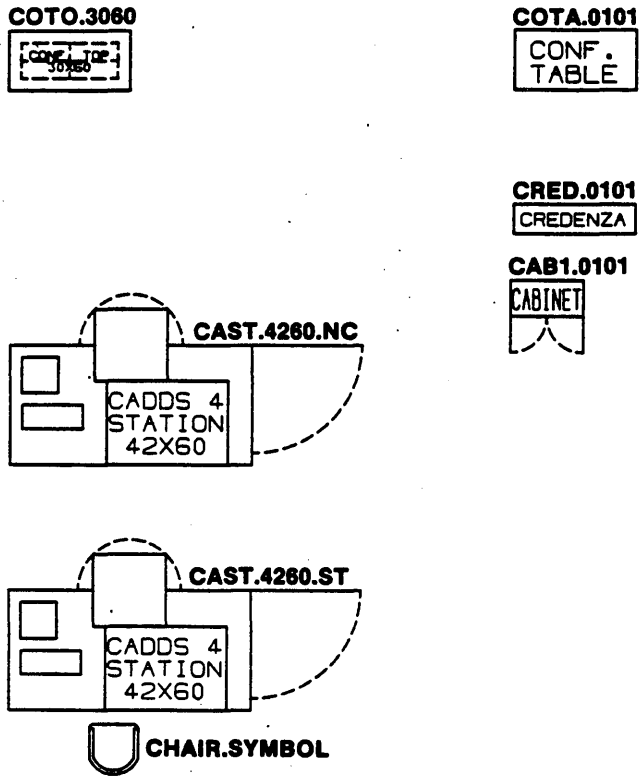


Figure F-12. Illustrations of Patterns Created on Level 31

Figure F-13 is an illustration of the patterns from FACPAT2 that were created on original levels 35 and 36 with the following exceptions. JUNCTION and SWITCH were created on level 40, SPRINKLER on level 60, and the AIR SUPPLY on level 50. These patterns are oriented on the top left corner of the patterns.

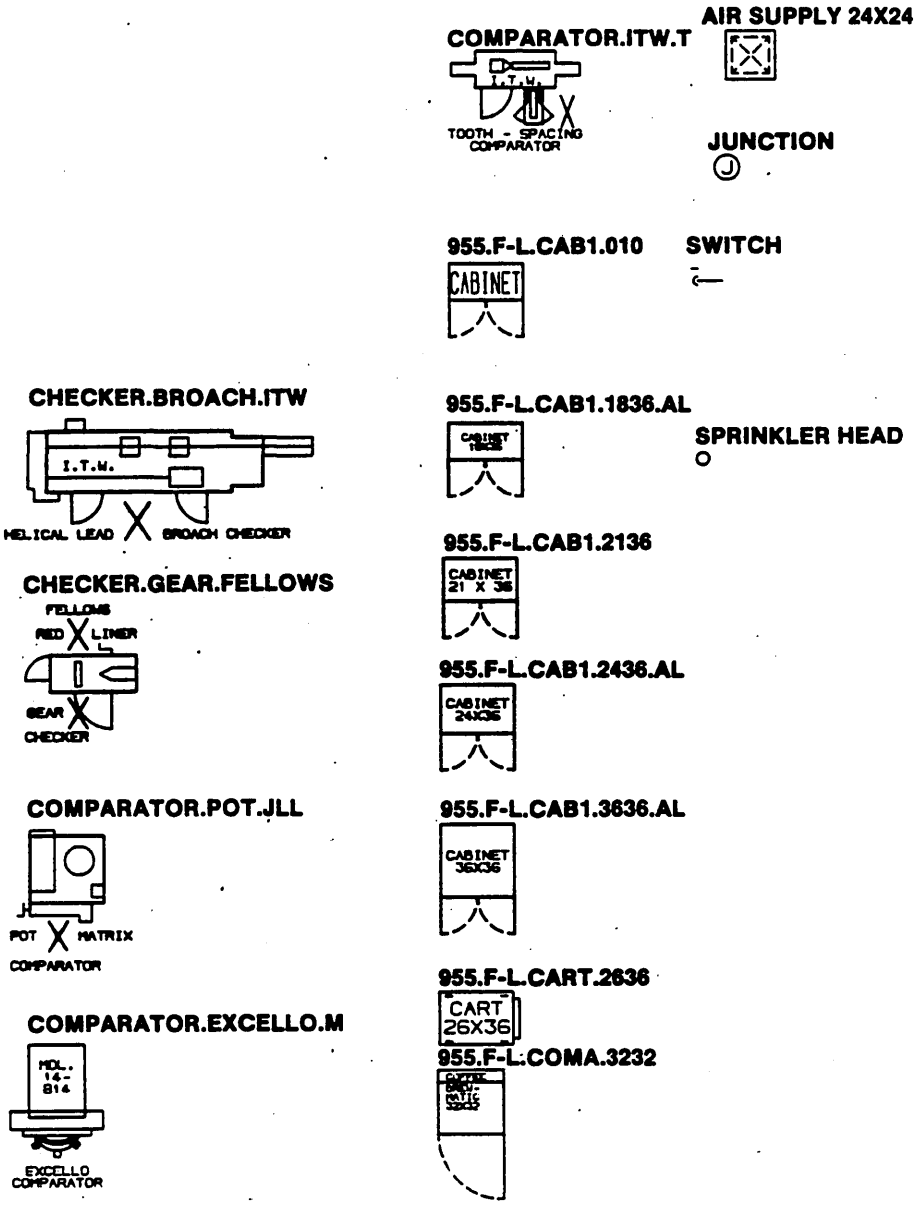


Figure F-13. Illustrations of Patterns Created on Original Levels 35 and 36

The following levels are set, blanked, and unblanked by tablet picks from page FAC1.

PATTERNS	Current Construction	New Construction
PERMANENT STRUCTURE	0	NA †
DEMOUNTABLE WALLS	1	101
ROOM NUMBER	3	103
TITLE BLOCK	37	104
FURNITURE	7	107
COMPONENTS	8	108
MECHANICAL LAYOUT	10	110
POWER LAYOUT	25	125
CEILING GRID	30	130
LIGHT LAYOUT	351	124
FIRE ROUTES	34	NA †
SPACE ACCOUNTING	35	NA †
MISC. TEXT	39	139
DIMENSIONS	NA †	106
SYMBOLS	NA †	105

Note that original levels for patterns may not correspond to these levels.

† NA indicates NOT APPLICABLE.

ICEM FACILITIES H

The following is a list of the files provided in the ICEM FACILITIES software package and descriptions of each file.

Access/Content	File Name	Description
Indirect Source	INSTALL	The installation procedure
Direct Binary	FACTFIL	Facilities tablet file
Direct Binary	FACMSTR	MSTRING file
Direct Binary	FACPAT1	Global pattern file
Direct Binary	FACPAT2	Global pattern file
Indirect Source	FACGPLS	GPL source
Direct Binary	FACLIB	Compiled GPL library
Direct Binary	FACGPRT	GPARTS file with tablet overlays, pattern descriptions, and example layouts.
Indirect Source	EXAMPLE	Input trace for example layout
Indirect Source	ICEMFAC	Procedure file for ICEM Facilities
Indirect Source	REPSRC	Report generator FORTRAN 5 program
Indirect Binary	REPABS	Absolutized version of REPSRC
Indirect Text	OFDATA	Office component data base
Indirect Text	HWDATA	Haworth component data base
Indirect Text	CEDATA	Cost estimate component data base
Indirect Proc	REPORTS	Procedure file to run the report generator
Indirect Proc	VERIFY	Installation verification procedure
Indirect Source	VERIT	Input trace file for verification

ICEM FACILITIES produces three kinds of reports: Haworth bill-of-materials, office bill-of-materials, and construction estimates. The bill-of-materials reports present a listing of all those items specified in the drawing. The construction estimate report presents the total estimated cost for removal and installation of doors, demountable walls, etc. specified in the drawing.

To generate a report follow this procedure:

1. Select tablet pick BILL OF MATRL. on page FAC1.

2. Terminate ICEM Design/Drafting by keying in F.4.3.Y

3. In response to the NOS prompt, enter:

   BEGIN,, REPORTS

4. Make a menu selection for desired report.

   REPORT
   1 OFFICE BILL OF MATERIALS
   2 HAWORTH BILL OF MATERIALS
   3 NEW CONSTRUCTION COST ESTIMATES
   4 TERMINATE

5. The report is then displayed on the screen and the menu is repeated. Continue by selecting another report to be generated, or select 4 TERMINATE to end the report generation.

6. The reports reside on local files OFBILL, HWBILL, or CEESTM. Save and route them as desired.

Figures I-1 and I-2 show examples of two of these reports.

HAWORTH
BILL OF MATERIALS

PART NAME : HWTEST

ATTRIBUTE NAME	DESCRIPTION	QTY	UNIT COST	EXTENDED COST
CTS-515	60 X 30 COUNTER TOP / PROFILE B / LT OAK	1	77.00	77.00
DS-3	PENCIL DRAWER / PROFILE B	1	8.50	8.50
FDHV-3	3'-0 REG. FLIPPER DOOR /PROFILE B/LT OAK	1	85.50	85.50
LFBV-3	3'-0 LATERAL FILE BIN / PROFILE B/LT OAK	1	155.00	155.00
SH 3	3'-0 REGULAR SHELF / PROFILE B	1	44.10	44.10
TB 316	FABRIC TACK BOARD 3'-0 X 16 / COLOR	1	40.40	40.40
TL 1	3'-0 TASK LIGHT	1	61.30	61.30
TPR 36	ROUND TABLE 36 DIA./ PROFILE B /LT OAK	1	121.60	121.60
TPR 42	ROUND TABLE 42 DIA./ PROFILE B /LT OAK	1	135.05	135.05
TTC-1936	TYPING TABLE W/CASTORS 19X36/LT OAK/B	1	176.20	176.20
TOTAL				905.31

Figure I-1. Haworth Bill of Materials

PLANT ENGINEERING
PROJECT ESTIMATE

PART NAME : TESTNC

WORK TYPE	QTY	UNIT MEASURED	UNIT COST	EXTENDED COST
MOVE AIR SUPPLY	1.00	EA	45.00	45.00
REMOVE WALL	2.36	LIN FT	2.50	5.90
NEW WALL	2.46	LIN FT	45.00	110.85
MOVE WALL	5.51	LIN FT	25.00	137.80
MOVE SWITCH	1.00	EA	30.00	30.00
MOVE OUTLET	1.00	EA	30.00	30.00
MOVE DOOR	1.00	EA	60.00	60.00
MOVE LIGHT	1.00	EA	30.00	30.00
TOTAL				448.44

Figure I-2. Plant Engineering Project Estimate

UPDATING THE DATA BASES

Updating the component data bases (files named OFDATA, HWDATA, or CEDATA) should be done by the user with a text editor.

The Haworth and office component data bases contain three columns of information. The first column is the attribute name of the component. This attribute name must correspond exactly to the attribute assigned to the component entities in the ICEM Facilities part. Note that these attributes are assigned automatically through pattern retrieval and the GPL programs. The second column contains a description of the component and the third column contains the current price of the component.

Office Component Data Base Format:

Character Position	
1 - 21	Attribute name
22	Blank
23 - 67	Description of component
68 - 77	Price

Haworth Component Data Base Format:

Character Position	
1 - 11	Attribute name
12	Blank
13 - 60	Description
61 - 70	Price

The construction cost estimate data base contains the attribute name, the current price, a reuse factor, a units identifier, but no description. The reuse factor is a number from 0 to 1 which gives the percentage of the removed component that can be reused. The units identifier is either a 0 for components measured in units or a 1 for components measured in linear feet.

Example:

Suppose there are 10 feet of new wall and 10 feet of remove wall in an ICEM Facilities part. If there is a 0.7 factor on move wall, the resulting report will show 3 feet new wall, 3 feet remove wall, and 7 feet move wall. Note reuse factors are only written to MOVE attribute names.

Construction Cost Estimate Format:

Character Position

1 - 21	Attribute name
22 - 30	Blank
31 - 40	Price
41 - 45	Blank
46 - 51	Reuse factor
52 - 55	Blank
56 - 57	Units identifier

Figures I-3, I-4, and I-5 show examples of the component data bases.

AIR SUPPLY 24X24	AIR SUPPLY DIFFUSERION	57.50
BOOK.1230.2	BOOKCASE 12 X 30 2 SHELVES	87.50
BOOK.1230.3	BOOKCASE 12 X 30 3 SHELVES	76.50
BOOK.1236.2	BOOKCASE 12 X 36 2 SHELVES	89.25
BOOK.1236.3	BOOKCASE 12 X 36 3 SHELVES	87.50
CAB1.0101	OFFICE CABINET-UNIVERSAL- 18X36	196.00
CAB1.1236.2	OFFICE CABINET-2 SHELVES- 12X36	112.00
CAB1.1836.ALL	OFFICE CABINET- 18X36	145.00
CAB1.2436.ALL	OFFICE CABINET- 24X36	175.00
CAB1.3636.ALL	OFFICE CABINET- 36X36	185.00
CAS1.4260.NC	CADDS 4 WORK STATION - 42X60	8995.00
CAS1.4260.ST	CADDS 4 WORK STATION - 42X60	8995.00
CHAIR.SYMBOL	CHAIR STD. COUNTOUR	175.75
CHECKER.BROACH.ITW	ITW HELICAL LEAD BROACH CHECKER	5225.00
CHECKER.GEAR.FELLOWS	FELLOWS RED LINER GEAR CHECKER	4775.00
COMA.3232	OFFICE COFFEE MACHINE	600.00
COMPARATOR.EXCELLO.MDL	EXCELLO COMPARATOR MDL.14-814.	5225.00
COMPARATOR.ITW.TOOTH	ITW TOOTH SPACING COMPARATOR	5775.00
COMPARATOR.POT.J&L	J&L POT MATRIX COMPARATOR	4005.00
CONA.6101	CONFERENCE TABLE - UNIVERSAL-30X60	155.00
COTO.3060	CONFERENCE TABLE 30X60 OVERHANG TOP	179.95
CRED.0101	CREDENZA 12X60	225.00
DESK.0101	DESK UNIVERSAL 36X30	220.00
DESK.3055.NC	DESK 30X55	270.00
DESK.3055.ST	DESK 30X55	270.00
DESK.3068.NC	DESK 30X68	312.50
DESK.3068.ST	DESK 30X68	312.50
DESK.4472.NC	DESK 44X72	377.95
DESK.4472.ST	DESK 44X72	377.95
DRTA.4068.NC	DRAFTING TABLE 40X68	499.00
DRTA.4068.ST	DRAFTING TABLE 40X68	499.00
DRTA.4472.NC	DRAFTING TABLE 44X72	599.00
DRTA.4472.ST	DRAFTING TABLE 44X72	599.00
FILG.2	2 DRAWER LEGAL FILE CABINET 18X28	69.95
FILG.3	3 DRAWER LEGAL FILE CABINET 18X28	79.95
FILG.4	4 DRAWER LEGAL FILE CABINET 18X28	89.95
FILG.5	5 DRAWER LEGAL FILE CABINET 18X28	99.95
FIST.2	2 DRAWER STD. FILE CABINET 15X28	49.95
FIST.3	3 DRAWER STD. FILE CABINET 15X28	59.95
FIST.4	4 DRAWER STD. FILE CABINET 15X28	69.95
FIST.5	5 DRAWER STD. FILE CABINET 15X28	79.95
JUNCTION	ELECTRICAL JUNCTION BOX	1.25
SPRINKLER.HEAD	SPRINKLER HEAD	55.00
SWITCH	ELECTRICAL LIGHT SWITCH	1.00
055.F-L.CAB.1836.ALL	FACTORY CABINET 18X36	196.50
055.F-L.CAB1.0101	FACTORY CABINET UNIVERSAL 18X36	126.50
055.F-L.CAB1.2136	FACTORY CABINET 21X36	145.50
055.F-L.CAB1.2436.ALL	FACTORY CABINET 24X36	155.50
055.F-L.CAB1.3636.ALL	FACTORY CABINET 36X36	185.50
055.F-L.CART.2636	FACTORY CART 26X36	55.95
055.F-L.CHAIR.SYMBOL	FACTORY CHAIR STD.WITH CASTORS	137.00
055.F-L.COMA.3282	FACTORY COFFEE MACHINE 32X82	600.00
LIGHT 2 X 4	REGULAR LIGHT FOR DROP IN CEILING	124.25

Figure I-3. Office Component Data Base

CTS-S15	60 X 30 COUNTER TOP / PROFILE B / LT OAK	77.00
DS-3	PENCIL DRAWER / PROFILE B	0.00
FDRV-3	3'-0 REG. FLIPPER DOOR /PROFILE B/LT OAK	85.50
FDRV-4	4'-0 REG. FLIPPER DOOR /PROFILE B/LT OAK	92.00
FDRV-5	5'-0 REG. FLIPPER DOOR /PROFILE B/LT OAK	114.00
LFBV-3	3'-0 LATERAL FILE BIN / PROFILE B/LT OAK	155.00
LFBV-4	4'-0 LATERAL FILE BIN / PROFILE B/LT OAK	172.00
LFBV-5	4'-0 LATERAL FILE BIN / PROFILE B/LT OAK	200.00
PF-166	FABRIC PANEL 1'X66" PROFILE B /COLOR	126.25
PF-188	FABRIC PANEL 1'X80" PROFILE B /COLOR	138.00
PF-266	FABRIC PANEL 2'X66" PROFILE B /COLOR	159.10
PF-280	FABRIC PANEL 2'X80" PROFILE B /COLOR	182.00
PF-3066	FABRIC PANEL 30X66" PROFILE B /COLOR	189.25
PF-3080	FABRIC PANEL 30X80" PROFILE B /COLOR	211.20
PF-366	FABRIC PANEL 3'X66" PROFILE B /COLOR	198.00
PF-380	FABRIC PANEL 3'X80" PROFILE B /COLOR	229.40
PF-466	FABRIC PANEL 4'X66" PROFILE B /COLOR	221.05
PF-480	FABRIC PANEL 4'X80" PROFILE B /COLOR	258.00
PF-566	FABRIC PANEL 5'X66" PROFILE B /COLOR	259.05
PF-580	FABRIC PANEL 5'X80" PROFILE B /COLOR	288.00
PV-142	VIDENE PANEL 1'X42/ PROFILE B/ LT OAK	74.00
PV-166	VIDENE PANEL 1'X66/ PROFILE B/ LT OAK	80.00
PV-242	VIDENE PANEL 2'X42/ PROFILE B/ LT OAK	89.10
PV-266	VIDENE PANEL 2'X66/ PROFILE B/ LT OAK	97.05
PV-3042	VIDENE PANEL 30X42/ PROFILE B/ LT OAK	97.20
PV-3066	VIDENE PANEL 30X66/ PROFILE B/ LT OAK	119.05
PV-342	VIDENE PANEL 3'X42/ PROFILE B/ LT OAK	104.00
PV-366	VIDENE PANEL 3'X66/ PROFILE B/ LT OAK	122.00
PV-442	VIDENE PANEL 4'X42/ PROFILE B/ LT OAK	119.60
PV-466	VIDENE PANEL 4'X66/ PROFILE B/ LT OAK	138.55
PV-542	VIDENE PANEL 5'X42/ PROFILE B/ LT OAK	139.40
PV-566	VIDENE PANEL 5'X66/ PROFILE B/ LT OAK	152.95
SFC-66	FULL CENTER SUPPORT/ PROFILE B/ LT OAK	131.60
SFC-80	FULL CTR. SUPPORT 30X80 /PROFILE B/LT OAK	162.00
SFE-66	FULL END SUPPORT 30X66/ PROFILE B/LT OAK	120.05
SFE-80	FULL END SUPPORT 30X80/ PROFILE B/LT OAK	149.45
SHC-66	1/2 CTR. SUPPORT 21X66/ PROFILE B/LT OAK	109.55
SHC-80	1/2 CTR. SUPPORT 21X80/ PROFILE B/LT OAK	129.05
SHEL-66	1/2 END SUPP-LEFT 21X66/PROFILE B/LT OAK	89.35
SHEL-80	1/2 END SUPP-LEFT 21X80/PROFILE B/LT OAK	101.10
SHER-66	1/2 END SUPP-RIGHT 21X66/PROFILE B/LT OAK	89.35
SHER-80	1/2 END SUPP-RIGHT 21X80/PROFILE B/LT OAK	101.10
SR-3	3'-0 REGULAR SHELF / PROFILE B	44.10
SR-4	4'-0 REGULAR SHELF / PROFILE B	47.00
SR-5	5'-0 REGULAR SHELF / PROFILE B	50.00
TB-316	FABRIC TACK BOARD 3'-0 X 16 / COLOR	49.40
TB-416	FABRIC TACK BOARD 4'-0 X 16 / COLOR	53.20
TB-516	FABRIC TACK BOARD 5'-0 X 16 / COLOR	61.20
TBUC-511	UNDER COUNTER TACK BOARD/5'-0 X 11	62.20
TL-3	3'-0 TASK LIGHT	61.00
TL-4	4'-0 TASK LIGHT	64.15
TL-5	5'-0 TASK LIGHT	69.40
TPR-36	ROUND TABLE 36 DIA./ PROFILE B /LT OAK	121.00
TPR-42	ROUND TABLE 42 DIA./ PROFILE B /LT OAK	156.05
TTC-1936	TYPING TABLE W/CASTORS 19X36/LT OAK/B	175.20
WRCK-430	90 DEG. CORNER WORK SURFACE W/KEY LT OAK	177.10
WS-324	36X24 WORK SURFACE/PROFILE B/LT OAK	86.00
WS-330	36X30 WORK SURFACE/ PROFILE B/ LT OAK	88.00
WS-424	48X24 WORK SURFACE/ PROFILE B/ LT OAK	97.30
WS 430	48X30 WORK SURFACE/ PROFILE B/ LT OAK	100.25
WS- 24	60X24 WORK SURFACE/ PROFILE B/ LT OAK	111.60
WS-L	60X30 WORK SURFACE/ PROFILE B/ LT OAK	125.00

Figure I-4. Haworth Component Data Base

REMOVE AIR SUPPLY	25.00		0
NEW AIR SUPPLY	75.00		0
MOVE AIR SUPPLY	45.00	1.0	0
REMOVE WALL	2.50		1
NEW WALL	45.00		1
MOVE WALL	25.00	0.7	1
REMOVE SWITCH	20.00		0
NEW SWITCH	55.00		0
MOVE SWITCH	30.00	1.0	0
REMOVE OUTLET	20.00		0
NEW OUTLET	55.00		0
MOVE OUTLET	30.00	1.0	0
REMOVE DOOR	20.00		0
NEW DOOR	200.00		0
MOVE DOOR	60.00	1.0	0
REMOVE LIGHT	20.00		0
NEW LIGHT	55.00		0
MOVE LIGHT	30.00	1.0	0

Figure I-5. Construction Estimate Component Data Base

FACILITIES GPARTS FILE J

There is a permanent file named FACGPRT which is supplied with ICEM Facilities. This file contains example layouts, tablet overlay drawings, as well as pattern diagrams and descriptions. These files may be accessed using the RESTORE tablet picks on tablet overlay LAY1.

