Y-12

OAK RIDGE Y-12 PLANT

MARTIN MARIETTA

CAD DATA EXCHANGE
WITH
MARTIN MARIETTA
ENERGY SYSTEMS, INC.,
OAK RIDGE, TN

RECEIVED

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OSTI

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Computer Aided Engineering
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MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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INTRODUCTION

This document has been developed to provide guidance in the interchange of electronic CAD data with Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee. It is not meant to be as comprehensive as the existing standards and specifications, but to provide a minimum set of practices that will enhance the success of the CAD data exchange.

It is now a Department of Energy (DOE) Oak Ridge Field Office requirement that Architect-Engineering (A-E) firms prepare all new drawings using a Computer Aided Design (CAD) system that is compatible with the Facility Manager's (FM) CAD system. For Oak Ridge facilities, the CAD system used for facility design by the FM, Martin Marietta Energy Systems, Inc, is Intergraph. The format for interchange of CAD data for Oak Ridge facilities will be the Intergraph MicroStation/IGDS format.

As more experience is gained in the area of CAD data exchange, this document will be revised to reflect that experience.

1.0 COMPUTER AIDED DESIGN DELIVERABLES

At project completion, all new design drawings shall be provided in Intergraph Microstation format as well as in hard copy (reproducible). These deliverables shall be in accordance with this document and the Department of Energy (DOE) Project Management Procedure number PMP-6-07 revision 4.

1.1 A. Validation of A-E Submitted Data

If the design work is done by an A-E who uses a CAD system other than Intergraph Microstation and the applications listed in this document, a validation of the A-E's Computer Sensible Format (CSF) data translation to the Intergraph MicroStation format must occur as early as practical in the project. A set of test files, along with hard copy plots, representing typical design discipline drawings (less than ten) shall be prepared by the A-E using their CAD system. The A-E shall translate the files and submit them to Energy Systems for the purpose of validating the translation results. Energy Systems will provide the A-E a report documenting the deficiencies and/or acceptability of the test results of the submitted files.

The A-E shall submit a set of representative project drawings in Intergraph MicroStation format to Energy Systems at the 30% design review. The A-E shall submit the CAD test files to Energy Systems for the purpose of validating the interchange results. These test files are to be submitted by A-Es who use the Intergraph CAD system as well as by A-Es who use a CAD system other than Intergraph and translate the files to the Intergraph MicroStation format. Energy Systems will provide the A-E a report documenting the deficiencies and/or acceptability of the test results of the submitted files.

Upon completion of a project, the A-E shall provide all drawing files in the Intergraph MicroStation format. These files shall be the same as the final hard copy issue.

2.0 DATA EXCHANGE MEDIA

Computer Aided Design (CAD) files shall be transmitted to the FM in Intergraph Microstation format. The A-E should provide documentation of the version of Intergraph Microstation and any additional design applications used (as listed in Section 10.0).

2.0 (cont)

With each drawing file transmitted, all background data or reference files, used on the drawing must be included and labeled as to their location on the medium. Also, a name and telephone number of a person to contact in case of problems should be included.

The preferred media is UNIX format 8mm cassette tape, 3 1/2" DOS or UNIX formatted diskettes or removable * Bernoulli hard disk. A list or index of the tape shall contain the sequential number, name and size of each file and shall contain no more than 50 drawing files. Listed below are the requirements for tape and diskette media. Note, the 8mm cassette media for DOS format is not currently supported by the Facility Manager.

8mm CASSETTE TAPE FORMAT	
Format Specification	Value (tar or scpio)
Data Type	Microstation/IGDS
Size	2.3 GB

Data Required on a Cassette Label:

- Formatted cassette size
- Cassette Label (if any)
- Date of Cassette creation
- Person and phone number of contact for questions
- List of files on cassette and/or a directory
- Software name, version and release level

The preferred media for the PC format is 3 1/2" DOS formatted diskettes or 150MB Bernoulli removable hard disk. Diskettes may be used for either DOS or UNIX formats. DOS floppy disks shall be IBM PC compatible and shall be formatted to 1.44MB, high density, 3.5" diskettes. Diskettes may be used for either DOS or UNIX formats. This information shall be included on the diskette label.