Figures J-1 through J-5 are illustrations of the patterns and example layouts contained on this file. Tablet overlay drawing illustrations are shown in appendix C of this manual. These illustrations and parts are provided in ICEM Facilities as examples of how the ICEM Facilities package can be used or modified.

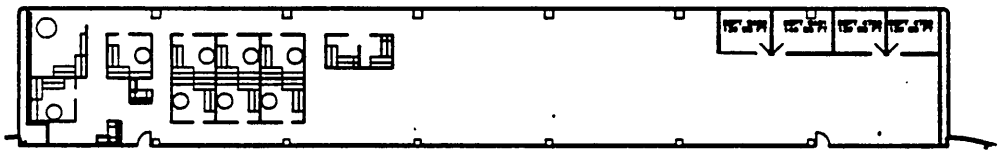


Figure J-1. WING

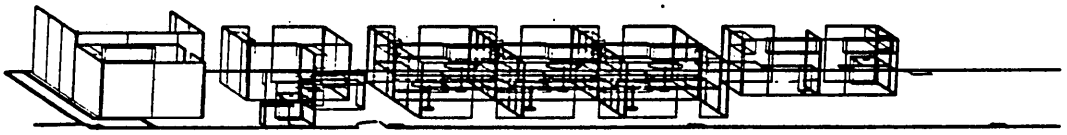


Figure J-2. 3D-WING

Figure J-3 is an illustration of Control Data Corporation World Headquarters seventh floor, part name TOWER.

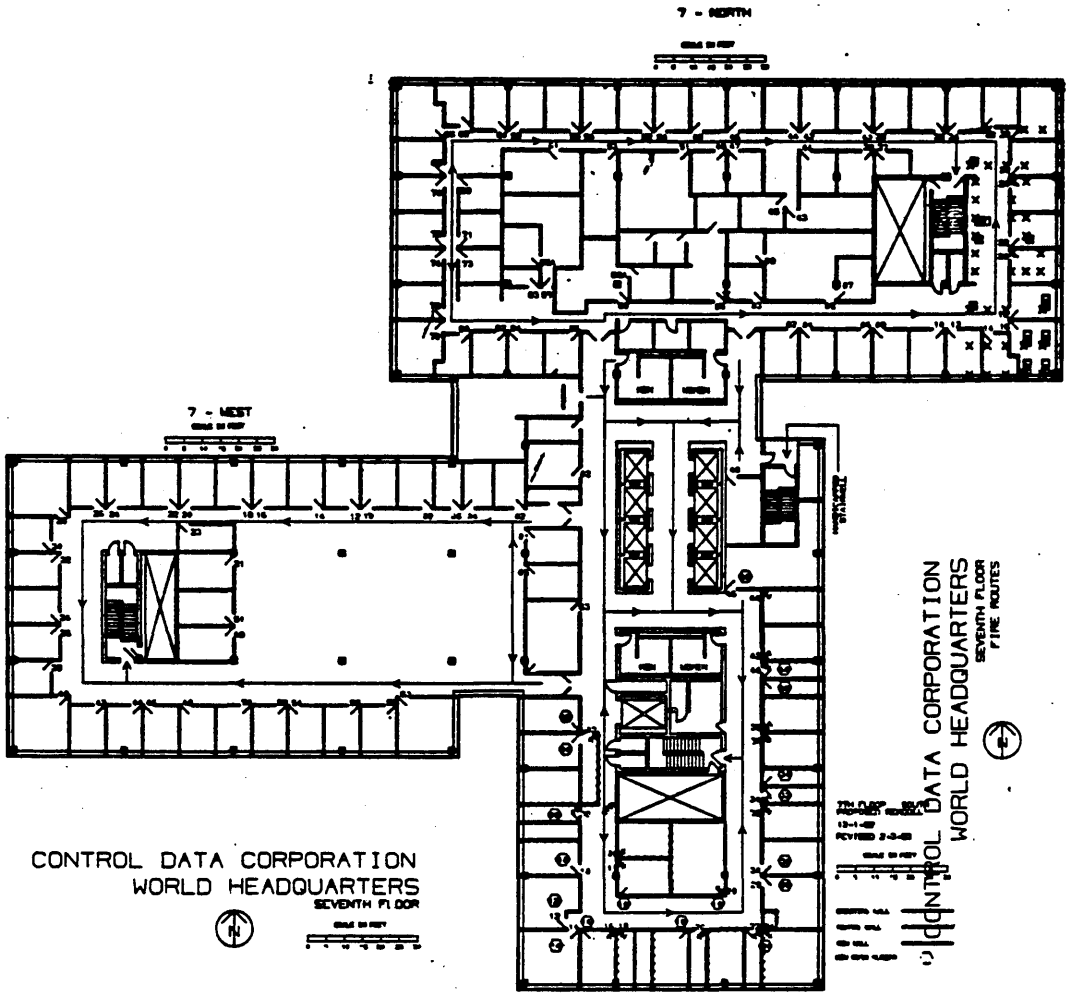


Figure J-3. CDC World Headquarters, Seventh Floor

The level conventions for this part are as follows:

LEVEL CONVENTIONS FOR PART TOWER

Level Number	Description
0	l -manent Structure Shell and Core
1	Demountable wall
2	Small Text
3	Large Text
4	Light Layout
5	Air Duct Layout
9	Staircase
34	Fire Routes
35	Space Allocation Scales
100	Scales
101	Proposed New Walls
103	Proposed New Name Numbers
104	KEY for new Construction
105	New Construction Symbols

Figure J-4 is an illustration of Control Data Corporation Energy Technology Center.

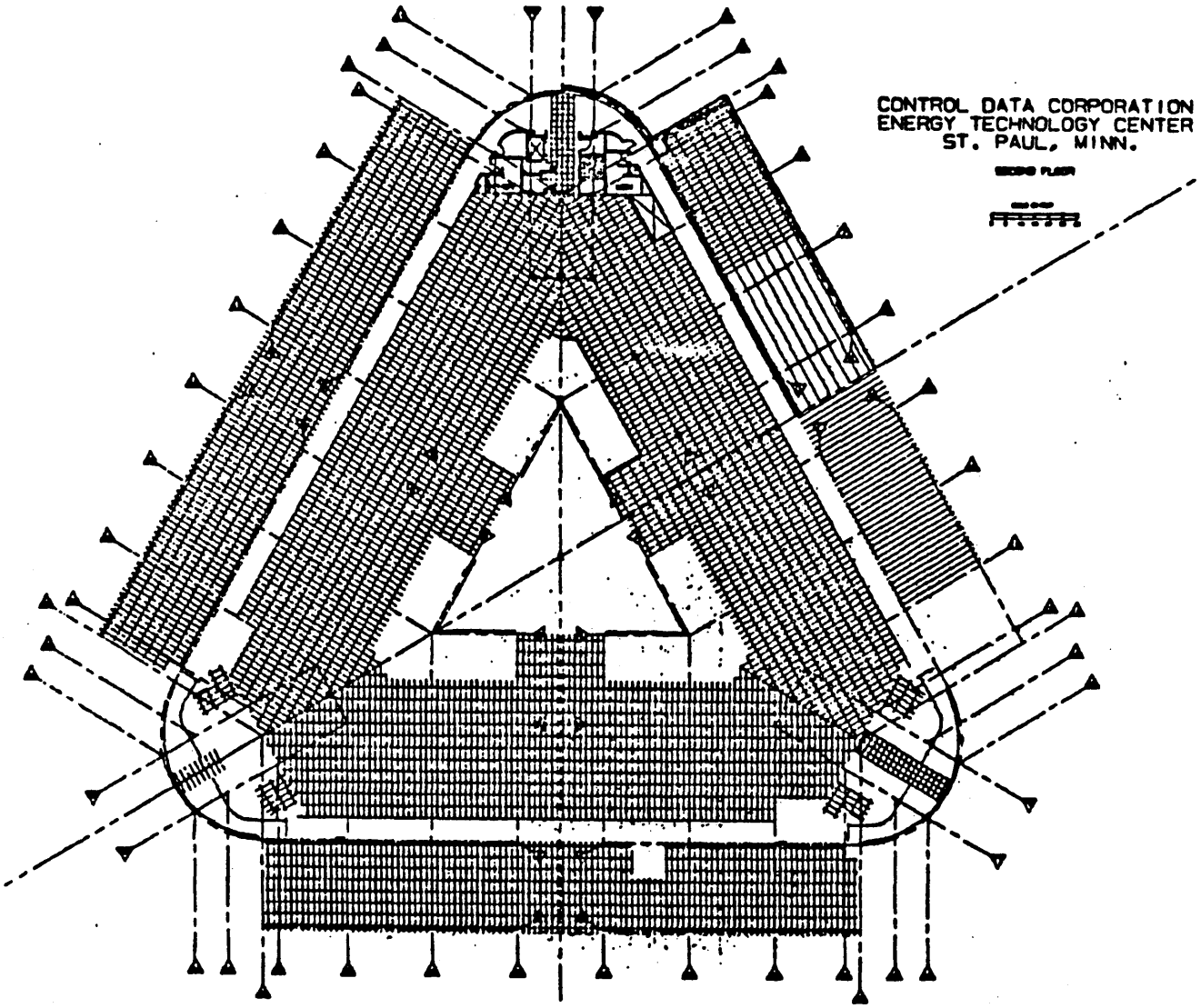


Figure J-4. ETC Demo

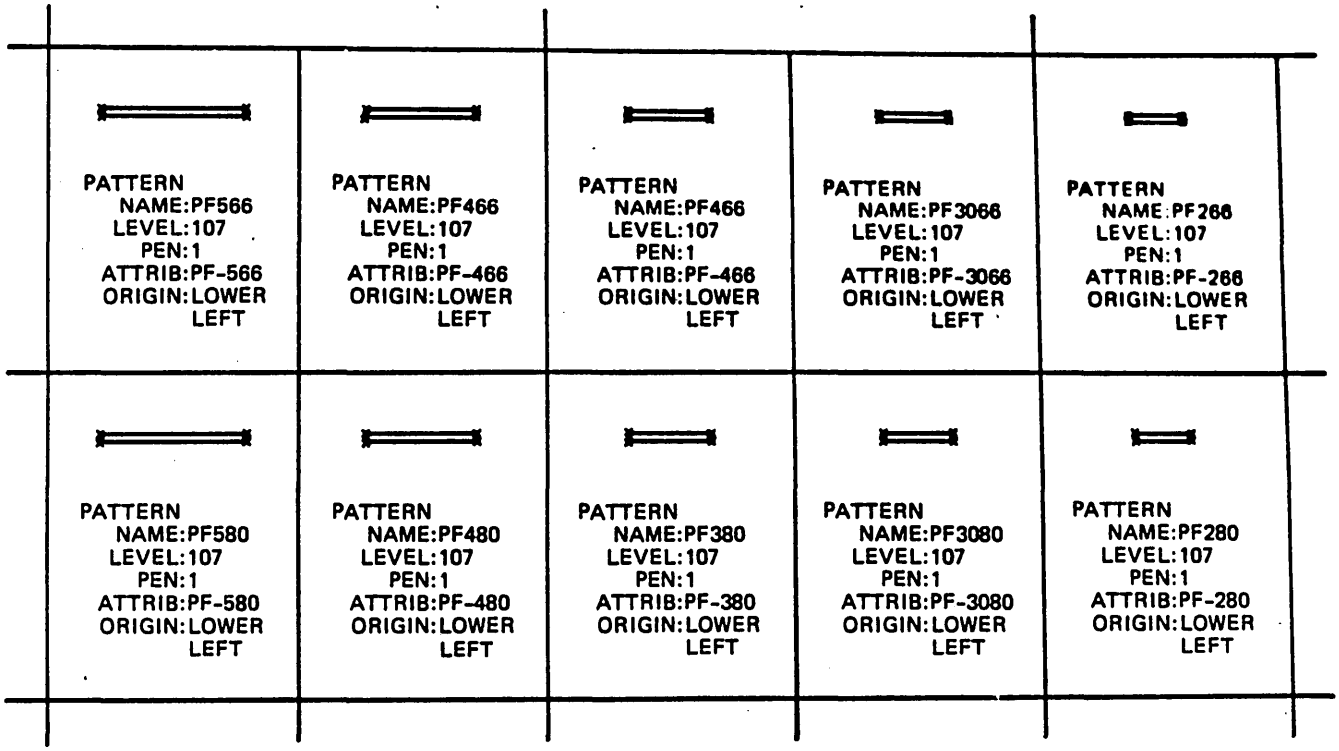


Figure J-5. Pattern Diagrams.

COMMON ICEM DESIGN/DRAFTING RESERVED FILE NAMES K

ICEM Facilities makes use of the following ICEM Design/Drafting files on a regular basis:

File Name	I/W/Out	Section	Use
GPARTS	I	6.1.2	Retrieve part from global file.
GPARTS	O	6.1.1	Save part on global file.
GPLLIB	I	5.13.3	GPL complliled program library.
IT	O	Intro	Input trace.
LIST	O	5.6.5	Attributes of entities.
MSTRING	I	7	Tablet menu string, user generated.
MSDIR	I/O	7	MSTRING file directory for system use only.
PATTERN	I	6.2.2	Create pattern.
PATTERN	O	6.2.3	Retrieve pattern.
TAPE3	I/O	Intro	Data base.
TAPE9	O	7.2	Plot file.
TFILE	I/O	7.13	Tablet pages.

You can cause ICEM Design/Drafting to generate other files not generally used with ICEM Facilities as listed in appendix C of the ICEM Design/Drafting Data Management manual.

PROCEDURES TO EXECUTE ICEM FACILITIES L

This appendix reflects the execute procedure file as supplied with ICEM Facilities. It will not reflect changes implemented by your support programmer.

1. Log into a graphics terminal under a user name with ICEM Facilities either installed or with access provided.

2. Execute the command BEGIN,,ICEMFAC.

NOTES

This procedure was written assuming that ICEM Design/Drafting Version 1.60 is stored as a direct access file named ICEMDDN on user name APPLLIB. If these assumptions are incorrect, you must change lines 10 through 12 of procedure ICEMFAC in file ICEMFAC to specify the file and user name in use. This procedure also assumes direct access file named GOLIB is stored on APPLLIB.

3. Answer the prompt

   FILE NAME FOR DRAWING FILE?

If the procedure file aborts, the file does not exist. You must define the file with the command DEFINE, filenam, where filenam is the name you assign to your file. Your file name may already exist. If it does exist the NOS operating system will respond with the appropriate message. Your file name must start with an alpha character (A to Z) and be a maximum of seven characters in length.

Once you have defined the file name, you must return the file using the command RETURN,filenam. When an empty file name has been defined, execute the command BEGIN,,ICEMFAC.

4. Answer the prompts:

   a. BAUD by indicating the baud rate which you are communicating, i.e., your terminal setting.

   b. TERMINAL CONFIGURATION. Specify your terminal type and tablet option. You must have a tablet attached to your terminal to run ICEM Facilities.

   c. ENTER PART NAME. Respond by entering a part file name you choose to use if you have just created an empty file described in step three. If the file partname is known, enter it. The LIST command will list the part names currently on file.

d. SHEET NUMBER. If a sheet number does not already exist, choose a number. Usually the number 1 will do.

e. ICEM Facilities may respond NEW PART ASSUMED. If it is a new part the following prompts will appear:

UNITS OF MEASURE

and

DRAFTING STANDARD.

To answer the prompts, an M followed by a carriage return will display the prompts menu options. If you chose a part name which already exists, this step will be bypassed.

5. a. When the main menu appears, attach the FAC1 tablet page by entering the ICEM Design/Drafting command menu string:

F.1.16.1

The following prompt will display:

ENTER 7 CHAR NAME

Type in FAC1.

b. Enter the following ICEM Design/Drafting command menu string to attach the LAY1 tablet page.

F.1.16.2

The following prompt will display:

ENTER 7 CHAR NAME

Type in LAY1.

c. You will be returned to the main menu. Now place the physical overlays located in appendix C, named FAC1 and LAY1, on the middle and lower thirds of the tablet.

6. You are now ready to start using ICEM Facilities. If you are starting a new layout, begin by picking the INITIALIZE square on the FAC1 tablet. This tablet pick should not be used when work is resumed on a previously initialized and saved layout.

7. To manually change a tablet, repeat step 5b of this appendix. Using the desired page name, place a new overlay on the lower third of the tablet.

8. To use the overlays MGR1 and MGR2, and the corresponding page names MGR1 and MGR2, repeat step 5 using MGR1 for FAC1 and MGR2 for LAY1.

The heating, ventilating and air-conditioning (HVAC) overlays have two major components. Refer to figure M-1. The components are:

- A set of GPL programs to do single and double line drawings for round HVAC duct.
- A tablet overlay to facilitate the use of the GPL programs.

The tablet overlay graphics reside on an ICEM DDN drawing. The tablet programs reside on a tablet TFILE and on a tablet MSTRING file. The GPL programs are divided into single line drawing routines and double line drawing routines.

The single line drawing routines allow a user to create a single-line drawing of an HVAC layout using Reference Point, HVAC modals, and HVAC operation tablet picks on the HVAC1 overlay. Single line drawings are drawings of the centerlines of the HVAC ducts.

The double line drawing routines allow a user to draw double line drawings using any of the tablet picks on the HVAC2 overlay. These are plan views of the HVAC duct layout showing the duct outlines. The majority of the double line drawing routines are routines to draw fittings. These routines all require centerlines (for example, the single-line drawing) for fitting placement. They were written to allow easy fitting placement on a single-line drawing produced by the HVAC module single-line drawing routines, but the fitting centerlines need not be created in this way.

The design of an HVAC system begins with an analysis of the building in question using the location of the building, the construction material, the number of windows, and other factors. Based on these variables, the cubic feet per minute (CFM) of air flow for each room is calculated. Then the engineer makes a sketch of the desired duct layout. The sketch is given to a drafter and a scale drawing of the layout is made. From this drawing the duct lengths of each segment are measured by hand and transcribed onto the drawing. The ducts are also numbered. The duct numbers, length, and connectivity are then used as input to a design program which sizes the duct and calls out the fittings.

The use of the HVAC1 and HVAC2 overlays begins after the analysis has been done on the building and the CFMs for each room are known. At this point, the engineer makes a sketch of the desired duct layout on a floor plan of the area previously drawn using ICEM DDN. The sketch may be made using the single-line portion of the HVAC program.

The single-line portion of the HVAC program is used to draw and number the HVAC trunk and runout segments, the VAV boxes and the diffusers. As the trunk and runout segments are being drawn, they are automatically numbered and the length of each segment is captured. At any point in this process, a trunk schedule or runout may be generated showing the trunk or runout number, length, and previous segment number. The single line modules eliminate the need to measure the duct segments on the drawing manually to determine their lengths. The information from the trunk and runout schedules may be used to create the input file for the duct sizing program.

Single-line routines generate trunk numbers and runout numbers automatically based on the trunk numbering parameters. The current trunk number and the trunk increment number are used to generate trunk numbers. Each time a trunk segment is drawn, the current trunk number is incremented by the trunk increment number. When runouts are drawn, the runout number is calculated from the trunk number of the upstream trunk. The first runout number for any trunk is one plus the trunk number of that trunk. The second runout number is two plus the trunk number of that trunk.

If changes are required for the single-line drawing, a GPL program assists in replacing a trunk segment.

Once the single-line drawing has been finalized and all the fitting types are known, the fittings may be drawn at all of the appropriate locations. Then they may be connected using the duct routine. This produces the final double line drawing.

USING OPERATION COMPLETE (]) AND OPERATION REJECT([)

The convention followed in the HVAC fitting GPL programs is that operation reject ([) returns you to the previous prompt and operation complete (]) causes you to exit from that program. An operation reject ([) to the first prompt in any fitting program causes you to exit from that program. The only consistent exception to this is when entering numerical parameters. In this case, an operation complete (]) accepts the parameter values currently being displayed. An operation reject ([) still returns you to the previous prompt or causes you to exit from that program. Any other exception to this convention is noted below.

GROUP STATUS OF FITTINGS

All of the fittings drawn by the HVAC fitting programs are drawn as groups. They can be deleted using the Delete Last Entity square on the main ICEM DDN tablet overlay. The Delete Last Entity operation can be used even during the GPL fitting program execution with the following restrictions:

1. It can not be used during a numerical parameter prompt.

2. It must be used before answering the fitting location prompt(s). This is because when the fitting location has been determined, a point is drawn at the location and that point becomes the last entity.

The Delete Last Entity operation can also be used after exiting the fitting program using operation reject ([). When the Delete Last Entity operation is used, the system displays the message:

DELETE ENTITIES IN GROUP?

Answer Yes (Y) to this prompt in order to delete the fitting or duct section just created.

Remember that the Delete Last Entity operation only deletes one entity or group. It can not be used to successively delete entities preceding the last entity created.

HVAC TABLET OVERLAYS

There are two tablet overlays supplied with HVAC. HVAC1, the upper overlay, deals mainly with single-line functions and general ICEM DDN operations. HVAC2, the lower overlay, is used to begin the HVAC fitting routines. The overlays are designed to be used in conjuction with one another and are supplied on a single page.

HVAC1 UPPER OVERLAY

The following sections describe the tablet squares of the upper overlay, HVAC1.