FLOPPY DISK LABEL REQUIREMENTS

Software name, version, and release level

Data Required on a Disk Label:

- Formatted disk size
- Disk Label (if any)
- Date of disk creation
- Person and phone number of contact for questions
- List of files on disk and/or a directory
- Format of data
- Compressed or not compressed

The * Bernoulli removable hard drive (150MB) is the preferred media for large number of files in the DOS format. DOS formatted files may be compressed using ** PKZIP shareware.

* Bernoulli is a registered trademark of IOMEGA Corporation.

** PKZIP is copyright of PKWARE, INC

3.0 DIMENSIONAL VS NON-DIMENSIONAL DRAWINGS

In the major engineering disciplines throughout industry, there are common practices that require certain types of models and drawings to be dimensional, i.e., to scale within a given accuracy while other types may be non-dimensional or not to scale. Guidance is provided in the following table for determining when CAD models and drawings are to be dimensional.

ENGINEERING DISCIPLINE	NON-DIMENSIONAL	DIMENSIONAL
Instrument & Electrical	<ol style="list-style-type: none">1. Schematics2. Wiring Diagrams3. One-line Diagrams4. Instrument Flow Diagrams	<ol style="list-style-type: none">1. Plan Views2. Panel & Equipment Layouts3. Equipment Layout Elevations
Mechanical	<ol style="list-style-type: none">1. Process Diagrams2. Flow Diagrams	<ol style="list-style-type: none">1. All others
Civil and Site	<ol style="list-style-type: none">1. None2. All Maps	<ol style="list-style-type: none">1. Site Plans2. All Civil work
Structural & Architectural	<ol style="list-style-type: none">1. Section Blowups Details, etc.	<ol style="list-style-type: none">1. Floor Plans2. Cross Sections3. Structural Plans4. All others
Piping	<ol style="list-style-type: none">1. Flow sheets2. Isometrics (2D only)3. Bill of Material4. Spool	<ol style="list-style-type: none">1. Equipment Layouts2. Piping Details3. Isometrics (3D)4. All others
HVAC	<ol style="list-style-type: none">1. Flow diagrams2. Schematics3. Tables	<ol style="list-style-type: none">1. HVAC Plan2. Sections3. Details
Process	<ol style="list-style-type: none">1. Process & Instrument Diagrams2. Process Flow Diagrams	<ol style="list-style-type: none">1. Equipment Layouts2. Equipment Assembly

Drawing scale for plan view drawings should be selected for readability. Typical minimum scale for installation drawings is $1/4" = 1'$. An acceptable scale for site plans is $1" = 20'$ with key maps at a scale of $1" = 200'$. The scale of related details and sections is identified in the subtitle to the detail or section view. The drawing scales stated above represent the actual physical size for the hardcopy plots.

4.0 BASIC DESIGN FILE ORGANIZATION

MicroStation geometric data begins with a copy of a standard seed file. Seed file settings and geometry shall conform to the standards established in this document. Seed files contain such information as working unit definition, initial settings, and the specified drawing size's referenced border file. These settings are described in Appendix A of this document.

A MicroStation design file may reference other files. Geometry within the reference file is not stored in the file but appears as background information to the design file data. Reference file geometry can be copied to the design file or can be used to position geometry within the design file's coordinate system. Standard seed files are available from Energy Systems in various drawing sizes (E, D, etc.) and have the appropriate border file attached as a reference file.

Geometry from specific levels or all levels of another design file may be referenced and made visible within a view of the current design file and need not be contained in the current design file itself. The title block and drawing format border for drawings are visible due to the referencing of a border file.