VARIABLE AIR VOLUME — SINGLE LINE — HVAC LAYOUT

REFERENCE POINT		HVAC MODALS				HVAC OPERATION		GRID PARAMS	GRID DISPLAY	ENTITY MANIP-ULATION	TRANS-LATE	BLANK MENU	
SCREEN POS	DELTA SCREEN POS	DISPLAY MODAL STATUS		TRUNK NUMBERING PARAMS.		ADD TRUNK SEGMENTS	ADD RUNOUT SEGMENTS	DATA VERIFY ONE	DATA VERIFY TWO	POINT	POINT CURVE INTER.	BLANK SELECT	UNBLANK SELECT
KEY-IN	DELTA	HVAC LEVEL MANAGEMENT		INITIAL SEGMENT NUMBER		ADD VAV BOXES	ADD DIFFUSERS	COLOR BY LEVEL	COLOR BY PEN NO.	LINE	POINT CURVE END	BLANK LEVEL	UNBLANK LEVEL
LINE END	DELTA FROM LINE END	ROUND TO NEAREST FOOT		DRAW CONSTRAINED LINES		REPLACE TRUNK SEGMENT	DECREMENT TRUNK COUNTER	SINGLE FROM GROUP ON	SINGLE FROM GROUP OFF	LINE PARLEL	LINE JOIN 2 CURVES	BLANK ALL	UNBLANK ALL
POINT	DELTA FROM POINT	ADD NOTES TO DRAWING		NUMBER RUNOUTS		CHANGE TO FLEXIBLE DUCT		MODALS AND FONTS MENU				BLANK ALL OF A TYPE	UNBLANK ALL OF A TYPE
ANGLE/ DISTANCE	TO A LINE	FLEXIBLE CONNECTIONS		YES	NO			SOLID	DASHED	SOLID	DASHED	BLANK DOUBLE LINE	UNBLANK DOUBLE LINE
LINE INTERSECTION	IDENTIFY CURRENT REF. POINT	6	8	10	12	DELETE MENU		MODIFY FONT PHANTOM	MODIFY FONT C-LINE	CURVE FONT PHANTOM	CURVE FONT C-LINE	BLANK SINGLE LINE	UNBLANK SINGLE LINE
TRUNK SCHEDULE REPORT	ATTRIBUTE MANAGEMENT MENU	14	16	18	20	SELECT	CHAIN	ONE END SCREEN		ONE END BOUND		BLANK NOTES	UNBLANK NOTES
VAV BOX SCHEDULE REPORT	WRITE ATTRIBUTES ON FILE	22	24	26	28	LEVEL	ALL POINTS	TWO ENDS SCREEN		TWO ENDS BOUND		SET LEVEL TO DOUBLE LINE	SET LEVEL TO DUCT NOTES
RUNOUT SCHEDULE REPORT		30	32	34	36	REGION IN	REGION OUT	MIDDLE SCREEN	BOUND MIDDLE	TWO ENDS AT INTER-SECTION		SET LEVEL TO SINGLE LINE	GENERAL TABLET OVERLAYS

ATTRIBUTE MANAGEMENT — TRIM/EXTEND — HVAC BLANK

HVAC1
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SINGLE WALL — ROUND DUCT FITTINGS

ELBOWS		TEES		LATERALS		CROSSES		MISCELLANEOUS	
DIE-STAMPED ELBOW (45, 90 DEG.)	PLEATED ELBOW (45, 60, 90 DEG.)	STRAIGHT TEE	REDUCING TEE	STRAIGHT LATERAL	REDUCING LATERAL	STRAIGHT CROSS (90 DEGREES)	REDUCING CROSS (90 DEG.)	OFFSET	VOLUME DAMPER
FABRICATED ELBOW (0-90 DEG.)	MITERED ELBOW	CONICAL TEE	REDUCING CONICAL TEE	CONICAL LATERAL	REDUCING CONICAL LATERAL	CONICAL CROSS (90 DEG.)	LATERAL CROSS	BELLMOUTH	SQUARE TO ROUND
ELBOW TURNING UP	ELBOW TURNING DOWN	BULLHEAD TEE	REDUCING BULLHEAD TEE					FLEXIBLE DUCT	DUCT
HEEL TAPPED 90 DEGREE ELBOW	FLEXIBLE ELBOW	Y-BRANCHES		REDUCERS		DIFFUSERS		COUPLING/ NECK	DAMPER
		90 DEGREE Y-BRANCH	REDUCING 90 DEGREE Y-BRANCH	CONCENTRIC REDUCER	ECCENTRIC REDUCER	SQUARE DIFFUSER	LATERAL DIFFUSER		

HVAC2
R. HOUSEL

Figure M-1. HVAC Tablet Overlays

REFERENCE POINT DEFINITION

Reference points are used in the single-line routines, and in the fitting routines (the double-line routines). They are used to add trunk segments, to add runout segments, to draw centerlines to diffusers, and to define the fitting locations for many fittings.

There are eleven reference point modes. The Reference Point Mode menu is displayed:

```
--- REFERENCE POINT MODE
 1.  SCREEN POS
 2.  KEY-IN
 3.  LINE END
 4.  POINT
 5.  DELTA FROM LINE END
 6.  DELTA FROM POINT
 7.  TO A LINE
 8.  DELTA
 9.  ANGLE/DISTANCE
10.  DELTA S.P.
11.  LINE INTERSECTION
12.  IDENTIFY CURRENT REF. POINT
```

They are programmed on the HVAC1 tablet overlay on the left side.

REFERENCE POINT	
SCREEN POS	DELTA SCREEN POS
KEY-IN	DELTA
LINE END	DELTA FROM LINE END
POINT	DELTA FROM POINT
ANGLE/ DISTANCE	TO A LINE
LINE INTERSECTION	IDENTIFY CURRENT REF. POINT

Trunk segments, runout segments and centerlines to diffusers are drawn from point to point in a way similar to the ICEM DDN string operation. That is, the endpoint of one trunk segment becomes the beginning of the next trunk segment. The modes used most often for this type of operation are SCREEN POS and ANGLE/DISTANCE.

Many fitting programs use a reference point to determine fitting location. A different set of reference point modes (POINT, LINE END, and LINE INTERSECTION) are used most often for this type of operation.

For every fitting that uses this method of placement, the part of the fitting located at the reference point is described in the documentation on that fitting.

Three reference point modes are maintained by the system:

- Beginning reference point mode
- Next reference point mode
- Fitting reference point mode

The beginning reference point mode is the mode used for positioning the beginning of the first trunk segment on the drawing. The next reference point mode is the reference point mode by which trunk segments, runout segments and diffuser duct segments are drawn. The fitting reference point mode is the reference point mode used in positioning fittings. They are retained separately because they differ in some respects.

A reference point mode is defined at its first use. When a reference point mode is first used, the reference point mode menu is displayed. Select the desired reference point method from this menu. Once you select a reference point mode, it remains in effect until it is changed. For example, when a fitting is being drawn that uses a reference point for the fitting location, the prompts for the reference point based on the reference point mode currently in effect are displayed.

To change the reference point mode, enter operation reject ([) when the reference point prompt is displayed. The reference point mode menu is displayed so you can make another selection on the menu. The selection you make is retained by the system for future use.

After the reference point is defined, the system draws a point at that location. The point displayed is visual feedback which indicates that the location has been registered. This point is not permanently retained on the drawing.

Reference point modes that require values to be keyed in allow feet and inches input. The convention for feet and inches input within HVAC differs slightly from the ICEM DDN convention. The convention for feet and inches input within HVAC is

X'Y N/D

where

X is the number of feet,

Y is the number of inches, N is the numerator of the fraction, and D is the denominator.

No inch sign (") is needed, but there must be a space between the fractional part and the rest of the entry. Also, there must be no space between the feet value and the inch value. Variations include X'Y if there is no fractional part, X' if there is no inch value and Y if there is no feet value. The Y may be greater than 12. A negative number is entered by preceding the expression with a minus (-) sign. However, formulas or calculations can not be entered.

Below is a brief description of each reference point mode.

1. SCREEN POSITION

   Screen position mode is used to establish the reference point by screen position. This is used if exact coordinates are not necessary or if the grid is activated. The screen position you select becomes the current reference point. The prompt for screen position mode is displayed:

   ```
   *** SCREEN POSITION ***
   ENTER POSITION
   ```

2. KEY-IN

   Key-in mode allows you to enter the exact coordinates of the reference point. The system prompts first for the X coordinate and then for the Y coordinate of the desired location. The X and Y values are entered using feet and inches notation. The prompts for key-in mode are displayed:

   ```
   ***   KEY-IN   ***
   X VALUE

   Y VALUE
   ```

3. LINE END

   Line end mode allows you to define a reference point at a line end. First, you indicate the line and then the line end. This menu selection only works for the ICEM DDN line entity type (not arcs, circles, and so forth). The prompts for line end mode are displayed:

   ```
   ***  LINE END  ***
   INDICATE LINE
   INDICATE END
   ```

4. POINT

   Point mode is used to define an existing point as the reference point. The system prompts you to select the desired point. The prompts for point mode are displayed:

   ```
   ***   POINT   ***
   INDICATE POINT
   ```

5. DELTA FROM LINE END

Delta from line end mode is used to define a reference point at a distance from the end of a line. You are prompted as in line end mode to indicate which line and at which end of the line to work. You are then prompted to enter the delta values. The system prompts first for the delta X value and then for the delta Y value. The delta values are the distances in the X and Y directions from the line end selected. The delta values are entered using feet and inches notation. The prompts for delta from line end mode are displayed:

```
*** DELTA FROM LINE END ***
INDICATE LINE

INDICATE END

***   DELTA   ***
DX

DY
```

6. DELTA FROM POINT

Using delta from point mode you may define a reference point at a distance from an existing point. You are prompted as in point mode to select a point. Then you are prompted to enter delta values. The delta values are the distance in the X and Y directions from the initial point. The delta values are entered using feet and inches notation. The prompts for delta from point mode are displayed:

```
*** DELTA FROM PONT ***
INDICATE POINT

***   DELTA   ***
DX

DY
```

7. TO A LINE

To a line mode defines a reference point at the intersection of an imaginary line drawn at an angle you specify from the current reference point to the line you select. You are prompted to enter the angle at which to proceed from the current reference point to that line and then to select the desired line. The two lines must intersect. The prompts for to a line mode are displayed:

```
***  TO A LINE  ***
ENTER ANGLE
ANGLE = 0.0000

INDICATE LINE
```

8. DELTA

Using delta reference point mode allows you to define a reference point at an X and Y offset from the current reference point. The delta values are entered using feet and inches notation. The prompts for delta mode are displayed:

```
***   DELTA
DX

DY
```

9. ANGLE/DISTANCE

Angle/distance mode allows you to define a reference point at the distance specified from the current reference point in the direction of the angle entered. You are prompted for the angle and the distance. The angle is measured from the positive X-axis in a counterclockwise direction. The distance may be entered using feet and inches notation. The prompts for angle/distance mode are displayed:

```
*** ANGLE/DISTANCE ***
ENTER ANGLE
ANGLE = 0.0000

ENTER DISTANCE
```

10. DELTA S.P.

Delta from screen position mode allows you to define a reference point at an X and Y distance from the screen position selected. This mode allows you to define reference points at an offset from a grid point. After the screen position prompt, you are prompted for the X and then the Y displacement. The delta values are entered using feet and inches notation. The prompts for delta from screen position mode are displayed:

```
*** DELTA FROM SCREEN POSITION ***
ENTER POSITION

***   DELTA   ***
DX

DY
```

11. LINE INTERSECTION

Line intersection mode allows you to define a reference point at the intersection of two lines. This mode is useful in the placement of some fittings which must be placed next to another fitting (for example, a reducer). The intersecting lines are the duct centerline and the end line of the preceding fitting. You are prompted to select the two intersecting lines. The lines can be selected in any order. The prompts for the line intersection mode are displayed:

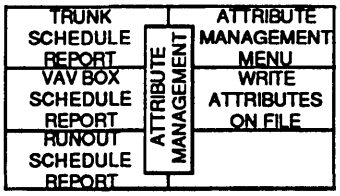
```
*** LINE INTERSECTION ***
INDICATE FIRST LINE

INDICATE SECOND LINE
```

12. IDENTIFY CURRENT REF. POINT

This is not a means of defining a reference point, but a way of displaying the current reference point maintained by the system. When this menu selection is made, a point is drawn at the current reference point and a circle is drawn around the point. The point and circle are then deleted and are not retained on the drawing.

ATTRIBUTE MANAGEMENT



In the lower left area of the HVAC1 overlay are five separate squares dealing with attribute management. Three of them deal with attribute schedule reports and the other two are concerned with the attribute management menu. The Trunk Attribute Report, VAV Box Attribute Report, and Runout Attribute Report are discussed in the section on single-line routines.

The Attribute Management Menu and Write Attributes On File squares are not currently used in HVAC.

DUCT SIZES

6	8	10	12
14	16	18	20
22	24	26	28
30	32	34	36

In the lower middle left portion of the HVAC1 tablet overlay some numbers are programmed onto the tablet overlay.

These numbers can be used for duct sizes. The only limitation is that one tablet pick gives an entire number, not just one or two digits.

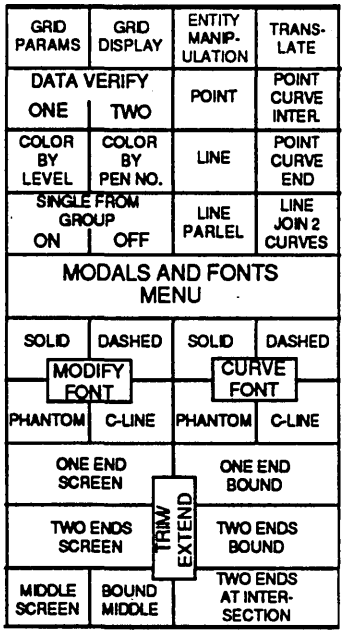
DELETE OPERATIONS

DELETE MENU	
SELECT	CHAIN
LEVEL	ALL POINTS
REGION IN	REGION OUT

In the lower middle portion of the HVAC1 tablet overlay are a number of programmed delete operations.

The delete operations are single select, delete chain, delete level range, delete all points, delete region-in, and delete region-out.

GENERAL ICEM DDN OPERATIONS



In the middle right portion of the HVAC1 tablet overlay are some programmed general ICEM DDN operations. They are described here from left-to-right and top-to-bottom.

The GRID PARAMS square allows you to define a grid size. The GRID DISPLAY square turns the grid display on or off.

The ENTITY MANIPULATION square calls up the Entity Manipulation menu for your selection.

The TRANSLATE square calls up the translate operation in the Entity Manipulation menu.

In the second row of squares, DATA VERIFY with ONE or TWO entities is programmed below the Grid squares.

POINT calls up the Point menu.

POINT CURVE INTER. allows you to define points at curve intersections.

In the third row of squares you can set the color display mode to COLOR BY LEVEL or COLOR BY PEN NO.

LINE calls up the Line menu.

POINT CURVE END allows you to define points as curve ends.

In the fourth row of squares you can turn single select group on or off. This is useful with entities defined by HVAC. Fitting programs leave single select from group on. If you want to select the entire group, you must turn single select from group off.

LINE PARLEL allows you to draw lines parallel to a line at a distance.

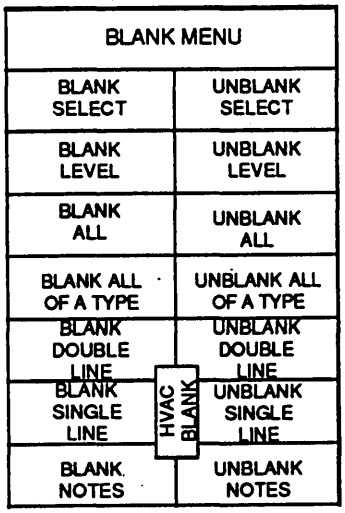
LINE JOIN 2 CURVES allows you to join curve ends.

The next row, MODALS AND FONTS MENU, calls up this menu.

The next two rows form two groups of squares to set or modify the curve font. The modify font group resets the curve font so new entities are drawn in that curve font.

The bottom three rows of squares are programmed for the TRIM/EXTEND operations. Every trim/extend mode is available in this section.

BLANK/UNBLANK OPERATIONS

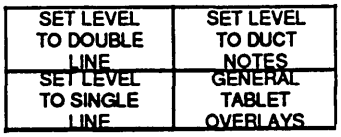


Some blank/unblank operations are programmed in the upper right section of the HVAC1 overlay.

You may blank or unblank by screen selection or by level. You may blank or unblank all and blank or unblank all of an entity type.

Since the HVAC program defines entities on predetermined levels, it is possible to selectively blank and unblank these levels. The middle right section of the HVAC1 overlay is programmed to do HVAC specific blanking and unblanking. You may selectively blank or unblank the double line level, the single line level or the note level.

HVAC LEVEL SETTING



In the lower right area of the HVAC1 overlay, set level operations are programmed. Another square is programmed to activate the BFU and BFL tablet overlays.

SET LEVEL TO DOUBLE LINE sets the ICEM DDN level to the double line level. SET LEVEL TO SINGLE LINE sets the level to the single line level. SET LEVEL TO DUCT NOTES sets the level to the note level. After the level has been set, all entities created subsequently outside of the HVAC programs are created on the level specified. Some HVAC programs may modify the current level definitions, so you must set levels after you use an HVAC program to ensure that the correct level is in use.

The GENERAL TABLET OVERLAYS square activates the General Facilities tablet overlays.

HVAC Routine Initialization Module

The first time one of the HVAC single line routines is invoked, the HVAC initialization routine is automatically executed. This routine initializes the HVAC modals, variables in the run-time library which are used by the single and double line routines. When the initialization module is run, the system displays:

```
ENTER SIX CHARACTER NAME
HTRUNK
GPL
*** RUNNING INITIALIZATION ROUTINE ***
*** DRAFTING SCALE SET TO .0104
BEGINNING TRUNK NUMBER
 = 100.0000
TRUNK NUMBER INCREMENT
 = 3.0000
NOTE LEVEL
 = 861.0000
SINGLE LINE LEVEL
 = 862.0000
DOUBLE LINE LEVEL
= 863.0000
LEFT LEVEL
= 0.0000
INITIAL TRUNK NUMBER
 = 0.0000
*** ROUNDED TO NEAREST FOOT ***
*** CONSTRAINED LINES ***
*** ADD NOTES TO DRAWING ***
*** NUMBER RUNOUTS ***
*** FLEXIBLE DUCT TO DIFFUSERS ***
***        ***        ***
*** PLEASE REENTER HVAC OPERATION
***        ***        ***
  -FINI-
```

This is a display of the HVAC modal status. The modals displayed here are discussed in more detail in the section on the HVAC modals.

Note that if a program such as NEW DRAWING is not run beforehand, the HVAC initialization module sets the drafting scale factor to 1/8 inch equals one foot.

Also notice that the operation you selected will have to be reinitiated after the initialization module is done.

HVAC MODALS

HVAC MODALS		
DISPLAY MODAL STATUS	TRUNK NUMBERING PARAMS.	
HVAC LEVEL MANAGEMENT	INITIAL SEGMENT NUMBER	
ROUND TO NEAREST FOOT	DRAW CONSTRAINED LINES	
ADD NOTES TO DRAWING	NUMBER RUNOUTS	
FLEXIBLE CONNECTIONS	YES	NO

There are eight HVAC modals. The HVAC modals are managed by the HVAC modal routine. The HVAC modal routine may be accessed using the middle left portion of the HVAC1 overlay.

DISPLAY MODAL STATUS

The first option in the HVAC modal section is to display the HVAC status. The display is similar to the following current modal status display:

```
*** DISPLAY MODAL STATUS ***
***        ***        ***
BEGINNING TRUNK NUMBER
 = 100.0000
TRUNK NUMBER INCREMENT
 = 3.0000
NOTE LEVEL
 = 861.0000
SINGLE LINE LEVEL
 = 862.0000
DOUBLE LINE LEVEL
= 863.0000
LEFT LEVEL
= 0.0000
INITIAL TRUNK NUMBER
 = 0.0000
*** ROUNDED TO NEAREST FOOT ***
*** CONSTRAINED LINES ***
*** ADD NOTES TO DRAWING ***
*** NUMBER RUNOUTS ***
*** FLEXIBLE DUCT TO DIFFUSERS ***
***        ***        ***
*** HVAC MODALS ***
```

TRUNK NUMBERING PARAMETERS

The trunk numbering parameters are the beginning trunk numbers and the trunk number increment. The beginning trunk number is the number the next trunk segment drawn will receive. The trunk number increment is the amount that will be added to the beginning trunk number after the next trunk segment is drawn.

The prompt for modifying the trunk numbering parameters displays:

```
*** TRUNK NUMBERING PARAMETERS ***
ENTER
1.  BEG. NUMBER = 100.0000
2.  INC. NUMBER =   3.0000
```

The above numbers are the numbers set by the HVAC initialization module. To change them enter one or both. Enter operation complete (]) twice.

HVAC LEVEL MANAGEMENT

The HVAC programs use predefined levels for the various HVAC components. The HVAC level management modal allows you to modify the level assignments. Single line drawing components, trunk segments, runout segments, VAV boxes, and diffusers (single line) are placed on one level. Notes on the single line drawing are on another level. The double line drawing is created on a third level. The prompt for altering the HVAC level assignments is displayed:

```
*** HVAC LEVEL MANAGEMENT ***
ENTER
1.  DUCT LEVEL  = 863.0000
2.  SINGLE LINE = 862.0000
3.  NOTE LEVEL  = 861.0000
4.  LEFT LEVEL  =   0.0000
```

These are the level numbers assigned by the HVAC initialization module. Duct level is the double line drawing level. Single line is the single line drawing level. Note level is the note level. Left level is the level at which ICEM DDN exits from any single line routines.

Enter any changes and enter operation complete (]) twice to exit from the HVAC modal module.

INITIAL SEGMENT NUMBER

The initial segment number is stored as the upstream trunk number of any initial trunk segment. An upstream trunk is not connected to another trunk, it only appears in the trunk schedule report. The prompt to alter the initial trunk segment is displayed:

```
*** INITIAL TRUNK NUMBER ***
ENTER
TRUNK = 0.0000
```

This is the initial trunk segment number defined by the HVAC initialization module.