Seed files also contain user data assigned to text elements in the title block for ease of extraction to a tabular data base. An MDL program, TBEDIT, is provided by the FM to assist in the initial placement and validation of title block data. Since manual editing of the text elements often corrupt the design file, use of the MDL title block edit program, TBEDIT, is mandatory. This program will execute by keying in the command `*ed ti*` at the MicroStation prompt.

Geometric entities may be further subdivided into any 1 of 63 available levels. Levels are primarily used to determine whether the set of entities contained in a level should be visible or not. Users place basic geometric elements (lines, circles, arcs, text notes, splines, etc.) into these levels. Levels 1 through 10 are common to most disciplines, see Appendix B, Table 7. Levels 50 through 55 are reserved for the Facility Manager's (FM) data management requirements and are not used for other purposes.

Cells which are common symbols used in many different design files may also be placed in the file. These are stored in central libraries accessible by all users. Since only a few key strokes are required to retrieve the cells, substantial productivity increases can be achieved by their use. When duplicated over a single design file, storage space is reduced due to the single definition of the geometry. Symbols in use by FM are taken from ISA, IEEE, and ANSI Y14.6-14.36 and Y32.9-32.10, drafting standards. All symbols used shall be in accordance with the applicable standards. A copy of standard cell libraries used by Energy Systems may be requested.

5.0 TYPES OF DESIGN FILES

5.1 Basic MicroStation Design Files

A basic MicroStation design file contains all the information used to create drawing(s) for a specific job for installation of equipment, construction, or to define the as-built state of an entity. These files are stored in the A-E's user/project areas until completion and then moved by the FM to the Engineering Document Control System (EDCS) for permanent archiving.

5.2 Master Files

Master files are MicroStation design files which provide the latest available CAD floor plans and major service or utility systems at a site or facility which may be used as beginning or referenced geometry for new drawings. Different facility systems (sewers; roads; building footprints; security fences; floor plans; steam; water; electrical; heating, ventilation, and air conditioning; etc.) are depicted on a specified level.

6.0 DESIGN FILE IDENTIFICATION

Intergraph uses the standard directory/file structure of the computer platform running MicroStation for storage of MicroStation design file data. Thus MicroStation on the workstation uses the UNIX file structures and MicrostationPC uses the DOS file structure. Currently, the UNIX file name consists of 14 characters, and the DOS name consists of an eight-character file name with a period separating a three-character file extension. A-Es may name the design files to meet their internal naming convention standards. A-E's shall provide a listing of the electronic file name, drawing number and reference files associated with each drawing.

6.1 Basic MicroStation Design Files

A-E's are encouraged to use their internal standards to avoid duplications of file names. A list of valid drawing numbers will be provided to the A-E by the FM's Project Manager.

6.2 Other File Names

Cell libraries will consist of a three-to eight-character file name and an extension of ".cel" which are separated by a period in both the UNIX and DOS environment (eg., doors.cel). Symbols in use by Martin Marietta Energy Systems Central Engineering Services are taken from ISA, IEEE, and ANSI Y14.6-14.36 and Y32.9-32.10, drafting standards. A copy of standard cell libraries used by FM may be requested.

Seed files will consist of a three-to eight-character file name and an extension of ".sed" which are separated by a period in both the UNIX and DOS environment (eg., smmes2de.sed).

Border files will consist of a three-to eight-character file name and an extension of ".bdr" which are separated by a period in both the UNIX and DOS environment (eg., saec2de.bdr). The Border File should be given the project name, example 920104, named 920104.BDR.

7.0 MICROSTATION DESIGN FILE STANDARDS

7.1 Seed, Border, and Reference Files

Figure 1, Typical Drawing Structure, graphically describes the organization of the typical MicroStation design file. There are basically three separate file types used to create a construction drawing. First, the seed file is copied into the design file upon creation and sets up initial design option parameters, establishes title block user data fields, and identifies the referenced border file. Second, the border file contains the drawing outline which is constant and common to all drawings. The border file is attached to the seed file as a reference file. Third, other design/data files or master files may be referenced by the user as background information to the design file.