ROUND TO NEAREST FOOT

The round to nearest foot modal allows you to specify that all reference points defined by the system be rounded to the nearest foot in both the X and Y directions. The prompt for this modal is displayed:

```
ROUND TO NEAREST FOOT?
```

Respond with yes or no. If you enter yes or y, the system displays:

```
*** ROUNDED TO NEAREST FOOT ***
```

If you enter no or n, the system displays:

```
*** NOT ROUNDED TO NEAREST FOOT ***
```

DRAW CONSTRAINED LINES

The constrained line modal allows you to specify that all drawn lines be constrained so that only horizontal or vertical lines appear. If the difference between two reference points is greater than the Y difference a horizontal line is drawn. Otherwise, a vertical line is drawn. The prompt for the constrained lines modal displays:

```
CONSTRAINED LINES?
```

Enter yes or no. If you enter yes or y, the system displays:

```
*** CONSTRAINED LINES ***
```

If you enter no or n, the system displays:

```
*** NOT CONSTRAINED LINES ***
```

ADD NOTES TO DRAWING

The add notes to drawing modal allows you to suppress the automatic writing of notes on a single line drawing. The prompt for this modal displays:

```
ADD NOTES TO DRAWING?
```

Answer yes or no in response. If you enter yes or y, the system displays:

```
*** ADD NOTES TO DRAWING ***
```

If you enter no or n, the system displays:

```
*** DO NOT ADD NOTES TO DRAWING ***
```

NUMBER RUNOUTS

The number runout modal allows you to specify or suppress the runout number and length notes on the runout segments. The prompt for this modal displays:

NUMBER RUNOUTS?

Enter yes or no in response to this prompt. If you enter yes or y, the system displays:

*** NUMBER RUNOUTS ***

If you enter no or n, the system displays:

*** NOT NUMBER RUNOUTS ***

FLEXIBLE CONNECTIONS

The flexible connections to diffusers modal allows you to specify that the last duct segment to the diffusers is drawn as a flexible duct representation. The prompt for this modal displays:

FLEXIBLE CONNECTIONS TO DIFFUSERS?

Answer yes or no in response to this prompt. If you enter yes or y, the system displays:

*** FLEXIBLE CONNECTIONS TO DIFFUSER ***

If you enter no or n, the system displays:

*** NOT FLEXIBLE CONNECTIONS TO DIFFUSERS ***

HVAC OPERATION

HVAC OPERATION	
ADD TRUNK SEGMENTS	ADD RUNOUT SEGMENTS
ADD VAV BOXES	ADD DIFFUSERS
REPLACE TRUNK SEGMENT	DECREMENT TRUNK COUNTER
CHANGE TO FLEXIBLE DUCT	

The single line drawing routines are used to make single line drawings of an HVAC. In addition to adding lines to a drawing, they also capture information and put it, as well as attributes, on the drawing.

The first items to be added to a single line drawing are the trunk segments, then runout segments may be added. After segments, VAV boxes may be added followed by diffusers. The HVAC modals govern the way these operations are carried out.

The single line routines are invoked using Reference Point, HVAC Modals, and HVAC Operation tablet picks on the upper middle part of the HVAC1 overlay.

ADD TRUNK SEGMENTS

The trunk segment module allows you to add trunk segments to your drawing. When you select the trunk segment module, the system displays:

```
ENTER SIX CHARACTER NAME
HTRUNK
GPL
*** ADD TRUNK SEGMENTS ***
```

If the trunk numbering parameters (see HVAC Modals section) are acceptable, the next prompt is to select a trunk on your drawing. If the trunk increment number is not greater than zero, the following message displays:

```
*** FIX TRUNK INCREMENT NUMBER ***
 = -1.0000
```

If numbered runouts are selected and the trunk increment number is less than 3, the following message displays:

```
*** TRUNK INCREMENT NUMBER MUST BE > 2 -
IT IS
 = 1.0000
```

If the current trunk number is greater than 99999, the following message displays:

```
*** MAXIMUM TRUNK NUMBER = 99999 ***
 = 100000.0000
```

If any of these error messages are displayed, you will be locked out of the trunk segment module. You must use HVAC modals to correct the trunk numbering parameters.

If the trunk numbering parameters are acceptable, the next prompt asks you to select a trunk segment. The purpose of this prompt is to allow you to connect the current segment to a previous trunk segment. This is necessary wherever there is a 'tee' in the trunk layout. You have to draw each stretch of the tee separately. As the trunk segments are drawn, the system keeps track of how the trunk segments are connected. The Indicate Trunk prompt allows the system to capture the upstream trunk number. The system prompts:

```
INDICATE TRUNK
INDICATE LINE
```

Use the graphics cursor to indicate the trunk and line. If this is an initial trunk segment on the drawing, enter operation reject ([). This allows you to place the first trunk segment on the drawing or to add another initial trunk segment.

If you enter operation reject ([) in response to the first prompt, you will be prompted for the beginning reference point. This is the upstream end of the trunk segment of the initial trunk segment. The system prompts:

```
*** BEGINNING REFERENCE POINT ***
```

For a description of the possible reference points modes, see the preceding section on Reference Point Definition.

If you do not enter operation reject ([) in response to the first prompt, select the trunk segment on the drawing that you want to connect with the next trunk. Select the upstream trunk segment.

Trunk segments should be drawn according to the direction of the air flow from upstream to downstream.

NOTE

Upstream refers to the direction from which air is flowing; downstream refers to the direction toward which a stream of air is flowing.

When the trunk segment is selected, the downstream end of the trunk becomes the beginning reference point of the next trunk segment. Its trunk number is recorded by the system.

If the line you select is not a trunk segment, one of the following messages is displayed:

*** NO ATTRIBUTES FOUND - NOT A TRUNK ***

*** NOT A TRUNK ***

After this prompt you return to the INDICATE TRUNK prompt.

The next prompt is for the next reference point. The next reference point is the downstream end of the trunk segment. It is defined by the reference point mode currently in effect. The prompt is displayed:

*** NEXT REFERENCE POINT ***

For a description of the possible reference point modes, see the preceding section on Reference Point Definition.

After the next reference point is defined, the trunk segment is drawn according to the HVAC modals currently in effect.

- If the number trunk modal is on, the trunk number and length will be drawn on the trunk segment as a note.
- If the round-to-nearest foot modal is on, all reference points will be rounded to the nearest foot. Otherwise, they will not be rounded.
- If the constrained line modal is on, only horizontal or vertical lines will be drawn. If the X displacement between reference points is greater than the Y displacement, a horizontal line will be drawn. Otherwise, a vertical line is drawn.

If the same location is specified for the beginning and next reference point, the following error message displays:

*** ZERO LENGTH SEGMENT ***

You are returned to the NEXT REFERENCE POINT prompt. If the trunk number exceeds 99999, the following message displays:

```
*** MAXIMUM TRUNK NUMBER = 99999
 = 100002.0000
```

The add trunk segment routine is then terminated.

After the trunk segment is drawn, the downstream end becomes the beginning reference point for the next trunk segment and you return to the NEXT REFERENCE POINT prompt. When you are done drawing trunk segments or when you want to draw another section, enter operation complete (]) at the NEXT REFERENCE POINT prompt. To begin the new section of trunk segments, use the add trunk segment square on the tablet overlay.

Deleting or Changing Trunk Segments

If you make a mistake in adding a trunk segment to the drawing, enter operation complete (]) at the next reference point prompt, then use Delete Last Entity on the main ICEM DDN overlay to delete the trunk segment last added. The trunk segment is defined as a group so it may be entirely deleted using the Delete Last Entity operation. The system prompts you when you do the Delete Last Entity operation:

```
DELETE ENTITIES IN GROUP?
```

Enter yes or y to this prompt and the trunk segment will be deleted. Then use the Decrement Trunk Counter square in the HVAC Operations section of the overlay. This will adjust the trunk counter back so that the next trunk segment has the same trunk number as the one you deleted. The Decrement Trunk Counter operation is described below.

Trunk Schedule Report

As trunk segments are added to the drawing, the system keeps track of their trunk number, lengths, and how they are connected. At any point in this process, you may generate a Trunk Schedule Report. The tablet square to create this report is in the lower left of the HVAC1 overlay. This lists every trunk by number, the upstream trunk numbers and the length of that trunk segment. It is placed on the drawing at a location you specify. The report origin for the trunk schedule is near the upper left-hand corner of the schedule. It is defined as a group and may be deleted by a Region In Delete at any time. If any changes are made to the drawing, rerun the report. A sample trunk schedule report follows.

TRUNK REPORT

TRUNK	UPSTREAM TRUNK	LENGTH
100	0	7.00
101	100	5.00
102	101	9.00
103	102	9.00
106	103	15.00
109	106	15.00
112	109	14.00
115	101	16.00
118	115	14.00
121	118	15.00
124	121	15.00
125	124	8.00
126	125	9.00
130	126	12.00
133	126	8.00

ADD RUNOUT SEGMENT

After trunk segments have been added, you may add runout segments to the drawing. Runout segments can be connected only to trunk segments.

The first prompt in the runout segment routine asks you to select the upstream trunk. Runout segments are always connected to the downstream end of a trunk segment. Only two runout segments may be connected to a trunk segment. The first prompt is displayed:

```
*** ADD RUNOUT SEGMENTS ***
INDICATE UPSTREAM TRUNK
```

If the line selected is not a trunk segment created by the trunk segment operation, one of the following messages is displayed:

```
*** NO ATTRIBUTES FOUND - NOT A TRUNK ***

*** NOT A TRUNK ***
```

You then return to the INDICATE UPSTREAM TRUNK prompt.

The trunk number is captured when you select the trunk segment. The beginning reference point for the runout segment is set to the downstream end of the trunk segment.

The next prompt is for the first segment of the next reference point. The system displays:

```
*** FIRST SEGMENT ***
*** NEXT REFERENCE POINT ***
```

This is the first segment of the runout. Runouts may have elbows and may have more than one segment. The segment ends are defined by reference points. The various reference point methods are described in the preceding section on Reference Point Definition.

When you define the next reference point, the runout segment is drawn. As runout segments are drawn, the segment length and the cumulative length of the runout are displayed:

```
*** THIS SEGMENT AND CUMULATIVE LENGTH
1 = 7.0000
2 = 7.0000
```

In this example, the lengths are the same because this is the first segment. You return to the NEXT REFERENCE POINT prompt.

- If the round-to-nearest foot modal is on, all reference points are rounded to the nearest foot. Otherwise, they will not be rounded.

- If the constrained line modal is on, only horizontal or vertical lines are drawn. If the X displacement between reference points is greater that the Y displacement, a horizontal line is drawn. Otherwise, a vertical line is drawn.

If the same location is selected as the next reference point, thereby creating a zero length segment, the following message is displayed:

```
*** ZERO LENGTH SEGMENT ***
```

You return to the NEXT REFERENCE POINT prompt.

When you finish the runout, enter operation complete (]) at the NEXT REFERENCE POINT prompt. At this point, if the number runouts modal is on, the length of the runout and the runout number are drawn as a note on the first runout segment. The runout number is calculated from the trunk number of the upstream trunk. The first runout is numbered with the trunk upstream number plus 1. The second runout is numbered with the upstream trunk number plus 2.

After the first runout is complete, you return to the first segment prompt to draw a second runout. If there is only one runout, enter operation complete (]) at this point. This brings you to the ADD RUNOUT SEGMENTS prompt. If you are done drawing runouts, enter operation complete (]). If there are two runouts, the second runout is drawn as the first. After it is completed, the following message is displayed:

*** ONLY TWO RUNOUTS ALLOWED ***

You return to the ADD RUNOUT SEGMENTS prompt.

Deleting or Changing Runouts

If you make a mistake entering a runout, use Delete Last Entity to delete a runout segment if no entities have been created after the last one entered.

If one runout has been added and you decide to add a second runout to a trunk, the first runout must be deleted and redrawn. This is true because the runout numbers always start at one plus the connected trunk number. If the second runout from a trunk needs to be modified, both runouts must be deleted and redrawn.

Runout Schedule Report

Because the runout segment operation keeps track of the runout lengths and connections, you can produce a runout schedule report. The tablet square to create this report is in the lower left of the HVAC1 overlay. The runout schedule lists the runouts by number along with the runout length and upstream trunk number. The schedule is placed on the drawing as a note and is a grouped entity. The runout schedule report origin is near the upper left-hand corner of the report. If any changes are made to the runouts, the old report may be deleted and a new one created at any time. A sample runout schedule report follows.

NUMBERED
RUNOUT REPORT

TRUNK	CONNECTING TRUNK	LENGTH
103	102	6.00
104	102	5.00
107	106	7.00
116	115	12.00
117	115	12.00

ADD VAV BOXES

This operation allows you to draw variable air volume boxes. They are placed at the downstream end of the runouts. The system tracks the connection of VAV boxes by means of runout segments to a trunk.

The first prompt in the VAV box routine is displayed:

```
*** ADD VARIABLE AIR VOLUME BOXES ***
INDICATE RUNOUT END
```

This prompt allows you to select the runout of the end from which to draw the VAV box. If the runout has more than one segment, the last segment will not have the runout attributes associated. In this case, the next prompt is displayed:

```
*** NO ATTRIBUTES FOUND ***
INDICATE BEGINNING RUNOUT SEGMENT
```

Indicate the first segment in the runout. This is the segment with the attributes. The downstream end of the last runout segment becomes the reference point where the VAV box is to be located. The trunk connection information is taken from the first runout segment. If no attributes are found on the beginning runout segment selected, the following message is displayed:

```
*** NO ATTRIBUTES FOUND - NOT A RUNOUT ***
```

You return to the INDICATE RUNOUT END prompt.

If the runout has only one segment, select that segment. If incorrect attributes are found on the beginning runout segment you select, the following message is displayed:

```
*** NOT A RUNOUT ***
```

You return to the INDICATE RUNOUT END prompt.

The next prompt is for the VAV box parameters:

```
VAV BOX PARAMETERS
1.  CFM    = 0.0000
2.  LENGTH = 0.0000
3.  WIDTH  = 0.0000
```

The CFM is the cubic feet per minute that the box delivers. The length is the size of the box running in the same direction as the last runout segment. The width is the size in the direction perpendicular to the last runout segment.

If the length entered is less than or equal to zero, the following message is displayed:

```
*** LENGTH MUST BE GREATER THAN 0 ***
```

You return to the VAV BOX PARAMETERS prompt. If the width entered is less than zero, the following message is displayed:

```
*** WIDTH MUST BE GREATER THAN 0 ***
```

You return to the VAV BOX PARAMETERS prompt. After you enter valid prompts, the VAV box outline is drawn. The next prompt is for the VAV box tag. The tag is a name or code identifying the VAV box. The following prompt is displayed:

```
VAV BOX TAG
```

At this point, if the Add Notes to Drawing modal is set to yes, the CFM and the VAV box tag are written as a note inside the VAV box outline. You return to the first prompt in the program.

VAV Box Schedule Report

At any time during the drawing process after VAV boxes have been drawn, you may request a VAV box schedule report. The tablet square to create this report is in the lower left of the HVAC1 overlay. The report lists VAV boxes sorted by the VAV box tags. The CFM and trunk connections are listed for each VAV box. The report is created as a group on your drawing. You must indicate the report origin. The report origin is located near the upper left corner of the report. A sample VAV box schedule report follows.

VARIABLE AIR
VOLUME BOX REPORT

VAVB	CONNECTING TRUNK	CFM
M1	115	300.00
M2	102	300.00
N1	115	300.00
N2	102	300.00

ADD DIFFUSER

The diffuser routine allows you to draw single line diffusers and the connecting single line duct centerlines. The first prompt is for a beginning reference point. You may use the points on the sides of a VAV box. The first prompt is displayed:

```
*** ADD DIFFUSERS ***
*** BEGINNING REFERENCE POINT ***
```

The next prompt is:

```
*** NEXT REFERENCE POINT ***
```

When this point is defined, the line segment between reference points is drawn and you return to the NEXT REFERENCE POINT prompt.

If the beginning reference point specified is the same as the next reference point specified, the following message is displayed:

```
*** ZERO LENGTH SEGMENT ***
```

You return to the NEXT REFERENCE POINT prompt.

Enter operation complete (]). This completes one diffuser and the slot diffuser is drawn perpendicular to the last diffuser centerline segment.

If the flexible connection to diffuser modal is on, the last diffuser centerline segment is redrawn in flexible connection representation. You return to the first prompt in the program. To exit, enter operation complete (]).

REPLACE TRUNK SEGMENT

The replace trunk segment routine assists you in modifying a single line drawing after it has been created. It manages the connection details if you have to modify a section of the layout.

You receive the first prompt in the replace trunk segment program:

```
*** REPLACE TRUNK SEGMENTS ***
INDICATE TRUNK TO REPLACE
INDICATE GROUP
```

Select the trunk segment you want replaced. The program checks to make sure it is a trunk segment. If the proper attributes are not found, one of the following messages is displayed:

```
*** NO ATTRIBUTES - NOT A TRUNK ***
```

```
*** NOT A TRUNK ***
```

You return to the INDICATE TRUNK TO REPLACE prompt. If a trunk segment has been selected, the next prompt is to indicate the previous upstream trunk:

```
INDICATE PREVIOUS TRUNK
INDICATE LINE
```

The upstream trunk number is captured from this trunk segment. If the proper attributes are not found, one of the following messages is displayed:

```
*** NO ATTRIBUTES - NOT A TRUNK ***
```

```
*** NOT A TRUNK ***
```

You return to the INDICATE PREVIOUS TRUNK prompt. If there is no upstream trunk and if you are replacing an initial trunk segment, enter an operation complete (]). You then receive the following prompt:

```
*** BEGINNING REFERENCE POINT ***
```

The next prompt in either case is for the trunk numbering parameters. Prior to this, the trunk segment you selected for replacement is deleted. The following messages are displayed:

```
*** DELETING SELECTED TRUNK ***
*** TRUNK NUMBERING PARAMETERS ***
ENTER
1.   BEG. NUMBER = 115.0000
2.   INC. NUMBER =   2.0000
```

If there were no upstream trunk segments, the beginning trunk number displayed is the trunk number of the segment deleted. If there is an upstream trunk segment, the beginning trunk number displayed is the number of the upstream trunk segment plus 2. These numbers may be accepted or modified. If the increment between trunk numbers is only one and if there are two runouts, there could be two runouts with the same number.

If the trunk increment number entered is less than or equal to zero, the following message is displayed:

```
*** FIX TRUNK INCREMENT NUMBER ***
 = 1.0000
```

You return to the TRUNK NUMBERING PARAMETERS prompt. If the trunk number you enter is greater than 99999, the following message is displayed:

```
*** MAXIMUM TRUNK NUMBER = 99999
 = 100001.0000
```

You return to the TRUNK NUMBERING PARAMETERS prompt.

Either the downstream end of the upstream trunk or the beginning reference point entered becomes the beginning reference point for the new trunk segment you are adding. The next prompt is for defining the downstream end of the new trunk segment.

```
*** NEXT REFERENCE POINT ***
```

When the next reference point is defined, the new trunk segment is drawn and given the trunk number you assigned. The trunk number is also incremented.

If you select the same location to be both the beginning and the next reference point, thereby producing a trunk segment of length zero, the following message is displayed:

```
*** ZERO LENGTH SEGMENT ***
```

You return to the NEXT REFERENCE POINT prompt after the first redefined trunk segment is drawn. You may continue to add trunk segments as necessary. When you are done, enter operation complete (]).

The next prompt displays:

```
*** UPDATING CONNECTING TRUNKS ***
INDICATE NEXT TRUNK
INDICATE LINE
```

Use the graphics cursor to indicate the trunk and line. The purpose of this prompt is to correct the trunk connection information stored in any connected trunk downstream from the replaced trunk segment. Select any downstream trunk segment one by one which was connected to the replaced trunk segment.

If the entity you selected does not have the proper attributes associated with it to indicate that it is a trunk segment, one of the following message is displayed:

```
*** NO ATTRIBUTES FOUND - NOT A TRUNK ***

*** NOT A TRUNK ***
```

When all the connected downstream trunk segments have been selected, enter operation complete (]). You return to the first prompt in the program. To exit the program, enter another operation complete (]).

NOTE

Runouts and VAV boxes connected to any replaced trunk segment must be deleted and redrawn.

DECREMENT TRUNK COUNTER

The decrement trunk counter routine decreases the current trunk number by the amount of the trunk increment number. This is useful if you make a mistake in drawing trunk segments and must delete one or more of the last segments entered. For each trunk segment deleted, use the decrement trunk counter routine once. This routine is only useful for the last segment or segments created. If a segment in the middle of a run must be modified, use the Replace Trunk Segment routine.

The first prompt in the decrement trunk counter routine is displayed:

```
*** DECREMENT TRUNK COUNTER ***
TRUNK NUMBER, INCREMENT NUMBER
1. = 115.0000
2. =   3.0000
*** CONTINUED?
```

This displays the current trunk and increment numbers. If you want to decrement the trunk number, enter yes or y. If you do not want to decrement the trunk number, enter no or n.

If you enter yes or y, the following message is displayed:

```
*** NEW CURRENT TRUNK NUMBER
 = 112.0000
```

If you enter no or n, the following message is displayed:

```
*** TRUNK NUMBER NOT CHANGED ***
```

CHANGE TO FLEXIBLE DUCT

This routine changes a segment of centerline to flexible duct representation.

The prompt in this program is displayed:

```
*** CHANGE TO FLEX ***
INDICATE LINE
INDICATE LINE
```

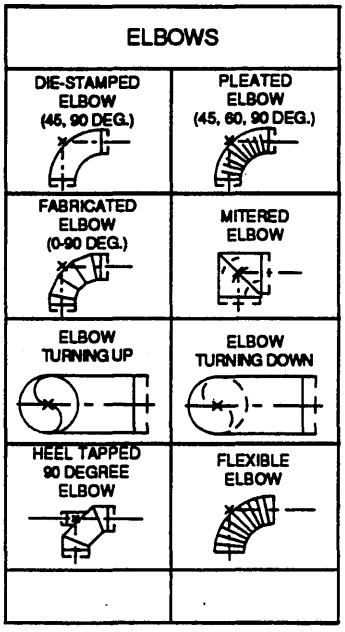
Select the centerline you want to change to flexible representation. It will be changed and you return to the CHANGE TO FLEX prompt.