Standard master seed and border files provided by FM simplifies the development of drawings by providing initial settings which meet this standard. Standard 2d and 3d seed and border files are provided for B, C, D, and E size drawings for both Architectural-Engineering (A-E) and Energy Systems formats. Master seed file settings are defined in Appendix A of this document. Unless specified otherwise by the FM Project Manager, all design files shall use seedfiles and border files as defined in Appendix B of this document.

A-E seed files contain areas for the A-E's logo, name, and contract number. Each A-E must edit these to their company's specific identification.

All new files must be created using the latest version of the seed files. Revisions to existing files need not be started on the current seed file but will usually be based on the previous versions file.

7.2 Reference Files

Reference files may be attached to the design file as background information for producing plots. The A-E may use their internal standards for assigning Logical Names for Reference File attachments. Also, the description field of the reference file panel shall include a brief explanation of the attached reference file plus any information pertaining to the manipulation of the reference file. Used consistently and with planning, reference files can save substantial development time.

Figure 1. Typical drawing structure.

7.3 Working Units

To ensure easy sharing of data between design files, standard working units within MicroStation design files are required. All master seed files are set to English dimension working units. At this time, unless otherwise specified by the contract, files shall be to English units.

For design files using English dimensions, working units are MU: 1FT, SU: 12 IN, PU: 2032/IN.

For design files using metric dimensions, set the working units to MU: 1M, SU: 100 CM, PU: 800/CM.

For mapping and civil/site applications that are greater than 33 miles in distance, the working units shall be set to MU: 1FT, SU: 12 IN, PU in increments of 1016, 508, 254, etc.

7.4 Scaling

All designs should be completed at full/actual size. Several scaling methods are available to correctly set the design data within the drawing border and at the proper scale. However, the user should not change the working units to scale drawing.

Table 1 defines common drawing scales with the associated border scaling and plotting factors.

7.5 Character Size and Spacing

Minimum text character height (excluding title block text) shall be .125 in. of the plotted scale with spacing between lines to be one-half of the character size used.

7.6 Font Styles

The MicroStation supplied Monospaced Font Number 3 shall be normally used. Other fonts and styles may be used for special characters, if they are Intergraph MicroStation supplied.

7.7 Leader Line Arrowheads

The length to width leader line arrowheads shall be 2:1 with the width two times that of the height. A single style of arrowheads shall be used throughout a drawing or set of drawings. The open end arrowhead is the preferred setting due to file size and translation considerations.

Table 1. Drawing, border, and plot scale

Drawing scale	Border scale	Plot scale
1/64 in. = 1 ft	768	64:1
1/32 in. = 1 ft	384	32:1
3/64 in. = 1 ft	256	21:4
1/16 in. = 1 ft	192	6:1
5/64 in. = 1 ft	153.6	12:8
3/32 in. = 1ft	128	10:8
1/8 in. = 1 ft	96	8:1
3/16 in. = 1ft	64	5:4
1/4 in. = 1 ft	48	4:1
3/8 in. = 1 ft	32	2:8
1/2 in. = 1 ft	24	2:1
3/4 in. = 1 ft	16	1:4
1 in. = 1 ft	12	1:1
1 1/2 in. = 1 ft	8	1:8
2 in. = 1 ft	6	1:6
3 in. = 1 ft	4	1:4
6 in. = 1 ft	2	1:2
12 in. = 1 ft	1	1:1
1 in. = 7 ft	84	7:1
1 in. = 8 ft	96	8:1
1 in. = 9 ft	108	9:1
1 in. = 10 ft	120	10:1
1 in. = 20 ft	240	20:1
1 in. = 30 ft	360	30:1
1 in. = 40 ft	480	40:1
1 in. = 50 ft	600	50:1
1 in. = 60 ft	720	60:1
1 in. = 100 ft	1200	100:1
1 in. = 200 ft	2400	200:1
1 in. = 300 ft	3600	300:1
1 in. = 400 ft	4800	400:1
1 in. = 500 ft	6000	500:1
1 in. = 600 ft	7200	600:1
1 in. = 700 ft	8400	700:1
1 in. = 800 ft	9600	800:1
1 in. = 900 ft	10800	900:1
1 in. = 1000 ft	12000	1000:1

7.8 Title Block User Data

Fields in the title block shall contain associated user data elements with hidden data attached to each title block text note. This allows computer programs callable in MicroStation to locate and manipulate specific text elements within the title block. Figure 2 shows the hidden user data information (in the codes) with its associated text field. FM master seed files already have the required user data associated with each item in the title block which correspond to the drawing title block. After initial entry of title block data, users should turn the user data field display "off" on the View Attributes menu.

Figure 2, Title Block Attributes, shows a title block with dashes in the fields where title block information would appear on the drawing border. Circled numbers are the hidden user data identification numbers. These numbers correspond to the numbers in Column 1 of Table 2.

During the Release Cycle at the FM's site, the user data fields are scanned to locate their associated text note values. The contents of the text notes are reviewed by a verification program for completeness and consistency with standard terminology. Dashes in the required fields, blanks, or nonstandard terminology will cause the drawing to be invalidated. Table-2 also lists the title block entry's acceptable values and whether the field is required. For example, the name of the designer and drafter (User Data 10 and 16) are text fields of 15 characters which are left justified. The entry should be of the form first initial, middle initial, space, last name (FM LAST). Building numbers should be of the form K-1200, 3500N, and 9204-1 for K-25, X-10, and Y-12, respectively. Building numbers are verified against valid site building numbers. Acceptable entries for the floor of the building are 1, 2, 3, 4, 5, B (basement), R (roof), M (mezzanine), and A (area).

The plant field will accept five characters. Acceptable entries are X-10, ORNL, Y-12, K-25, GCEP, WMCO, ORO, OR, and SRS. Other entries can be arranged by contacting the FM.

The accuracy of the title block attributes is essential for retrieval of drawing information from the FM's Engineering Design Information System (EDIS) data bases. An FM provided Microstation MDL program, TBEDIT, insures drawing files meet Title Block requirements.

Table 2. User data format

No.	Description	Acceptable entry	Req'd
1	Drawing number	See EP-C-03	Y
4	Three-line title	Text 72 See ES-6.6-0 (C)	Y*
6	Revision	Two characters	Y
10	Designer's name	Text 15 (L) FM LAST	Y*
11	Design date	Text 8 MM/DD/YY	N
13	Building number	Text 8 (C)	Y
14	Floor of building	Text 3 (L)	N
16	Name of draftsman	Text 15 (L) FM LAST	Y*
17	Drafting date	Text 8 MM/DD/YY	N
76	Project name	Text 28 (C)	Y*
77	Configuration control flag (Blk 51)	Text 2 See ES-6.6-0	Y
78	Configuration control Category (Blk 52)	Text 2 See ES-6.6-0	Y
79	As-built status (Blk 53)	Text 2 See ES-6.6-0	Y
81	Code for type of drawing	One character See ES-6.6-0	Y
82	IBM code (Block 1)	One character (2,3,4,6) See ES-6.6-0	Y
83	Discipline (Block 48)	One character EP-C-03 (C,E,Z,I,M,P,H,J,F)	Y
84	Type of work (Block 49)	One character See ES-6.6-1 through	N
85	Discipline (Block 50)	ES-6.6-9	N
86	Plant	Text 4	Y
87	Drawing sheet number	Integer 1	Y
88	Number of sheets	Integer 1	Y
89	Security classification	One character (S,C,U,N)	Y

(L) Left justified; (C) Center justified; Y = Yes; N = No

* Entry required, but acceptable entries are not limited.

7.9 Level Conventions

Level 50 is reserved for Title Block and border file data. Levels 51-55 are reserved for FM data management. All other levels are available for use. See Appendix B for recommended level conventions for each engineering discipline. FM provided seed and border files have Title Block element levels preset.