The flexible duct symbol produced is not a grouped entity.

HVAC2 LOWER OVERLAY

The following sections describe the tablet squares of the lower overlay, HVAC2.

ELBOWS



You begin using the elbow fitting programs in the lower left portion of the HVAC2 overlays. To begin any elbow fitting, touch the appropriate square with the tablet stylus.

DIE-STAMPED ELBOW (45° and 90°)

When you begin the die-stamped elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
ELBDST
GPL
```

The first prompt in the die-stamped elbow program is for the elbow parameters:

```
*** DIE-STAMPED 45 OR 90 DEGREE ELBOW ***
ELBOW PARAMETERS
1.  DIAMETER   = 8.0000
2.  RADIUS FTR = 1.5000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The parameters for drawing die-stamped elbows include the elbow diameter and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the elbow centerline is 1.5 times the diameter of the elbow. The default value for the radius factor is 1.5. The elbow duct diameter you enter is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the radius factor. Then enter operation complete (]).

The die-stamped elbow program allows only duct diameters between 3 and 8 inches. If the diameter you enter is not in that range, the following message is displayed:

```
MAIN DIAMETER MUST BE 3" to 8".
```

You then return to the ELBOW PARAMETERS prompt.

If the radius factor you entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

You return to the ELBOW PAREMETERS prompt.

The next prompts are for the fitting location. The fitting location for die-stamped elbows is at the intersection point of the two centerlines of the elbow, so the following prompts are for the two centerlines.

```
*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE FIRST CENTERLINE
INDICATE LINE
```

Indicate one of the two elbow centerlines, using the graphics cursor. They may be selected in any order. You will then be prompted:

```
INDICATE SECOND CENTERLINE
INDICATE LINE
```

Indicate the second centerline, using the graphics cursor. The system determines the intersection angle of the centerlines and displays the elbow angle:

```
*** ELBOW ANGLE ***
 = 90.0000
```

If the centerlines do not intersect, the system displays the following message:

```
LINES DO NOT INTERSECT. . .
```

You return to the FITTING LOCATION prompt.

The die-stamped elbow program only allows elbows of 45° and 90°. If the intersection angle determined by the program is not 45° or 90°, the following message is displayed:

```
ELBOW ANGLE MUST BE 45 or 90 DEGREES.
```

You return to the FITTING LOCATION prompt.

The program draws the elbow. You return to the ELBOW PARAMETERS prompt to draw more die-stamped elbows.

The elbow fitting program will correctly determine the elbow angle as long as both centerlines end at their intersection point. If one or both of the centerlines do not end at the intersection point, one of the following may happen:

- The elbow angle may not be correctly determined by the program.
- The elbow may not be correctly drawn. For example, it may turn the wrong way.

If one of these problems is encountered, one or both of the centerlines must be broken at the intersection point by using a trim middle bound operation and specifying the same line twice as the boundaries. Once this is done, the elbow program will work correctly.

PLEATED ELBOW (45°, 60°, and 90°)

When you begin the pleated elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
ELBPLT
GPL
```

The first prompt in the pleated elbow program is for the elbow parameters:

```
*** PLEATED 45, 60, OR 90 DEGREE ELBOW ***
ELBOW PARAMETER
1.  DIAMETER   = 8.0000
2.  RADIUS FTR = 1.5000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The parameters for drawing pleated elbows include the elbow diameter and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the elbow centerline is 1.5 times the diameter of the elbow. The default value for the radius factor is 1.5. The elbow duct diameter entered is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the radius factor. Enter operation complete (]).

The pleated elbow program allows only duct diameters of 4 to 12, 14, and 16 inches. If the diameter entered is less than 4 inches, the following message is displayed:

```
MINIMUM DIAMETER IS 4".
```

You return to the ELBOW PARAMETER prompt.

If the diameter entered is greater than 4 inches, but not one of the allowed diameters, the following message is displayed:

```
DIAMETER DIMENSION NOT ALLOWED
```

You return to the ELBOW PARAMETER prompt.

If the radius factor you entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

You return to the ELBOW PARAMETER prompt.

The next prompts are for the fitting location. The fitting location for pleated elbows is at the intersection point of the two centerlines of the elbow, so the next two prompts are for the two centerlines.

```
*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE FIRST CENTERLINE
INDICATE LINE
```

Indicate one of the two elbow centerlines using the graphics cursor. They may be selected in any order. The system prompts:

```
INDICATE SECOND CENTERLINE
INDICATE LINE
```

Indicate the second centerline, using the graphics cursor. The system determines the intersection angle of the centerlines and displays the elbow angle:

```
*** ELBOW ANGLE ***
 = 60.000
```

If the centerlines do not intersect, the system displays the following message:

```
LINES DO NOT INTERSECT. . .
```

You return to the FITTING LOCATION prompt.

The pleated elbow program only allows elbows of 45o, 60o, or 90o. If the intersection angle determined by the program is not 45o, 60o, or 90o, the following message is displayed:

```
ELBOW ANGLE MUST BE 45, 60, OR 90 DEGREES
```

You return to the FITTING LOCATION prompt.

The maximum diameter of a 90o pleated elbow is 14 inches. If, when the system determines the elbow angle selected, it finds that an elbow diameter of greater than 14 inches was entered for a 90o elbow, the following message is displayed:

```
MAXIMUM DIAMETER FOR 90 DEGREE
ELBOW IS 14 INCHES
```

You return to the ELBOW PARAMETER prompt.

The program draws the elbow. You return to the ELBOW PARAMETER prompt to draw more pleated elbows.

The elbow fitting program will correctly determine the elbow angle as long as both centerlines end at their intersection point. If one or both of the centerlines do not end at the intersection point, one of the following may happen:

- The elbow angle may not be correctly determined by the program.
- The elbow may not be correctly drawn. For example, it may turn the wrong way.

If one of these problems is encountered, one or both of the centerlines must be broken at the intersection point by using a trim middle bound operation and specifying the same line twice as the boundaries. Once this is done, the elbow program will work correctly.

FABRICATED ELBOW (0° to 90°)

When you enter the fabricated elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
ELBFAB
GPL
```

The first prompt in the fabricated elbow program is for the elbow parameters:

```
*** FABRICATED 0-90 DEGREE ELBOW ***
ELBOW PARAMETER
1.  DIAMETER   = 8.0000
2.  RADIUS FTR = 1.5000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The parameters for drawing fabricated elbows include the elbow diameter and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the elbow centerline is 1.5 times the diameter of the elbow. The default value for the radius factor is 1.5. The elbow duct diameter entered is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the radius factor. Enter operation complete (]).

The duct diameter for the fabricated elbow program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

DIAMETER MUST BE GREATER THAN 0".

You return to the ELBOW PARAMETER prompt.

If the radius factor entered is less than 1, the following message is displayed:

RADIUS FACTOR MUST BE >= 1.

You return to the ELBOW PARAMETER prompt.

The next prompts are for the fitting location. The fitting location for fabricated elbows is at the intersection point of the two centerlines of the elbow, so the next two prompts are for the two centerlines.

*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE FIRST CENTERLINE
INDICATE LINE

Indicate one of the two elbow centerlines, using the graphics cursor. They may be selected in any order. The system prompts:

INDICATE SECOND CENTERLINE
INDICATE LINE

Indicate the second centerline, using the graphics cursor. The system determines the intersection angle of the centerlines and displays the elbow angle:

*** ELBOW ANGLE ***
= 22.5000

If the centerlines do not intersect, the system displays the following message:

LINES DO NOT INTERSECT. . .

You return to the FITTING LOCATION prompt.

The fabricated elbow program allows elbows of 0° to 90°. Intersection angles of less than 0° are not possible. The possibility of an intersection angle of 0° is eliminated by the test for centerline intersection. If the intersection angle determined by the program is greater than 90°, the following message is displayed:

90 DEGREES IS THE MAXIMUM ELBOW ANGLE.

You return to the FITTING LOCATION prompt.

The program draws the elbow. You return to the ELBOW PARAMETER prompt to draw more fabricated elbows.

The elbow fitting program will correctly determine the elbow angle as long as both centerlines end at their intersection point. If one or both of the centerlines do not end at the intersection point, one of the following may happen:

- The elbow angle may not be correctly determined by the program.
- The elbow may not be correctly drawn. For example, it may turn the wrong way.

If one of these problems is encountered, one or both of the centerlines must be broken at the intersection point by using a trim middle bound operation and specifying the same line twice as the boundaries. Once this is done, the elbow program will work correctly.

MITERED ELBOW (90°)

When you enter the mitered elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
ELBMIT
GPL
```

The first prompt in the mitered elbow program is for the elbow parameters:

```
*** MITERED 90 DEGREE ELBOW ***
ELBOW PARAMETERS
DIAMETER = 16.0000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The only parameter for drawing the mitered elbow is the elbow diameter. The elbow diameter is the duct diameter of the elbow. The elbow duct diameter entered is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the radius factor. Enter operation complete (]).

The duct diameter for the mitered elbow must be greater than 3 inches. If the diameter entered is less than 3 inches, the following message is displayed:

```
MINIMUM DIAMETER IS 3"
```

You return to the ELBOW PARAMETERS prompt.

If the radius factor you entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

You return to the ELBOW PARAMETERS prompt.

The next prompts are for the fitting location. The fitting location for mitered elbows is at the intersection point of the two centerlines of the elbow. The next two prompts are for the two centerlines:

```
*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE FIRST CENTERLINE
INDICATE LINE
```

Indicate one of the two elbow centerlines, using the graphics cursor. They may be selected in any order. The system prompts:

```
INDICATE SECOND CENTERLINE
INDICATE LINE
```

Indicate the second centerline, using the graphics cursor. The system determines the intersection angle of the centerlines and displays the elbow angle:

```
*** ELBOW ANGLE ***
 = 90.0000
```

Then the number of turning vanes and the vane spacing is displayed:

```
*** NUMBER OF VANES
 = 4.0000
*** VANE SPACING
 = 4.5255
```

If the centerlines do not intersect, the system displays the following message:

```
LINES DO NOT INTERSECT. . .
```

You return to the FITTING LOCATION prompt.

The mitered elbow program allows only elbows of 90°. If the intersection angle determined by the program is not equal to 90°, the following message is displayed:

```
90 DEGREES IS THE ONLY AVAILABLE ELBOW ANGLE
```

You return to the FITTING LOCATION prompt.

The program draws the elbow. You return to the ELBOW PARAMETERS prompt to draw more mitered elbows.

The elbow fitting program will correctly determine the elbow angle as long as both centerlines end at their intersection point. If one or both of the centerlines do not end at the intersection point, one of the following may happen:

- The elbow angle may not be correctly determined by the program.
- The elbow may not be correctly drawn. For example, it may turn the wrong way.

If one of these problems is encountered, one or both of the centerlines must be broken at the intersection point by using a trim middle bound operation and specifying the same line twice as the boundaries. Once this is done, the elbow routine will work correctly.

ELBOW TURNING UP (90°)

When you enter the upturned elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
ELBUP
GPL
```

The first prompt in the upturned elbow program is for the elbow parameters:

```
*** UP-TURNED 90 DEGREE ELBOW ***
ELBOW PARAMETERS
1.  DIAMETER   = 8.0000
2.  RADIUS FTR = 1.5000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The parameters for drawing upturned elbows include the elbow diameter and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the elbow centerline is 1.5 times the diameter of the elbow. The default value for the radius factor is 1.5. The radius factor is needed to determine the length of the protruding portion of the elbow. The elbow duct diameter entered is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the radius factor. Enter operation complete (]).

The duct diameter for the upturned elbow program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the ELBOW PARAMETERS prompt.

If the radius factor entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

You return to the ELBOW PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for the upturned elbows is by reference point. The center of the circle representing the upturned portion of the elbow is located at the reference point you specify. For a description of the possible reference point prompts, see the preceding section on Reference Point Definition. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to inicate the centerline and line.

The next prompt is for the fitting direction. The fitting direction for upturned elbows is the direction away from the upturned portion of the elbow. The response to this prompt is a screen selection in the direction along the centerline where you want the fitting to be located. The system prompts:

```
*** INDICATE FITTING DIRECTION ***
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

The program draws the elbow. You return to the ELBOW PARAMETERS prompt to draw more upturned elbows.

ELBOW TURNING DOWN (90°)

When you enter the downturned elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
ELBDWN
GPL
```

The first prompt in the downturned elbow program is for the elbow parameters:

```
*** DOWN-TURNED 90 DEGREE ELBOW ***
ELBOW PARAMETERS
1.  DIAMETER   = 8.0000
2.  RADIUS FTR = 1.5000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The parameters for drawing downturned elbows include the elbow diameter and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the elbow centerline is 1.5 times the diameter of the elbow. The default value for the radius factor is 1.5. The radius factor is needed to determine the length of the protruding portion of the elbow. The elbow duct diameter entered is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the radius factor. Enter operation complete (]).

The duct diameter for the upturned elbow program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the ELBOW PARAMETERS prompt.

If the radius factor entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

You return to the ELBOW PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for downturned elbows is by reference point. The center of the circle representing the downturned portion of the elbow is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the fitting direction. The fitting direction for downturned elbows is the direction away from the downturned portion of the elbow. The response to this prompt is a screen selection in the direction along the centerline where you want the fitting to be located. The system prompts:

```
INDICATE FITTING DIRECTION
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

The program draws the elbow. You return to the ELBOW PARAMETER prompt to draw more downturned elbows.

HEEL TAPPED 90° ELBOW

When you enter the heel-tapped elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
ELBTAP
GPL
```

The first prompt in the heel-tapped elbow program is for the elbow parameters:

```
*** HEEL-TAPPED 90 DEGREE ELBOW ***
ELBOW PARAMETER
1.  DIAMETER   = 8.0000
2.  TAP DIAM.  = 4.0000
3.  RADIUS FTR = 1.5000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The parameters for drawing heel-tapped elbows are the elbow diameter, the tap diameter and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The tap diameter is the duct diameter of the heel tap. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the elbow centerline is 1.5 times the diameter of the elbow. The default value for the radius factor is 1.5. The elbow duct and tap diameter entered is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter, the tap diameter and, if necessary, the radius factor. Enter operation complete (]).

The duct diameter for the heel-tapped elbow program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the ELBOW PARAMETER prompt.

The tap diameter for the heel-tapped elbow program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

You return to the ELBOW PARAMETER prompt.

If the radius factor entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

You return to the ELBOW PARAMETER prompt.

The next prompts are for the fitting location. The fitting location for heel-tapped elbows is at the intersection point of the two centerlines of the elbow, so the next two prompts are for the two centerlines. The system displays:

```
*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE FIRST CENTERLINE
INDICATE LINE
```

Indicate one of the two elbow centerlines, using the graphics cursor. They may be selected in any order. The system prompts:

```
INDICATE SECOND CENTERLINE
INDICATE LINE
```

Indicate the second centerline, using the graphics cursor.

The next prompt is for the tap direction. The tap direction is the direction of the tap. The response to this prompt is a screen selection in the direction along one centerline where you want to place the tap. The system prompts for the tap direction:

```
INDICATE TAP DIRECTION
```

The system determines the intersection angle of the centerlines and displays the elbow angle:

```
*** ELBOW ANGLE ***
 = 90.0000
```

If the centerlines do not intersect, the system displays the following message:

```
LINES DO NOT INTERSECT. . .
```

You return to the FITTING LOCATION prompt.

The heel-tapped elbow program only allows 90° elbows. If the intersection angle determined by the program is not equal to 90°, the following message is displayed:

```
90 DEGREES IS THE ONLY ALLOWABLE ELBOW ANGLE
```

You return to the FITTING LOCATION prompt.

If the system cannot determine the tap direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP DIRECTION prompt.

The program draws the elbow. You return to the ELBOW PARAMETER prompt to draw more heel-tapped elbows.

The elbow fitting program will correctly determine the elbow angle as long as both centerlines end at their intersection point. If one or both of the centerlines do not end at the intersection point, one of the following may happen:

- The elbow angle may not be correctly determined by the program.
- The elbow may not be correctly drawn. For example, it may turn the wrong way.

If one of these problems is encountered, one or both of the centerlines must be broken at the intersection point by using a trim middle bound operation and specifying the same line twice as the boundaries. Once this is done, the elbow routine will work correctly.

FLEXIBLE ELBOW

When you enter the flexible elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
FLELBO
GPL
```

The first prompt in the flexible elbow program is for the elbow parameters:

```
*** FLEXIBLE ELBOW ***
ELBOW PARAMETER
1.  DIAMETER    = 8.0000
2.  RADIUS FTR = 1.5000
```

You may exit the elbow program at this prompt by entering operation reject ([).

The parameters for drawing flexible elbows include the elbow diameter and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the elbow centerline is 1.5 times the diameter of the elbow. The default value for the radius factor is 1.5. The elbow duct diameter entered is retained by the system and reused in elbow and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the radius factor. Enter operation complete (]).

The duct diameter for the flexible elbow program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the ELBOW PARAMETER prompt.

If the radius factor entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

You return to the ELBOW PARAMETER prompt.

The next prompts are for the fitting location. The fitting location for flexible elbows is at the intersection point of the two centerlines of the elbow, so the next two prompts are for the two centerlines.

```
*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE FIRST CENTERLINE
INDICATE LINE
```

Indicate one of the two elbow centerlines, using the graphics cursor. They may be selected in any order. The system prompts:

```
INDICATE SECOND CENTERLINE
INDICATE LINE
```

Indicate the second centerline, using the graphics cursor.

If the centerlines do not intersect, the system displays the following message:

```
LINES DO NOT INTERSECT. . .
```

You return to the FITTING LOCATION prompt.

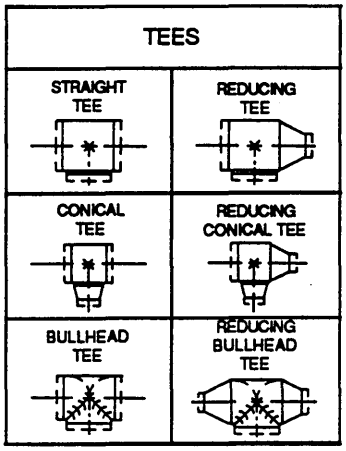
The program draws the elbow. You return to the ELBOW PARAMETER prompt to allow more flexible elbows to be drawn.

The elbow fitting program will correctly determine the elbow angle as long as both centerlines end at their intersection point. If one or both of the centerlines do not end at the intersection point, one of the following may happen:

- The elbow angle may not be correctly determined by the program.
- The elbow may not be correctly drawn. For example, it may turn the wrong way.

If one of these problems is encountered, one or both of the centerlines must be broken at the intersection point by using a trim middle bound operation and specifying the same line twice as the boundaries. Once this is done, the elbow routine will work correctly.

TEES



The tee fitting programs are located on the middle left section of the HVAC2 overlay. To begin a tee fitting program, touch the appropriate square with the tablet stylus.

STRAIGHT TEE (One Tap)

When you enter the straight tee program, the system displays:

```
ENTER SIX CHARACTER NAME
TEE
GPL
```

The first prompt in the straight tee program is for the tee parameters:

```
*** STRAIGHT TEE, ONE TAP ***
TEE PARAMETERS
1.  MAIN DIAM. = 18.0000
2.  TAP DIAM.  = 8.0000
```

You may exit the tee program at this prompt by entering operation reject ([).

The parameters for drawing the straight tee are the main diameter and the tap diameter. The main diameter is the duct diameter of the tee. The tap diameter is the duct diameter of the tap. The main duct diameter and tap diameter entered are retained by the system and reused in the tee and other fitting programs.

In response to this prompt, enter the main diameter and tap diameter, then enter operation complete (]). If the current parameter values are correct, only operation complete (]) is needed.

The main diameter for the straight tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the TEE PARAMETERS prompt.

The tap diameter for the straight tee program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

You return to the TEE PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for straight tees is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing that has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the center line and line.

The next prompt is for the tap side of the duct. The response to this prompt is a screen selection of the side of the tee fitting to have the tap. The system prompts:

```
INDICATE TAP SIDE
```

If the system cannot determine the tap side from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP SIDE prompt.

The program draws the tee. You return to the TEE PARAMETERS prompt to allow more straight tees to be drawn.

REDUCING TEE (One Tap)

When you enter the reducing tee program, the system displays:

```
ENTER SIX CHARACTER NAME
TEERED
GPL
```

The first prompt in the reducing tee program is for the tee parameters:

```
*** REDUCING TEE, ONE TAP ***
TEE PARAMETERS
1.  LARGE DIAM. = 18.0000
2.  SMALL DIAM. = 14.0000
3.  TAP DIAM.   =  8.0000
```

You may exit the tee program at this prompt by entering operation reject ([).

The parameters for drawing the reducing tee are the large diameter, the small diameter and the tap diameter. The large diameter is the duct diameter of the tee. The small diameter is the diameter of the reduced end of the tee. The tap diameter is the duct diameter of the tap. The large diameter, small diameter, and tap diameter entered are retained by the system and reused in tee and in other fitting programs.

In response to this prompt, enter the large diameter, small diameter, and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (])is needed.

The large diameter for the reducing tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

The small diameter for the reducing tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

The tap diameter for the reducing tee program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

If the small diameter is greater than or equal to the large diameter, the following message is displayed:

```
SMALL DIAMETER IS EQUAL TO OR GREATER THAN
LARGE DIAMETER
```

The maximum reduction in a reducing fitting is 12 inches. If the small diameter is more than 12 inches less than the large diameter, the following message is displayed:

```
*** MAXIMUM REDUCTION IS 12 INCHES ***
```

After any of these messages, you return to the TEE PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for reducing tees is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the tap side of the duct. The response to this prompt is a screen selection of the tee fitting side which has the tap. The system prompts:

```
INDICATE TAP SIDE
```

The next prompt is for the reduced end of the fitting. The response to this prompt is a screen selection of the tee fitting side to have the reduced end. The system prompts:

```
INDICATE REDUCED END
```

If the system cannot determine the tap side from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP SIDE prompt.

If the system cannot determine the reduced end from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE REDUCED END prompt.

The program draws the tee. You return to the TEE PARAMETERS prompt to draw more reducing tees.

CONICAL TEE (One Tap)

When you enter the conical tee program, the system displays:

```
ENTER SIX CHARACTER NAME
TEECON
GPL
```

The first prompt in the conical tee program is for the tee parameters:

```
*** CONICAL TEE, ONE TAP ***
TEE PARAMETERS
1.  MAIN DIAM. = 18.0000
2.  TAP DIAM.  =  8.0000
```

You may exit the tee program at this prompt by entering operation reject ([).

The parameters for drawing the conical tee are the main diameter and the tap diameter. The main diameter is the duct diameter of the tee. The tap diameter is the duct diameter of the tap. The main duct diameter and tap diameter entered are retained by the system and reused in the tee and other fitting programs.

In response to this prompt, enter the main diameter and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The main diameter for the conical tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the TEE PARAMETERS prompt.

The tap diameter for the conical tee program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

You return to the TEE PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for conical tees is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the tap side of the duct. The response to this prompt is a screen selection of the tee fitting side which has the tap. The system prompts:

```
INDICATE TAP SIDE
```

If the system cannot determine the tap side from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP SIDE prompt.

The program draws the tee. You return to the TEE PARAMETERS prompt to allow more conical tees to be drawn.

REDUCING CONICAL TEE (One Tap)

When you enter the reducing conical tee program, the system displays:

```
ENTER SIX CHARACTER NAME
TCONRD
GPL
```

The first prompt in the reducing conical tee program is for the tee parameters:

```
*** REDUCING CONICAL TEE, ONE TAP ***
TEE PARAMETERS
1.  LARGE DIAM. = 18.0000
2.  SMALL DIAM. = 14.0000
3.  TAP DIAM.   =  8.0000
```

You may exit the tee program at this prompt by entering operation reject ([).

The parameters for drawing the reducing conical tee are the large diameter, the small diameter and the tap diameter. The large diameter is the duct diameter of the tee. The small diameter is the diameter of the reduced end of the tee. The tap diameter is the duct diameter of the tap. The large diameter, small diameter, and tap diameter entered are retained by the system and reused in the tee and other fitting programs.

In response to this prompt, enter the large diameter, small diameter, and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The large diameter for the reducing conical tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

The small diameter for the reducing conical tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

The tap diameter for the reducing conical tee program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

If the small diameter is greater than or equal to the large diameter, the following message is displayed:

```
SMALL DIAMETER IS EQUAL TO OR GREATER THAN
LARGE DIAMETER
```

The maximum reduction in a reducing fitting is 12 inches. If the small diameter is more than 12 inches less than the large diameter, the following message is displayed:

```
*** MAXIMUM REDUCTION IS 12 INCHES ***
```

After any of these messages, you return to the TEE PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for reducing conical tees is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. Thus, you may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the tap side of the duct. The response to this prompt is a screen selection of the tee fitting side to have the tap. The system prompts:

```
INDICATE TAP SIDE
```

The next prompt is for the reduced end of the fitting. The response to this prompt is a screen selection of the tee fitting side to have the reduced end. The system prompts:

```
INDICATE REDUCED END
```

If the system cannot determine the tap side from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP SIDE prompt.

If the system cannot determine the reduced end from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE REDUCED END prompt.

The program draws the tee. You return to the TEE PARAMETERS prompt to allow more reducing conical tees to be drawn.

BULLHEAD TEE

When you enter the bullhead tee program, the system displays:

```
ENTER SIX CHARACTER NAME
TEEBUL
GPL
```

The first prompt in the bullhead tee program is for the tee parameters:

```
*** BULLHEAD TEE ***
TEE PARAMETERS
1.  DIAMETER   = 8.0000
```

You may exit the tee program at this prompt by entering operation reject ([).

The only parameter for drawing a bullhead tee is the duct diameter of the tee. The duct diameter entered is retained by the system and reused in the tee and other fitting programs.

In response to this prompt, enter the duct diameter and enter operation complete (]). If the displayed parameter value is correct, only operation complete (]) is necessay.

The duct diameter for the bullhead tee program must be greater than 3 inches. If the diameter entered is less than 3 inches, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 3".
```

You return to the TEE PARAMETERS prompt.

The next prompts are for the fitting location. The fitting location for bullhead tees is at the intersection point of the centerlines of the main duct and of the tap. The next two prompts are for the two centerlines.

```
*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE MAIN CENTERLINE
INDICATE LINE
```

Indicate the main duct centerline, using the graphics cursor. The system prompts:

```
INDICATE TAP CENTERLINE
INDICATE LINE
```

Indicate the tap centerline, using the graphics cursor. The number of turning vanes and the vane spacing are displayed:

```
*** NUMBER OF VANES
 = 4.0000
*** VANE SPACING
 = 4.5255
```

If the centerlines do not intersect, the system displays the following message:

```
LINES DO NOT INTERSECT. . .
```

You return to the FITTING LOCATION prompt.

The bullhead tee routine requires a tap angle of 90o. If the intersection angle determined by the program is other than 90o, the following message is displayed:

```
TAP ANGLE MUST BE 90 DEGREES
```

You return to the FITTING LOCATION prompt.

The program draws the tee. You return to the TEE PARAMETERS prompt to draw more bullhead tees.

REDUCING BULLHEAD TEE

When you enter the reducing bullhead tee program, the system displays:

```
ENTER SIX CHARACTER NAME
TBULRD
GPL
```

The first prompt in the reducing bullhead tee program is for the tee parameters:

```
*** REDUCING BULLHEAD TEE ***
TEE PARAMETERS
1.  LARGE DIA. = 18.0000
2.  SMALL DIA. = 14.0000
3.  TAP DIA.   =  8.0000
```

You may exit the tee program at this prompt by entering operation reject ([).

The parameters for drawing the reducing bullhead tee are the large diameter, small diameter, and tap diameter. The large diameter is the duct diameter of the large end of the tee. The small diameter is the diameter of the small end of the tee. The tap diameter is the duct diameter of the tap. The large diameter, small diameter, and tap diameter entered are retained by the system and reused in the tee and other fitting programs.

In response to this prompt, enter the large diameter, small diameter, and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The large diameter for the reducing bullhead tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

The small diameter for the reducing bullhead tee program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

The tap diameter for the reducing bullhead tee program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

If the tap diameter is less than the large diameter, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN LARGE DIAMETER
```

If the tap diameter is less than the small diameter, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN SMALL DIAMETER
```

The maximum reduction in a reducing fitting is 12 inches. If the tap diameter is more than 12 inches larger than the small diameter, the following messages are displayed:

```
*** SMALL OUTLET END ***
*** MAXIMUM REDUCTION IS 12 INCHES ***
```

If the tap diameter is more than 12 inches larger than the large diameter, the following messages are displayed:

```
*** LARGE OUTLET END ***
*** MAXIMUM REDUCTION IS 12 INCHES ***
```

After any of these messages, you return to the TEE PARAMETERS prompt.

The next prompts are for the fitting location. The fitting location for bullhead tees is at the intersection point of the centerlines of the main duct and the tap, so the next two prompts are for the two centerlines.

```
*** FITTING LOCATION ***
*** FITTING CENTERLINES ***
INDICATE MAIN CENTERLINE
INDICATE LINE
```

Indicate the main duct centerline, using the graphics cursor. The system prompts:

```
INDICATE TAP CENTERLINE
INDICATE LINE
```

Indicate the tap centerline, using the graphics cursor. The next prompt is for the large end of the fitting. The response to this prompt is a screen selection of the tee fitting side which has the larger duct diameter. The system prompts:

```
INDICATE LARGE END
```

You are prompted for the number of turning vanes and the vane spacing:

```
*** NUMBER OF VANES
 = 4.0000
*** VANE SPACING
 =4.5255
```

If the system cannot determine the large end of the fitting from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE LARGE END prompt.

If the centerlines do not intersect, the system displays the following message:

```
LINES DO NOT INTERSECT. . .
```

You return to the FITTING LOCATION prompt.

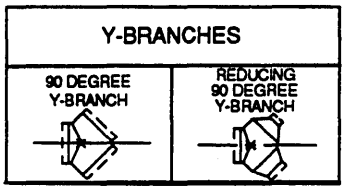
The reducing bullhead tee routine requires a tap angle of 90°. If the intersection angle determined by the program is other than 90°; the following message is displayed:

```
TAP ANGLE MUST BE 90 DEGREES
```

You return to the FITTING LOCATION prompt.

The program draws the tee. You return to the TEE PARAMETERS prompt to draw more bullhead tees.

Y-BRANCHES



The Y-branch fitting programs are located on the middle left section of the HVAC2 overlay. To begin a Y-branch fitting program, touch the appropriate square with the tablet stylus.

90° Y-BRANCH

When you enter the 90° Y-branch program, the system displays:

```
ENTER SIX CHARACTER NAME
YBRNCH
GPL
```

The first prompt in the 90° Y-branch program is for the Y-branch diameter:

```
*** 90 DEGREE Y-BRANCH ***
Y-BRANCH DIAMETER
1.  MAIN DIAM. = 18.0000
```

You may exit the Y-branch program at this prompt by entering operation reject ([).

The only parameter for drawing the 90° Y-branch is the main diameter. The main diameter is the main duct diameter. The main duct diameter entered is retained by the system and reused in Y-branch and in other fitting programs.

In response to this prompt, enter the main diameter and operation complete (]). If the displayed diameter value is correct, only operation complete (]) is necessary.

The main diameter for the 90o Y-branch program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the Y-BRANCH DIAMETER prompt.

The next prompt is for the fitting location. The fitting location for Y-branch fittings is by reference point. The intersection point of the main centerline and the Y-branch centerlines is located at the reference point you specify and offset by an amount you select. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix.

The Y-branch fitting programs automatically calculate a fitting offset. The offset value allows ease of fitting placement on drawings where the centerlines for the Y-branches are not drawn. The offset calculated is the distance the Y-branch fitting would have to be offset from the intersection of the main duct centerline and a perpendicular centerline to allow the 45o elbow to be connected to the Y-branch and the perpendicular duct runs without adding an additional duct segment between the Y-branch and the elbow. Y-branch fittings need a 45o elbow to link up to all sections of duct oriented perpendicular to the main duct run.

The calculated offset is displayed. It may be accepted by entering operation complete (]) or changed by entering another offset value. A zero offset places the fitting exactly at the reference point you specify. Entering a larger number than the calculated offset ensures that a duct segment will have to be added between the Y-branch and the connecting 45o elbow. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The fitting centerline is the centerline of the intake branch of the Y-branch fitting. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the branch direction. The branch direction is the direction in which Y-branches are pointing. The response to this prompt is a screen selection of the direction. The system prompts:

```
INDICATE BRANCH DIRECTION
```

If the system cannot determine the branch direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE BRANCH DIRECTION prompt.

The program draws the Y-branch. You return to the Y-BRANCH DIAMETER prompt to draw more 90o Y-branches.

REDUCING 90° Y-BRANCH

When you enter the reducing 90o Y-branch program, the system displays:

```
ENTER SIX CHARACTER NAME
YBRRED
GPL
```

The first prompt in the reducing 90o Y-branch program is for the Y-branch diameters:

```
*** REDUCING 90 DEGREE Y-BRANCH ***
Y-BRANCH PARAMETERS
1.  INTAKE DI. = 18.0000
2.  LARGE DIA. = 14.0000
3.  SMALL DIA. = 12.0000
```

You may exit the Y-branch program at this prompt by entering operation reject ([).

The parameters for drawing the reducing 90o Y-branch are the intake diameter, large diameter, and small diameter. The intake diameter is the intake duct diameter. The large diameter is the diameter of the large Y-branch duct. The small diameter is the diameter of the small Y-branch duct. The intake, large, and small duct diameters entered are retained by the system and reused in Y-branch and in other fitting programs.

In response to this prompt, enter the intake diameter and the large and small diameters. Enter operation complete (]). If the displayed diameter values are correct, only operation complete (]) is necessary.

The intake diameter for the reducing 90o Y-branch program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
MAIN DIAMETER MUST BE GREATER THAN 0".
```

The large diameter for the reducing 90o Y-branch program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

The small diameter for the reducing 90o Y-branch program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

The large diameter of the reducing 90o Y-branch must be greater than or equal to the small Y-branch diameter. If the small diameter is greater than the large diameter, the following message is displayed:

```
*** SMALL DIAMETER IS GREATER THAN
LARGE DIAMETER
```

After any of these messages, you return to the Y-BRANCH PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for Y-branch fittings is by reference point. The intersection point of the main centerline and the Y-branch centerline is located at the reference point you specify and offset by an amount you select. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix.

The Y-branch fitting programs automatically calculate a fitting offset. The offset value allows ease of fitting placement on drawings where the centerlines for the Y-branches are not drawn. The offset calculated is the distance the Y-branch fitting would have to be offset from the intersection of the main duct centerline and a perpendicular centerline in order to allow the 45° elbow to be connected to the Y-branch and the perpendicular duct runs without adding an additonal duct segment between the Y-branch and the elbow. Y-branch fittings need a 45° elbow to link up to all sections of duct oriented perpendicular to the main duct run.

The calculated offset is displayed. It may be accepted by using operation complete (]) or changed by entering another offset value. A zero offset will place the fitting exactly at the reference point you specify. Entering a larger number than the calculated offset ensures that a duct segment will have to be added between the Y-branch and the connecting 45° elbow. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The fitting centerline is the centerline of the intake branch of the Y-branch fitting. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the ceterline and line.

The next prompt is for the large branch quadrant. The large branch quadrant includes the direction in which the large Y-branch is pointing and the direction the small Y-branches are pointing. The quadrant is defined by the fitting centerline as the Y-axis with the X-axis being perpendicular to this line through the reference point. The response to this prompt is a screen selection of this quadrant. The system prompts:

```
INDICATE LARGE BRANCH QUADRANT
```

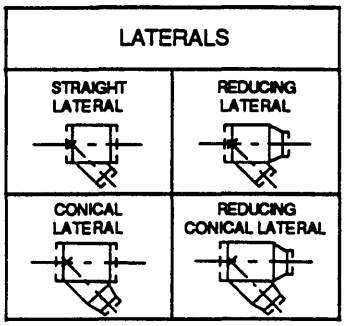
If the system cannot determine the large branch direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE LARGE BRANCH QUADRANT prompt.

The program draws the reducing Y-branch. You return to the Y-BRANCH PARAMETERS prompt to draw more reducing 90° Y-branches.

LATERALS



The lateral fitting programs are located in the middle section of the HVAC2 overlay. To begin a lateral fitting program, touch the appropriate square with the tablet stylus.

STRAIGHT LATERAL (One Tap)

When you enter the straight lateral program, the system displays:

```
ENTER SIX CHARACTER NAME
LATERL
GPL
```

The first prompt in the straight lateral program is for the lateral parameters:

```
*** STRAIGHT LATERAL, ONE TAP ***
LATERAL PARAMETERS
1.  MAIN DIAM. = 18.0000
2.  TAP DIAM.  =  8.0000
```

You may exit the lateral program at this prompt by entering operation reject ([).

The parameters for drawing the straight lateral are the main diameter and the tap diameter. The main diameter is the main duct diameter. The tap diameter is the duct diameter of the tap. The main duct diameter and the tap diameter entered are retained by the system and reused in lateral and in other fitting programs.

In response to this prompt, enter the main diameter and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The main diameter for the straight lateral program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the LATERAL PARAMETERS prompt.

The tap diameter for the straight lateral program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

TAP DIAMETER MUST BE GREATER THAN 0".

You return to the LATERAL PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for all laterals is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify and offset by an amount you select. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix.

The lateral fitting program automatically calculates a fitting offset. The offset value allows ease of fitting placement on drawings where the centerlines for the lateral taps are not drawn. The offset calculated is the distance the lateral fitting would have to be offset from the intersection of the main duct centerline and perpendicular centerline to allow the 45° elbow to connect with the lateral and the perpendicular duct runs without adding an additional duct segment between the lateral and the elbow. Lateral fittings need a 45° elbow to link up to all sections of duct oriented perpendicular to the main duct run.

The calculated offset is displayed. You may be accept it by using operation complete (]) or change it by entering another offset value. A zero offset will place the fitting exactly at the reference point you specify. Entering a larger number than the calculated offset ensures that a duct segment will have to be added between the lateral and the connecting 45° elbow. The system prompts:

*** FITTING LOCATION ***

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the tap direction. The tap direction indicates the side of the duct to have the tap and the direction the lateral tap is to point. The response to this prompt is a screen selection in the quadrant toward which the lateral tap should point. The origin to determine the quadrant is the reference point you specify; the X-axis is a line running through the reference point and parallel to the fitting centerline you select. The system prompts:

INDICATE TAP DIRECTION (QUADRANT)

If the system cannot determine the tap direction from your selection, the following message is displayed:

RESELECT DIRECTION - ZERO LENGTH SEGMENT

You return to the INDICATE TAP DIRECTION prompt.

The program draws the lateral. You return to the LATERAL PARAMETERS prompt to draw more straight laterals.

REDUCING LATERAL (One Tap)

When you begin the reducing lateral program, the system displays:

```
ENTER SIX CHARACTER NAME
LATRED
GPL
```

The first prompt in the reducing lateral program is for the lateral parameters:

```
*** REDUCING LATERAL, ONE TAP ***
LATERAL PARAMETERS
1.  LARGE DIAM. = 18.0000
2.  SMALL DIAM. = 14.0000
3.  TAP DIAM.   =  8.0000
```

You may exit the lateral program at this prompt by entering operation reject ([).

The parameters for drawing the reducing lateral are the large diameter, the small diameter, and the tap diameter. The large diameter is the main duct diameter of the lateral. The small diameter is the diameter of the reduced end of the lateral. The tap diameter is the duct diameter of the tap. The large diameter, small diameter, and tap diameter entered are retained by the system and reused in lateral and in other fitting programs.

In response to this prompt, enter the large diameter, small diameter, and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The large diameter for the reducing lateral program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

The small diameter for the reducing lateral program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

The tap diameter for the reducing lateral program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

If the small diameter is greater than or equal to the large diameter, the following message is displayed:

```
SMALL DIAMETER IS EQUAL TO OR GREATER THAN
LARGE DIAMETER
```

The maximum reduction in a reducing fitting is 12 inches. If the small diameter is more than 12 inches smaller than the large diameter, the following message is displayed:

```
*** MAXIMUM REDUCTION IS 12 INCHES ***
```

After any of these messages, you return to the LATERAL PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for all laterals is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify and offset by an amount you select. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix.

The lateral fitti' g program automatically calculates a fitting offset. The offset value allows ease of fitting placement on drawings where the centerlines for the lateral taps are not drawn. The offset calculated is the distance the lateral fitting would have to be offset from the intersection of the main duct centerline and perpendicular centerline to allow the 45° elbow to connect with the lateral and perpendicular duct runs without adding an additional duct segment between the lateral and the elbow. Lateral fittings need a 45° elbow to link up to a section of duct oriented perpendicular to the main duct run.

The calculated offset is displayed. You may accept it by entering operation complete (]) or change it by entering another offset value. A zero offset will place the fitting exactly at the reference point you specify. Entering a larger number than the calculated offset ensures that a duct segment will have to be added between the lateral and the connecting 45° elbow. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the tap direction. The tap direction indicates the side of the duct to have the tap, the direction the lateral tap should point and the reduced end of the lateral fitting. The response to this prompt is a screen selection in the quadrant toward which the lateral tap should point. The origin to determine the quadrant is the reference point you specify; the X-axis is a line running through the reference point and parallel to the fitting centerline you select. The system prompts:

```
INDICATE TAP DIRECTION (QUADRANT)
```

If the system cannot determine the tap direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP DIRECTION prompt.

The program draws the lateral. You return to the LATERAL PARAMETERS prompt to draw more reducing laterals.

CONICAL LATERAL (One Tap)

When you begin the conical lateral program, the system displays:

```
ENTER SIX CHARACTER NAME
LATCON
GPL
```

The first prompt in the conical lateral program is for the lateral parameters:

```
*** CONICAL LATERAL, ONE TAP ***
LATERAL PARAMETERS
1. MAIN DIAM. = 18.0000
2.  TAP DIAM. =  8.0000
```

You may exit the lateral program at this prompt by entering operation reject ([).

The parameters for drawing the conical lateral are the main diameter and the tap diameter. The main diameter is the main duct diameter of the lateral. The tap diameter is the duct diameter of the tap. The main duct diameter and tap diameter entered are retained by the system and reused in lateral and in other fitting programs.

In response to this prompt, enter the main diameter and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The main diameter for the conical lateral program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the LATERAL PARAMETERS prompt.

The tap diameter for the conical lateral program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

```
TAP DIAMETER MUST BE GREATER THAN 0".
```

You return to the LATERAL PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for all laterals is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify, offset by an amount you select. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix.

The lateral fitting program automatically calculates a fitting offset. The offset value allows ease of fitting placement on drawings where the centerlines for the lateral taps are not drawn. The offset calculated is the distance the lateral fitting would have to be offset from the intersection of the main duct centerline and perpendicular centerline to allow the 45° elbow to connect with the lateral and perpendicular duct runs without adding an additional duct segment between the lateral and the elbow. Lateral fittings need a 45° elbow to link up to a section of duct oriented perpendicular to the main duct run.

The calculated offset is displayed. You may accept it by entering operation complete (]) or change it by entering another offset value. A zero offset will place the fitting exactly at the reference point you specify. Entering a larger number than the calculated offset ensures that a duct segment will have to be added between the lateral and the connecting 45° elbow. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline or line.

The next prompt is for the tap direction. The tap direction indicates the side of the duct to have the tap and the direction the lateral tap should point. The response to this prompt is a screen selection in the quadrant where the lateral tap should point. The origin to determine the quadrant is the reference point you specify; the X-axis is a line running through the reference point and parallel to the fitting centerline you select. The system prompts:

```
INDICATE TAP DIRECTION (QUADRANT)
```

If the system cannot determine the tap direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP DIRECTION prompt.

The program draws the lateral. You return to the LATERAL PARAMETERS prompt to allow more conical laterals to be drawn.

REDUCING CONICAL LATERAL (One Tap)

When you begin the reducing conical lateral program, the system displays:

```
ENTER SIX CHARACTER NAME
LCONRD
GPL
```

The first prompt is for the lateral parameters:

```
*** REDUCING CONICAL LATERAL, ONE TAP ***
LATERAL PARAMETERS
1.  LARGE DIAM. = 18.0000
2.  SMALL DIAM. = 14.0000
3.  TAP DIAM.   =  8.0000
```

You may exit the lateral program at this prompt by entering operation reject ([).

The parameters for drawing the reducing conical lateral are the large diameter, the small diameter, and the tap diameter. The large diameter is the main duct diameter of the lateral. The small diameter is the diameter of the reduced end of the lateral. The tap diameter is the duct diameter of the tap. The large diameter, small diameter, and tap diameter entered are retained by the system and reused in lateral and in other fitting programs.

In response to this prompt, enter the large diameter, small diameter, and tap diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The large diameter for the reducing conical lateral program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

LARGE DIAMETER MUST BE GREATER THAN 0".

The small diameter for the reducing conical lateral program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

SMALL DIAMETER MUST BE GREATER THAN 0".

The tap diameter for the reducing conical lateral program must be greater than 0 inches. If the tap diameter entered is less than zero, the following message is displayed:

TAP DIAMETER MUST BE GREATER THEN 0".

If the small diameter is greater than or equal to the large diameter, the following message is displayed:

SMALL DIAMETER IS EQUAL TO OR GREATER THAN LARGE DIAMETER

The maximum reduction in a reducing fitting is 12 inches. If the small diameter is more than 12 inches smaller than the large diameter, the following message is displayed:

*** MAXIMUM REDUCTION IS 12 INCHES ***

After any of these messages, you return to the LATERAL PARAMETERS prompt.

The next prompt is for fitting location. The fitting location for all laterals is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify and offset by an amount you select. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix.

The lateral fitting program automatically calculates a fitting offset. The offset value allows ease of fitting placement on drawings where the centerlines for the lateral taps are not drawn. The offset calculated is the distance the lateral fitting would have to be offset from the intersection of the main duct centerline and perpendicular centerline to allow the 45° elbow to connect with the lateral and perpendicular duct runs without adding an additional duct segment between the lateral and the elbow. Lateral fittings need a 45° elbow to link up to a section of duct oriented perpendicular to the main duct run.

The calculated offset is displayed. You may accept it by entering operation complete (]) or change it by entering another offset value. A zero offset will place the fitting exactly at the reference point you specify. Entering a larger number than the calculated offset ensures that a duct segment will have to be added between the lateral and the connecting 45° elbow. The system prompts:

*** FITTING LOCATION ***

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the tap direction. The tap direction indicates the side of the duct to have the tap, the direction the lateral tap should point, and the reduced end of the lateral fitting. The response to this prompt is a screen selection in the quadrant where the lateral tap should point. The origin to determine the quadrant is the reference point you specify; the X-axis is a line running through the reference point and parallel to the fitting centerline you select. The system prompts:

```
INDICATE TAP DIRECTION (QUADRANT)
```

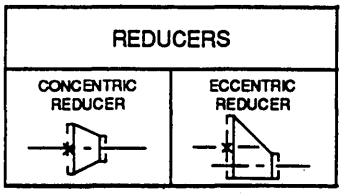
If the system cannot determine the tap direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE TAP DIRECTION prompt.

The program draws the lateral. You return to the LATERAL PARAMETERS prompt to draw more reducing conical laterals.

REDUCERS



The reducer fitting programs are located in the middle section of the HVAC2 overlay. To begin a reducer fitting program, touch the appropriate square with the tablet stylus.

CONCENTRIC REDUCER

When you begin the concentric reducer program, the system displays:

```
ENTER SIX CHARACTER NAME
REDCON
GPL
```

The first prompt in the concentric reducer program is for the reducer parameters:

```
*** CONCENTRIC REDUCER ***
REDUCER PARAMETERS
1.  LARGE DIAM. = 18.0000
2.  SMALL DIAM. = 14.0000
```

You may exit the reducer program at this prompt by entering operation reject ([).

The parameters for drawing the concentric reducer are the large diameter and the small diameter. The large diameter is the duct diameter of the large end. The small diameter is the duct diameter of the small end. The large duct diameter and small diameter entered are retained by the system and reused in reducer and in other fitting programs.

In response to this prompt, enter the large diameter and the small diameter. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The large diameter for the concentric reducer program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

The small diameter for the concentric reducer program must be greater than 0 inches. If the small diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

The large diameter of the reducer must be greater than the small diameter. If the small diameter is greater than or equal to the large diameter, the following message is displayed:

```
*** SMALL DIAMETER IS EQUAL TO OR GREATER
THAN THE LARGE DIAMETER
```

The maximum reduction in a reducing fitting is 12 inches. If the small diameter is more than 12 inches smaller than the large diameter, the following message is displayed:

```
*** MAXIMUM REDUCTION IS 12 INCHES ***
```

After any of these messages, you return to the REDUCER PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for all reducers is by reference point. The outside center of the large end of the fitting is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the reducer end. The reducer end is the small end of the fitting. The response to this prompt is a screen selection in the direction that the reduced end should point. The system prompts:

```
INDICATE REDUCED END
```

If the system cannot determine the reduced end from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE REDUCED END prompt.

The program draws the reducer. You return to the REDUCER PARAMETERS prompt to allow more concentric reducers to be drawn.

ECCENTRIC REDUCER

When you begin eccentric reducer program, the system displays:

```
ENTER SIX CHARACTER NAME
REDECC
GPL
```

The first prompt is for the eccentric reducer parameter:

```
*** ECCENTRIC REDUCER FITTING ***
ECCENTRIC REDUCER PARAMETER
LARGE DIA. = 18.0000
```

You may exit the reducer program at this prompt by entering operation reject ([).

The first parameter for drawing the eccentric reducer is the large diameter. The large diameter is the duct diameter of the large end. The large duct diameter entered is retained by the system and reused in reducer and in other fitting programs.

There are two modes of parameter entry in the eccentric reducer program. The first method is by large diameter and the fitting centerlines. This method assumes that both the large end and the small end centerlines exist on the drawing. The second method is by entering the large and small diameters and the offset side of the fitting. This method does not require the existence of both fitting centerlines.

In response to this prompt, enter the large diameter and operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The large diameter for the eccentric reducer program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

You return to the ECCENTRIC REDUCER PARAMETER prompt.

The next prompt is for the fitting location. The fitting location for all reducers is by reference point. The outside center of the large end of the fitting is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting large centerline. The fitting large centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. If the fitting centerline mode for parameter entry is being used, both centerlines must be in the proper orientation and they must be the correct distance apart. The system prompts:

```
*** FITTING LARGE CENTERLINE ***
INDICATE LARGE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the centerline of the small end of the fitting.

If the fitting centerline mode of parameter entry is being used, the response to this prompt is a selection of the centerline of the small end of the fitting.

If the fitting centerline mode is not being used, you must enter operation complete (]) or operation reject ([) in response to this prompt to switch modes. The system prompts:

```
*** FITTING SMALL CENTERLINE ***
INDICATE SMALL CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

If the fitting centerline method of parameter entry is used, the next prompt is for the fitting direction. The fitting direction is the direction that the reduced end should point. The system prompts:

```
INDICATE FITTING DIRECTION
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

The program calculates the small end diameter of the reducer based on the information entered.

The small diameter for the eccentric reducer program must be greater than 0 inches. If the small diameter calculated is less than zero, the following message is displayed:

```
*** OFFSET EXCEEDS ALLOWABLE
LARGE DIA., SMALL DIA. AND REDUCTION ARE:
1. = 16.0000
2. = -12.7298
3. = 28.7298
```

You return to the ECCENTRIC REDUCER PARAMETER prompt.

The maximum reduction in a reducing fitting is 12 inches. If the small diameter calculated is more than 12 inches smaller than the large diameter, the following message is displayed:

```
*** MAXIMUM REDUCTION IS 12 INCHES ***
LARGE DIA., SMALL DIA. AND REDUCTION ARE:
1. = 16.0000
2. =  2.0000
3. = 14.0000
```

The minimum reduction in a reducing fitting is 4 inches. If the small diameter calculated is less than 4 inches smaller than the large diameter, the following message is displayed:

```
*** MINIMUM REDUCTION IS 4 INCHES ***
```

You return to the ECCENTRIC REDUCER PARAMETER prompt.

The program draws the reducer. You return to the ECCENTRIC REDUCER PARAMETER prompt to allow more eccentric reducers to be drawn.

If large and small diameter entry mode is used, [you must have entered operation complete (]) or operation reject ([) in response to the FITTING SMALL CENTERLINE prompt to switch modes], the next prompt encountered after switching modes is the prompt for the small diameter. The system prompts:

```
SMALL DIAMETER
SMALL DIA. = 10.0000
```

In response to this prompt, enter the small diameter and operation complete (]). If the displayed parameter value is correct, only operation complete (]) is necessary. Operation reject ([) at this point returns you to the FITTING LARGE CENTERLINE prompt.

The small diameter for the eccentric reducer program must be greater than 0 inches. If the small diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

You return to the ECCENTRIC REDUCER PARAMETER prompt.

The maximum reduction in a reducing fitting is 12 inches. If the small diameter entered is more than 12 inches smaller than the large diameter, the following message is displayed:

```
*** MAXIMUM REDUCTION IS 12 INCHES ***
LARGE DIA., SMALL DIA. AND REDUCTION ARE:
1. = 16.0000
2. =  2.0000
3. = 14.0000
```

The minimum reduction in a reducing fitting is 4 inches. If the small diameter entered is less than 4 inches smaller than the large diameter, the following message is displayed:

```
*** MINIMUM REDUCTION IS 4 INCHES ***
```

You return to the ECCENTRIC REDUCER PARAMETER prompt.

The next prompt is for the eccentric direction. This is the offset direction of the eccentric reducer. In response to this prompt, make a screen selection on the side of the centerline that is to be offset. The system prompts:

```
INDICATE ECCENTRIC DIRECTION
```

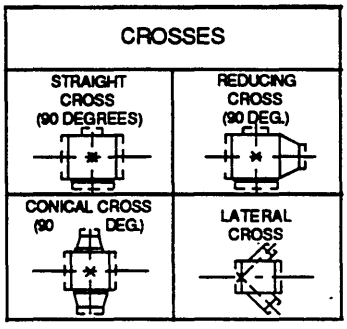
If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE ECCENTRIC DIRECTION prompt.

The program draws the reducer. You return to the ECCENTRIC REDUCER PARAMETER prompt to draw more eccentric reducers.

CROSSES



The cross fitting programs are located in the middle right section of the HVAC2 tablet overlay. To begin a cross fitting program, touch the appropriate square with the tablet stylus.

STRAIGHT CROSS (90°)

When you begin the straight cross program, the system displays:

```
ENTER SIX CHARACTER NAME
CROSS
GPL
```

The first prompt is for the cross parameters:

```
*** STRAIGHT CROSS, 90 DEGREE ***
CROSS PARAMETERS
1.  MAIN DIAM. = 18.0000
2.  TAP 1 DIA. =  8.0000
3.  TAP 2 DIA. =  6.0000
```

You may exit the cross program at this prompt by entering operation reject ([).

The parameters for drawing the straight cross are the main diameter and the two tap diameters. The main diameter is the main duct diameter of the cross. The tap diameters are the duct diameters of the taps. The main duct diameter and tap diameters entered are retained by the system and reused in cross and in other fitting programs.

In response to this prompt, enter the main diameter and the two tap diameters. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The main diameter for the straight cross program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
MAIN DIAMETER MUST BE GREATER THAN 0".
```

You return to the CROSS PARAMETERS prompt.

The tap diameters for the straight cross program must be greater than 0 inches. If one of the tap diameters entered is less than zero, the following message is displayed:

```
BOTH TAP DIAMETERS MUST BE GREATER THAN 0".
```

You return to the CROSS PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for all crosses is by reference point. The intersection point of the main centerline and the tap centerlines is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

If the taps are of different sizes, the next prompt is for the large tap side. If they are the same size, this prompt is skipped. The large tap side is the side of the cross with the large tap. The response to this prompt is a screen selection of the cross fitting side to have the large tap. The system prompts:

```
INDICATE LARGE TAP SIDE
```

If the system cannot determine the large tap side from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE LARGE TAP SIDE prompt.

The program draws the cross. You return to the CROSS PARAMETERS prompt to draw more straight crosses.

REDUCING CROSS (90°)

When you begin the reducing cross program the system displays:

```
ENTER SIX CHARACTER NAME
CRSRED
GPL
```

The first prompt in the reducing cross program is for the cross parameters:

```
*** REDUCING CROSS, 90 DEGREE ***
CROSS PARAMETERS
1.  LARGE DIAM. = 18.0000
2.  SMALL DIAM. = 14.0000
3.  TAP 1 DIA. =   8.0000
4.  TAP 2 DIA. =   6.0000
```

You may exit the cross program at this prompt by entering operation reject ([).

The parameters for drawing the reducing cross are the main diameter, small diameter, and two tap diameters. The large diameter is the main duct diameter of the cross. The small diameter is the diameter of the reduced end of the cross. The tap diameters are the duct diameters of the taps. The large diameter, small diameter, and tap diameters entered are retained by the system and reused in cross and in other fitting programs.

In response to this prompt, enter the large diameter, the small diameter, and the two tap diameters. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The large diameter for the reducing cross program must be greater than 0 inches. If the diameter entered is less then zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

The small diameter for the reducing cross program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
SMALL DIAMETER MUST BE GREATER THAN 0".
```

The tap diameters for the reducing cross program must be greater than 0 inches. If the first tap diameter entered is less than zero, the following message is displayed:

TAP 1 DIAMETER MUST BE GREATER THAN 0".

If the second tap diameter entered is less than zero, the following message is displayed:

TAP 2 DIAMETER MUST BE GREATER THAN 0".

If the small diameter is greater than or equal to the large diameter, the following message is displayed:

SMALL DIAMETER IS EQUAL TO OR GREATER THAN
LARGE DIAMETER

The maximum reduction in a reducing fitting is 12 inches. If the small diameter is more than 12 inches smaller than the large diameter, the following message is displayed:

*** MAXIMUM REDUCTION IS 12 INCHES ***

After any of these messages, you return to the CROSS PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for all crosses is by reference point. The intersection point of the main centerline and the tap centerlines is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

*** FITTING LOCATION ***

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE

Use the graphics cursor to indicate the centerline or line.

If the taps are of different sizes, the next prompt is for the large tap side of the cross. If they are the same size, this prompt is skipped. The response to this prompt is a screen selection of the cross fitting side to have the large tap. The system prompts:

INDICATE LARGE TAP SIDE

If the system cannot determine the large tap side from your selection, the following message is displayed:

RESELECT DIRECTION - ZERO LENGTH SEGMENT

You return to the INDICATE LARGE TAP SIDE prompt.

The next prompt is for the reduced end of the fitting. The response to this prompt is a screen selection of the side of the cross fitting to have the reduced end. The system prompts:

```
INDICATE REDUCED END
```

If the system cannot determine the reduced end from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE REDUCED END prompt.

The program draws the cross. You return to the CROSS PARAMETERS prompt to draw more reducing crosses.

CONICAL CROSS (90°)

When you begin the conical cross program, the system displays:

```
ENTER SIX CHARACTER NAME
CRSCON
GPL
```

The first prompt in the conical cross program is for the cross parameters:

```
*** CONICAL CROSS, 90 DEGREE ***
CROSS PARAMETERS
1.  MAIN DIAM. = 18.0000
2.  TAP 1 DIA. =  8.0000
3.  TAP 2 DIA. =  6.0000
```

You may exit the cross program at this prompt by entering operation reject ([).

The parameters for drawing the conical cross are the main diameter and the two tap diameters. The main diameter is the main duct diameter of the cross. The tap diameters are the duct diameters of the taps. The main duct diameter and the tap diameters entered are retained by the system and reused in cross and in other fitting programs.

In response to this prompt, enter the main diameter and the two tap diameters. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The main diameter for the conical cross program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
MAIN DIAMETER MUST BE GREATER THAN 0".
```

You return to the CROSS PARAMETERS prompt.

The tap diameters for the conical cross program must be greater than 0 inches. If one of the tap diameters entered is less than zero, the following message is displayed:

```
BOTH TAP DIAMETERS MUST BE GREATER THAN 0".
```

You return to the CROSS PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for all crosses is by reference point. The intersection point of the main centerline and the tap centerlines is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline or line.

If the taps are of different sizes, the next prompt is for the large tap side of the cross. If they are the same size, this prompt is skipped. The response to this prompt is a screen selection of the cross fitting side to have the large tap. The system prompts:

```
INDICATE LARGE TAP SIDE
```

If the system cannot determine the large tap side from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE LARGE TAP SIDE prompt.

The program draws the cross. You return to the CROSS PARAMETERS prompt to draw more conical crosses.

LATERAL CROSS

When you begin the lateral cross program, the system displays:

```
ENTER SIX CHARACTER NAME
CRSLAT
GPL
```

The first prompt is for the lateral cross parameters:

```
*** LATERAL CROSS ***
LATERAL CROSS PARAMETERS
1.  MAIN DIA.  = 18.0000
2.  TAP 1 DIA. =  8.0000
3.  TAP 2 DIA. =  6.0000
```

You may exit the lateral cross program at this prompt by entering operation reject ([).

The parameters for drawing the lateral cross are the main diameter and the two tap diameters. The main diameter is the main duct diameter of the cross. The tap diameters are the duct diameters of the taps. The main duct diameter and the tap diameters entered are retained by the system and reused in the lateral cross and other fitting programs.

In response to this prompt, enter the main diameter and the two tap diameters. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The main diameter for the lateral cross program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

MAIN DIAMETER MUST BE GREATER THAN 0".

You return to the LATERAL CROSS PARAMETERS prompt.

The tap diameter for the lateral cross program must be greater than 0 inches. If one of the tap diameters entered is less than zero, the following message is displayed:

BOTH TAP DIAMETERS MUST BE GREATER THAN 0".

You return to the LATERAL CROSS PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for the lateral cross is by reference point. The intersection point of the main centerline and the tap centerline is located at the reference point you specify and offset by an amount you select. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix.

The lateral cross fitting program automatically calculates a fitting offset. The offset value allows ease of fitting placement on drawings where the centerlines for the lateral cross taps are not drawn. The offset calculated is the distance the lateral cross fitting would have to be offset from the intersection of the main duct centerline and perpendicular centerline to allow the 45° elbow to connect with the lateral cross and perpendicular duct run without adding an additional duct segment between the lateral cross and the elbow.

The calculated offset is displayed. You may accept it by entering operation complete (]) or change it by entering another offset values. A zero offset will place the fitting exactly at the reference point you specify. Entering a larger number than the calculated offset ensures that a duct segment will be added between the lateral cross and the connecting 45° elbow. The system prompts:

*** FITTING LOCATION ***

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the large tap direction. The large tap direction indicates the side of the duct to have the large tap and the direction the lateral cross taps should point. The response to this prompt is a screen selection in the quadrant where the lateral cross large tap should point. The origin to determine the quadrant is the reference point you specify; the X-axis is a line running through the reference point and parallel to the fitting centerline you select. If both taps are the same diameter, the screen selection is in the direction the lateral cross taps should point. The system prompts:

INDICATE LARGE TAP DIRECTION (QUADRANT)

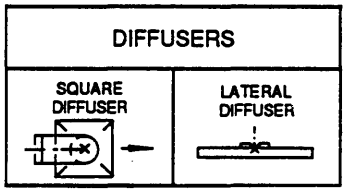
If the system cannot determine the large tap direction from your selection, the following message is displayed:

RESELECT DIRECTION - ZERO LENGTH SEGMENT

You return to the INDICATE LARGE TAP DIRECTION prompt.

The program draws the lateral cross. You return to the LATERAL CROSS PARAMETERS prompt to draw more lateral crosses.

DIFFUSERS



The diffuser fitting programs are located on the right middle portion of the HVAC2 overlay. To begin any diffuser fitting, touch the appropriate square with the tablet stylus.

SQUARE DIFFUSER

When you begin the square diffuser with downturned elbow program, the system displays:

```
ENTER SIX CHARACTER NAME
DIFSQU
GPL
```

The first prompt in the square diffuser program is for the diffuser parameters:

```
*** DOWN-TURNED ELBOW WITH SQUARE DIFFUSER ***
ELBOW DIFFUSER PARAMETERS
1.  ELBOW DIA. =  8.0000
2.  DIF SIZE   = 24.0000
3.  RADIUS FTR =  1.5000
```

You may exit the diffuser program at this prompt by entering operation reject ([).

The parameters for drawing a square diffuser are the elbow diameter, the diffuser size and the elbow radius factor. The elbow diameter is the duct diameter of the elbow. The diffuser size is the size of the diffuser. The radius factor is the multiple of the elbow diameter which defines the radius of the centerline of the elbow. A radius factor of 1.5 means that the radius of the diffuser centerline is 1.5 times the diameter of the diffuser. The default value for the radius factor is 1.5. The radius factor is needed to determine the length of the protruding portion of the elbow. The elbow duct diameter and diffuser size entered will be retained by the system and reused in diffuser and in other fitting programs.

In response to this prompt, enter the duct diameter and, if necessary, the diffuser size and radius factor. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The elbow diameter for the square diffuser program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
ELBOW DIAMETER MUST BE GREATER THAN 0".
```

The diffuser size for the square diffuser program must be greater than 0 inches. If the size entered is less than zero, the following message is displayed:

```
DIFFUSER SIZE MUST BE GREATER THAN 0".
```

If the radius factor entered is less than 1, the following message is displayed:

```
RADIUS FACTOR MUST BE >= 1.
```

After any of these messages, you return to the ELBOW DIFFUSER PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for the square diffuser is by reference point. The center of the circle representing the downturned portion of the diffuser is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the fitting direction. The fitting direction for the square diffuser is the direction away from the downturned portion of the elbow. The response to this prompt is a screen selection in the direction along the centerline where you want the fitting to be located. The system prompts:

```
INDICATE FITTING DIRECTION
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

The program draws the diffuser. You return to the ELBOW DIFFUSER PARAMETERS prompt to draw more square diffusers.

LATERAL DIFFUSER

When you begin the lateral diffuser program, the system displays:

```
ENTER SIX CHARACTER NAME
DIFLAT
GPL
```

The first prompt in the lateral diffuser program is for the diffuser parameters:

```
*** LATERAL DIFFUSER ***
LATERAL DIFFUSER PARAMETERS
1.  NECK DIA. = 8.0000
2.  DIF. DIA. = 24.0000
3.  DIF. LEN. =  4.0000
```

You may exit the diffuser program at this prompt by entering operation reject ([).

The parameters for drawing a lateral diffuser are the neck diameter, the diffuser width and the diffuser length. The neck diameter is the duct diameter of the duct to the diffuser. The diffuser width is the lateral dimension of the diffuser. The diffuser length is the short dimension of the diffuser. The neck diameter, diffuser width, and diffuser length entered will be retained by the system and reused in diffuser and in other fitting programs.

In response to this prompt, enter the neck diameter and, if necessary, the diffuser width and length. Enter operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The neck diameter for the lateral diffuser program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

The diffuser width for the lateral diffuser program must be greater than 0 inches. If the width entered is less than zero, the following message is displayed:

```
WIDTH MUST BE GREATER THAN 0".
```

If the diffuser length entered is less than 0 inches, the following message is displayed:

```
LENGTH MUST BE GREATER THAN 0".
```

After any of these messages, you return to the LATERAL DIFFUSER PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for the lateral diffuser is by reference point. The point in the center on the diffuser side of the neck is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The fitting centerline runs through the center of the fitting neck. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the fitting direction which, for the lateral diffuser, is the direction from the neck to the diffuser. The response to this prompt is a screen selection in the fitting direction. The system prompts:

INDICATE FITTING DIRECTION

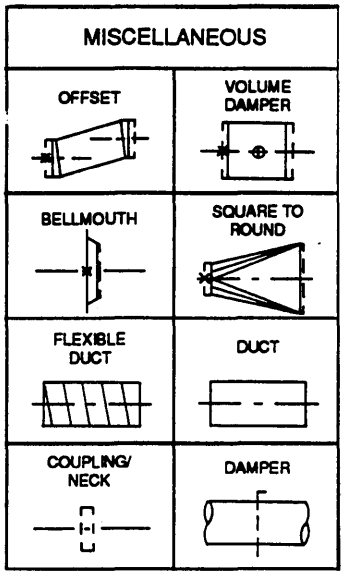
If the system cannot determine the fitting direction from y r selection, the following message is displayed:

RESELECT DIRECTION - ZERO LENGTH SEGMENT

You return to the INDICATE FITTING DIRECTION prompt.

The program draws the diffuser. You return to the LATERAL DIFFUSER PARAMETERS prompt to draw more lateral diffusers.

MISCELLANEOUS



The miscellaneous fitting programs are located on the right section of the HVAC2 tablet overlay. To begin a miscellaneous fitting program, touch the appropriate square with the tablet stylus.

OFFSET

When you begin the offset program, the system displays:

```
ENTER SIX CHARACTER NAME
OFFSET
GPL
```

The first prompt in the offset program is for the offset diameter:

```
*** OFFSET FITTING **
OFFSET DIAMETER
MAIN DIA. = 18.0000
```

You may exit the offset program at this prompt by entering operation reject ([).

The first parameter for drawing an offset fitting is the duct diameter of the offset. The duct diameter entered is retained by the system and reused in offset and in other fitting programs.

In response to this prompt, enter the duct diameter and enter operation complete (]). If the displayed parameter value is correct, only operation complete (]) is necessary.

The duct diameter for the offset program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the OFFSET DIAMETER prompt.

The next prompt is for the offset length. The offset fitting program calculates the offset length to be two times the offset diameter and displays this value in a parameter statement. You may accept it with operation complete (]) or change it by entering a new value. The system prompts:

```
OFFSET LENGTH
LENGTH = 36.0000
```

In response to this prompt, enter the duct diameter and operation complete (]). If the displayed parameter value is correct, only operation complete (]) is necessary.

The length of the offset fitting must be greater than 0 inches. If the length entered is less than zero, the following message is displayed:

```
LENGTH MUST BE GREATER THAN 0".
```

You return to the OFFSET DIAMETER prompt.

The next prompt is for the fitting location. The fitting location for the offset fitting is by reference point. The outside center of one end of the fitting is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting first centerline. The fitting centerlines determine the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. Both centerlines must be in the proper orientation and they must be the correct distance apart if they are not the actual offset fitting centerlines. The system prompts:

```
*** FITTING FIRST CENTERLINE ***
INDICATE FIRST CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the first centerline and line.

The next prompt is for the fitting second centerline. The system prompts:

```
INDICATE SECOND CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the second centerline and line.

The next prompt is for the fitting direction (the direction the fitting should point). The response to this prompt is a screen selection in that direction. The system prompts:

```
INDICATE FITTING DIRECTION
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

If the offset is more than three-quarters (75 percent) of the main diameter, the following message is displayed:

```
OFFSET EXCEEDS 3/4 MAIN DIAMETER
1.  = 13.5000
2.  = 14.0000
PLEASE USE FABRICATED ELBOWS
AND A LENGTH OF DUCT
```

The first number displayed is three-quarters (75 percent) of the main diameter and the second number is the offset distance between the two centerlines.

You return to the OFFSET DIAMETER prompt.

The program draws the offset. You return to the OFFSET DIAMETER prompt to draw more offsets.

VOLUME DAMPER

When you begin the volume damper program, the system displays:

```
ENTER SIX CHARACTER NAME
VOLDMP
GPL
```

The first prompt is for the volume damper diameter:

```
*** VOLUME DAMPER **
VOLUME DAMPER DIAMETER
MAIN DIA. = 18.0000
```

You may exit the volume damper program at this prompt by entering operation reject ([).

The only parameter for drawing a volume damper is the large diameter. The large diameter is the duct diameter of the volume damper. The duct diameter entered is retained by the system and reused in this and in other fitting programs.

In response to this prompt, enter the duct diameter and operation complete (]). If the displayed parameter value is correct, only operation complete (]) is necessary.

The duct diameter for the volume damper program must be greater then 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
LARGE DIAMETER MUST BE GREATER THAN 0".
```

You return to the VOLUME DAMPER DIAMETER prompt.

The next prompt is for the fitting location. The fitting location for the volume damper is by reference point. The outside center of the large end of the fitting is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting, but not the location. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the fitting direction, which is the direction the fitting is to point. The response to this prompt is a screen selection in that direction. The system prompts:

```
INDICATE FITTING DIRECTION
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

The program draws the volume damper. You return to the VOLUME DAMPER DIAMETER prompt to draw more volume dampers.

BELLMOUTH

When you begin the bellmouth program, the system displays:

```
ENTER SIX CHARACTER NAME
BELMTH
GPL
```

The first prompt in the bellmouth program is for the bellmouth diameter:

```
*** BELLMOUTH FITTING **
BELLMOUTH FITTING DIAMETER
MAIN DIA. = 18.0000
```

You may exit the bellmouth program at this prompt by entering operation reject ([).

The only parameter for drawing a bellmouth is the main diameter. The main diameter is the duct diameter of the bellmouth outlet duct. The duct diameter you enter is retained by the system and reused in this and in other fitting programs.

In response to this prompt, enter the duct diameter and operation complete (]). If the displayed parameter value is correct, only operation complete (]) is necessary.

The duct diameter for the bellmouth program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the BELLMOUTH FITTING DIAMETER prompt.

The next prompt is for the fitting location. The fitting location for the bellmouth is by reference point. The center of the large end of the fitting is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the fitting direction, (the direction the fitting is to point). The response to this prompt is a screen selection in that direction. The system prompts:

```
INDICATE FITTING DIRECTION
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

The program draws the bellmouth. You return to the BELLMOUTH FITTING DIAMETER prompt to draw more bellmouths.

SQUARE TO ROUND

When you begin the square to round fitting program, the system displays:

```
ENTER SIX CHARACTER NAME
SQRRND
GPL
```

The first prompt in the square to round fitting program is for the square to round parameters:

```
*** SQUARE TO ROUND ***
FITTING PARAMETERS
1.  ROUND DIA. = 18.0000
2.  SQR. WIDTH = 24.0000
```

You may exit the square to round fitting program at this prompt by entering operation reject ([).

The parameters for a square to round fitting are the round diameter, the square width, and the fitting length. The round diameter is the round duct diameter of the square to round fitting. The square width is the width of the rectangular duct. The fitting length is the length of the fitting and is prompted for after the round diameter and square width are known. The round diameter and square width you enter are retained by the system and reused in this and in other fitting programs.

In response to this prompt, enter the round diameter and the square width. Enter operation complete (]). If the displayed parameter value is correct, only operation complete (]) is necessary.

The round diameter for the square to round fitting must be greater than 0 inches. If the diameter you enter is less than zero, the following message is displayed:

ROUND DIAMETER MUST BE GREATER THAN 0".

You return to the SQUARE TO ROUND FITTING PARAMETERS prompt.

The square width for the square to round fitting must be greater than 0 inches. If the width you enter is less than zero, the following message is displayed:

SQUARE WIDTH MUST BE GREATER THAN 0".

You return to the SQUARE TO ROUND FITTING PARAMETERS prompt.

The next prompt is for the fitting length. The square to round fitting program calculates the fitting length necessary to have a 15° flare-out from the round to the square fitting. This value is displayed. You may accept it with operation complete (]) or change it to another value. The system prompts:

FITTING LENGTH
LENGTH = 11.1962

The fitting length for the square to round fitting must be greater than 0 inches. If the length entered is less than zero, the following message is displayed:

FITTING LENGTH MUST BE GREATER THAN 0".

You return to the SQUARE TO ROUND FITTING PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for the square to round fitting is by reference point. The outside center of the round end of the fitting is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the square direction (the direction the square part of the fitting should point). The response to this prompt is a screen selection in that direction. The system prompts:

```
INDICATE SQUARE DIRECTION
```

If the system cannot determine the square direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE SQUARE DIRECTION prompt.

The program draws the square to round fitting. You return to the SQUARE TO ROUND FITTING PARAMETER prompt to draw more square to round fittings.

FLEXIBLE DUCT

When you begin the flexible duct program, the system displays:

```
ENTER SIX CHARACTER NAME
FLDUCT
GPL
```

The first prompt in the flexible duct program is for the first fitting end. There are no parameters for the flexible duct program. The flexible duct program is used after the flexible elbows and other fittings have been added to the drawing to connect the fittings with flexible duct. Therefore the prompts are the ends of the fittings to be connected. The entities selected should be the lines representing the ends of the fitting. You may use either the dashed lines or the solid lines. The system prompts:

```
*** FLEXIBLE DUCT ***
*** FIRST FITTING END ***
INDICATE FIRST FITTING END
```

You may exit the flexible duct program at this prompt by entering operation reject ([).

Indicate the first fitting end, using the graphics cursor. The system prompts:

```
*** SECOND FITTING END ***
INDICATE SECOND FITTING END
```

Indicate the second fitting end, using the graphics cursor.

If the two fitting ends are of equal diameter, they are joined by flexible duct representation. The program returns you to the prompt for the first fitting end.

If the fitting ends are not of equal length, the following message is displayed:

```
*** FITTINGS NOT EQUAL DIAMETER ***
```

You return to the FIRST FITTING END prompt.

This program will detect unequal lengths, but not incorrect orientations. If the fitting ends are not parallel or if they are parallel but not aligned, they still connect in some way with flexible duct representation. It is your responsibility to ensure that the fitting ends are parallel and aligned correctly.

DUCT

When you begin the duct program, the system displays:

```
ENTER SIX CHARACTER NAME
DUCT
GPL
```

The first prompt in the duct program is for the first fitting end. There are no parameters for the duct program. The duct program is used after the fittings have been added to the drawing to connect the fittings with the duct. Therefore, the prompts are for the ends of the fittings to be connected. The entities selected should be the lines representing the ends of the fittings. You may use either the dashed lines or the solid lines. The system prompts:

```
*** DUCT ***
*** FIRST FITTING END ***
INDICATE FIRST FITTING END
```

You may exit the duct program at this prompt by entering operation reject ([).

Indicate the first fitting end using the graphics cursor. The system prompts:

```
*** SECOND FITTING END ***
INDICATE SECOND FITTING END
```

Indicate the second fitting end, using the graphics cursor.

If the two fitting ends are of equal diameter, they are joined by duct representation. The program returns you to the INDICATE FIRST FITTING END prompt.

If the fitting ends are not of equal length, the following message is displayed:

```
*** FITTINGS NOT EQUAL DIAMETER ***
```

You return to the INDICATE FIRST FITTING END prompt.

This program will detect unequal lengths, but not incorrect orientations. If the fitting ends are not parallel or if they are parallel but not aligned, they still connect in some way with duct representation. It is your responsibility to ensure that the fitting ends are parallel and aligned correctly.

COUPLING/NECK

The coupling/neck program is used to draw couplings or necks on the drawing. If you want to draw duct to a VAV box, you must put a neck at the appropriate location on the VAV box. When you begin the coupling/neck program, the system displays:

```
ENTER SIX CHARACTER NAME
CPLING
GPL
```

The first prompt in the coupling/neck program is for the coupling/neck parameters:

```
*** COUPLING/NECK ***
COUPLING/NECK PARAMETERS
1.  DIAMETER = 18.0000
2.  LENGTH   =  2.0000
```

You may exit the coupling/neck program at this prompt by entering operation reject ([).

The parameters for drawing a coupling/neck are the diameter and the length. The diameter is the duct diameter of the coupling/neck. The length is the length of the coupling/neck. The diameter and length you enter are retained by the system and used in other fitting programs.

In response to this prompt, enter the duct diameter and operation complete (]). If the displayed parameter values are correct, only operation complete (]) is necessary.

The diameter for the coupling/neck program must be greater than 0 inches. If the diameter entered is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the COUPLING/NECK PARAMETERS prompt.

The length for the coupling/neck program must be greater than 0 inches. If the length entered is less than zero, the following message is displayed:

```
LENGTH MUST BE GREATER THAN 0".
```

You return to the COUPLING/NECK PARAMETERS prompt.

The next prompt is for the fitting location. The fitting location for the coupling/neck is by reference point. The center of one end of the fitting is located at the reference point you specify. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** FITTING LOCATION ***
```

The next prompt is for the fitting centerline. The fitting centerline determines the orientation of the fitting. You may use the fitting centerline or any line on the drawing which has the proper orientation. The system prompts:

```
*** FITTING CENTERLINE ***
INDICATE CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the fitting direction (the direction the fitting is to go). The response to this prompt is a screen selection in that direction. The system prompts:

```
INDICATE FITTING DIRECTION
```

If the system cannot determine the fitting direction from your selection, the following message is displayed:

```
RESELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE FITTING DIRECTION prompt.

The program draws the coupling/neck. You return to the COUPLING/NECK PARAMETERS prompt to draw more coupling/necks.

DAMPER

When you begin the manual damper program, the system displays:

```
ENTER SIX CHARACTER NAME
DAMPER
GPL
```

The first prompt is for the manual damper location:

```
*** MANUAL DAMPER ***
*** MANUAL DAMPER LOCATION ***
```

You may exit the manual damper program at this prompt by entering operation reject ([).

The first prompt is for the damper location. The damper location for the manual damper is by reference point and by centerline. The reference point you specify is projected onto the centerline or duct outline you select, so the reference point you select becomes the location on the duct or centerline where you want the manual damper drawn. Screen position will work adequately in most cases for this. For a description of the possible reference point prompts, see the Reference Point Definition section at the beginning of this appendix. The system prompts:

```
*** DAMPER LOCATION ***
```

The next prompt is for the damper first or centerline. There are two modes for drawing a manual damper. The first uses the fitting centerline and draws a manual damper across it. The second uses the duct outline. In the first mode, you select the fitting centerline and enter the duct diameter. In the second you select the two lines representing the duct.

The damper first or centerline determines the orientation of the damper. The damper will either be drawn centered on the centerline or extending over both duct outlines. The system prompts:

```
*** DAMPER FIRST OR CENTERLINE ***
INDICATE FIRST OR CENTERLINE
INDICATE LINE
```

Use the graphics cursor to indicate the centerline and line.

The next prompt is for the handle direction. The handle direction indicates which end of the damper is to have the handle and which direction the handle is to point. The response to this prompt is a screen selection in the quadrant that the handle should point. The system prompts:

```
INDICATE HANDLE DIRECTION (QUADRANT)
```

If the system cannot determine the handle direction from your selection, the following message is displayed:

```
SELECT DIRECTION - ZERO LENGTH SEGMENT
```

You return to the INDICATE HANDLE DIRECTION prompt.

The next prompt is for the second line of the duct outline. The system prompts:

```
USE [ OR ] TO USE PARAMETER ENTRY MODE
INDICATE SECOND LINE
```

At this point, select the second line of the duct outline, enter operation complete (]), or enter operation reject ([).

Duct Outline Mode

If you select the second duct line, the program calculates the distance between the lines and uses the distance for the damper diameter. The diameter calculated is retained by the system and used in other fitting programs.

If the lines selected as the duct outline intersect, the following message is displayed:

```
LINES INTERSECT. . .
```

You return to the INDICATE HANDLE DIRECTION prompt.

If the calculated diameter is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the INDICATE HANDLE DIRECTION prompt.

The program draws the manual damper. You return to the manual damper location prompt to draw more manual dampers.

Duct Diameter Mode

If you enter operation complete (]) or operation reject ([) in response to the second line prompt, the system prompts you to enter the duct diameter. This diameter determines the length of the manual damper. The system prompts:

```
MANUAL DAMPER DIAMETER
DIAMETER = 18.0000
```

The entered diameter is retained by the system and used in other fitting programs.

The damper diameter for the manual damper program must be greater than 0 inches. If the diameter you enter is less than zero, the following message is displayed:

```
DIAMETER MUST BE GREATER THAN 0".
```

You return to the MANUAL DAMPER DIAMETER prompt.

The program draws the manual damper. You return to the MANUAL DAMPER LOCATION prompt to draw more manual dampers.

FILES RELATED TO THE HVAC TABLET OVERLAYS

The following are lists of files related to the HVAC tablet overlays.

CROSS PROGRAMS:

CROSS	-	STRAIGHT 90° CROSS
CRSCON	-	CONICAL 90° CROSS
CRSLAT	-	LATERAL CROSS
CRSRED	-	90° REDUCING CROSS

DIFFUSER PROGRAMS:

DIFLAT	-	LATERAL DIFFUSER
DIFSQU	-	SQUARE DIFFUSER

ELBOW PROGRAMS:

ELBDST	-	DIE-STAMPED 45° OR 90° ELBOW
ELBPLT	-	PLEATED 45°, 60°, OR 90° ELBOW
ELBFAB	-	FABRICATED 0°-90° ELBOW
ELBMIT	-	MITERED 90° ELBOW
ELBUP	-	UPTURNED ELBOW
ELBDWN	-	DOWNTURNED ELBOW
ELBTAP	-	HEEL-TAPPED 90° ELBOW
FLELBO	-	FLEXIBLE ELBOW

TEE PROGRAMS:

TEE	-	STRAIGHT 90° TEE
TEERED	-	REDUCING 90° TEE
TEECON	-	CONICAL 90° TEE
TCONRD	-	REDUCING 90° CONICAL TEE
TEEBUL	-	BULLHEAD TEE
TBULRD	-	REDUCING BULLHEAD TEE

LATERAL PROGRAMS:

LATERL	-	STRAIGHT LATERAL
LATRED	-	REDUCING LATERAL
LATCON	-	CONICAL LATERAL
LCONRD	-	REDUCING CONICAL LATERAL

Y-BRANCH PROGRAMS:

YBRNCH	-	90° Y-BRANCH
YBRRED	-	REDUCING 90° Y-BRANCH

REDUCER PROGRAMS:

REDCON	-	CONCENTRIC REDUCER
REDECC	-	ECCENTRIC REDUCER

MISCELLANEOUS PROGRAMS:

OFFSET	-	OFFSET
VOLDMP	-	VOLUME DAMPER
BELMTH	-	BELLMOUTH
SQRRND	-	SQUARE-TO-ROUND
FLDUCT	-	FLEXIBLE DUCT
DUCT	-	DUCT
CPLING	-	COUPLING/NECK
DAMPER	-	MANUAL DAMPER

SINGLE LINE PROGRAMS:

HMODAL	-	HVAC MODAL PROGRAM
HINIT	-	HVAC VARIABLE INITIALIZATION PROCEDURE
HTRUNK	-	TRUNK SEGMENT PROGRAM
HRUNOU	-	RUNOUT SEGMENT PROGRAM
HVAVB	-	VARIABLE AIR VOLUME BOX PROGRAM
HDIFFU	-	LATERAL DIFFUSER SINGLE LINE PROGRAM
HRTSEG	-	REPLACE TRUNK SEGMENT PROGRAM
HDECTN	-	DECREMENT TRUNK COUNTER PROGRAM
HRESET	-	RESETS SOME DDN MODALS AT END OF SINGLE LINE PROGRAMS
TOFLEX	-	CHANGES SINGLE LINE TO FLEXIBLE REPRESENTATION

GPL PROCEDURES:

PROCGPL	-	NUMEROUS UTILITY GPL PROCEDURES

TABLET FILES:

HMSTR	-	MSTRING FILE
HTFILE	-	TFILE
HVACTAB	-	TABLET GRAPHICS

GPL LIBRARY:

HVACLIB	-	GPL LIBRARY

PROCEDURE FILES TO EXECUTE HVAC MODULE:

721	-	FOR 721 TERMINAL

PROCEDURE FILES:

PROCFIL	-	CONTAINS PROCEDURE B TO COMPILE GPL PROGRAMS
GPLC	-	COMPILES GPL PROGRAMS - CALLED BY B
GPLN	-	ADDS COMPILED GPL PROGRAM TO GPL LIBRARY
HVGPLC	-	COMPILES ALL HVAC GPL PROGRAMS

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