7.10 Color Table

The MicroStation delivered color table is the attached color table for the basic master seed files. Individual disciplines may use the delivered color table (color.tbl) or the FM's color table (mmesclr.tbl) in their customized seed files. Figure 4 gives an example of Color Codes. See Appendix B for recommended colors by levels.

7.11 Line Weights and Codes

The line weights are described in Table 3. The line thickness represents the actual hardcopy output created by the plotter. Line codes are the basic (8) delivered by the MicroStation product and are described in Figure 3. Use of customized line codes must be approved by the FM.

8.0 Classification and Sensitivity

All design files whether believed to contain classified, Unclassified National Security Related (UNSR), or nonsensitive data must be reviewed and marked in accordance with EG-C-37.

8.1 UNSR Drawings

UNSR drawings include Unclassified Controlled Nuclear Information (UCNI) drawings which have a classification of N. The drawing conventions are the same for all drawing classifications.

TABLE 3

Line Weights

<u>Line Weight Number</u>	<u>Thickness (Inches)</u>	<u>Leroy Pen Size</u>
0	0.005	0000
1	0.010	000
3	0.020	0
5	0.030	1

Line Weight Formula: Width (Inches) - Weight
Number x 0.005 + 0.005

0	<u>Solid</u>
1	<u>Dotted</u>
2	<u>Medium Dash</u>
3	<u>Long Dash</u>
4	<u>Long Dash-Dot</u>
5	<u>Short Dash</u>
6	<u>Dash-Dot-Dot</u>
7	<u>Long Dash-Short Dash</u>

Figure 3
Example Line Codes

Color Code

0
1
2
3
4
5
6

Color

White
Red
Green
Light Blue
Violet
Blue/Gray
Yellow

Figure 4
Example Color Codes
Color Table MMESCLR.TBL

9.0 ACKNOWLEDGMENTS

A number of people participated in the development of this document and their contributions are greatly appreciated. The author would particularly like to thank Dusty Shamblin, Terry Sanders, and Karon Davis of Lockwood Greene Technologies and Robert Carter of Midwest Technical for their input, suggestions, and comments on the content of this document. Their willingness to share their knowledge as experienced Intergraph CAD system users was most helpful. I would also like to thank the Energy Systems Central Engineering Services Standards Committee for their help and advice.

10.0 REFERENCES

10.1 Acceptable Software Levels, Releases and Applications

Listed below are the Intergraph "Microstation" Software and Software applications that are supported by Martin Marietta Energy Systems, Inc., Oak Ridge Operations:

GRAPHICS SOFTWARE:

Microstation PC Version 4.0 and Higher

Microstation 32 Version 4.0 and Higher

RELATIONAL DATABASE:

Informix

Oracle

DBaseIV

APPLICATION SOFTWARE:

InSite

InRoads

InFlow

InServ

InSewer

InSitu

Modular GIS Env. (MGE) Nucleus

Modular GIS Env. (MGE) PC1

MGE Analyst

MGE Dynamic Analyst

MGE Terrain

PE HVAC

PE Pipe

EE Schematic

EE Power

EE Wiring and Panel Design

EE Raceway

PE Electrical

PE Lighting

2D Panel Design

Wiring Diagram Designer

Project Architect

Project Layout

Application Software (Cont'd)

Project Modeler
Landscape Designware
MicasPlus
MicasPlus ModelDraft
MicasPlus Analysis
MicasPlus Design
Design Review
ModelView
Net Video Manager
Net Video Worker
AEC Shell
Plant Design (PDS)
 Process and Instrumentation Diagram
 Process Flow Diagram

10.2 REFERENCE DOCUMENTATION

Procedure for Preparation of Construction Specifications and Drawings, PMP-6-07, Rev. 4, United States Department of Energy, Oak Ridge Operations Office.

ANSI/ASME STANDARDS

Y14.1-14.26 Engineering Drawing and Related Documentation Practices
Y32.4-32.10 Engineering Graphic Symbols

MMES ENGINEERING STANDARDS

ES-6.4-1	Drafting Practices for Microfilming
ES-6.6-0	General Drawing Format-All Disciplines
ES-6.6	Subsections 1-9 Drawing Title Block and coding-Discipline Specific
ES-6.6-15	MicroStation Drawing Format
EP-C-03	Drawing Numbering
EG-C-37	Control of Unclassified and Classified Design Documents

Appendix A Seed File Settings

View Attributes

ACS Triad	All Views	Off
Area Fill	All Views	On
Background	All Views	Off
Camera	All Views	Off
Constructions	All Views	On
Depth Cueing	All Views	Off
Dimensions	All Views	On
Dynamics	All Views	On
Data Fields	All Views	Initially on, turn off after title block entered
Fast Curves	All Views	Off
Fast Font	All Views	Off
Fast Ref Clipping	All Views	Off
Grid	All Views	Off
Level Symbolologies	All Views	Off
Line Weights	All Views	On
Patterns	All Views	On
Ref Boundaries	All Views	Off
Text	All Views	On
Text Nodes	All Views	Off
Display Mode	All Views	Wireframe

Locks Full

Grid Lock	Off
Level Lock	Off
Boresite	On
ACS Plane	Off
Text Node	Off
Graphics Group	Off
Fence Selection	Inside
Snap Lock	On
Snap Lock Mode	Keypoint
Snap Lock Divisor	2
Snap Intersection	On
Snap Association	Off
ACS Plane Snap	Off
Axis Lock	Off
Unit Lock	Off
Isometric Lock	Off

Working Units (MU:' SU:" PU 2032)

Master Units (MU)	' or ft
Sub Units (SU)	" or inches
Resolution	12 " per ' and 2032 Positional Units per "

Appendix A (continued)

Element Attributes

Level	1
Color	0 for white
Style	0
Weight	1
Area	Solid
Class	Primary
Fill	Off

Text

Font	3
Height	0:0 1/8
Width	0:0 1/8
Line Spacing	0:0 1/16
Line Length	255
Mirror Text	Off
Fractions	On
Justification	
Text String	Left Center (LC)
Multi-line Text	Left Top (LT)

Coordinate Readout

Coordinates Format	Sub Units
Coordinates Accuracy	1/64
Angles Format	DD MM SS
Angles Mode	Conventional
Accuracy	0.1234
Window Origin	0,0

Levels

	All levels on all views on
Current level	Level 1 on all views
Global Origin	88069:4 1/2, 88069:4 1/2, 88069:4 1/2 (0,0,0 at center of design cube)
Color Table (MS_CLRTBL)	MMES customized color table, mmesclr.tbl

Appendix A (continued)

<u>Views</u>	<u>Second Name</u>	<u>Third Name</u>	<u>Status</u>
1	View 1	Top	Display on, Fit all
2	View 2	ISO	Off
3	View 3	Front	Off
4	View 4	Right	Off
5	View 5	ISO	Off
6	View 6	Bottom	Off
7	View 7	Back	Off
8	View 8	Left	Off

Dimensions Placements

Text Orientation	Above
Text Justification	Center
Text Location	Automatic
Text Frame	None
Alignment	View
Reference File Units	Off
Witness Lines	On
Relative Dimension Line	Off
Underline text (NTS)	Off

Dimension Attributes

Text color	On and color = 18
Text Weight	On and set to 1
Font	On and set to 3
Height	Off
Width	Off
Elements Color	On, color = 18
Element Style	On and set to 0
Element Weight	On and set to 0
Alternate Color	OFF
Alternate Style	Off
Alternate Weight	Off
Level	2

Dimension Geometry

Witness Lines	On
Witness Lines Offset	0.25000
Witness Lines Extension	0.25000
Joined when text outside	On
Terminators Width	1.0000
Terminator Height	0.5000
Terminator Arrowhead	Closed
Text Margins Left	0.2500
Text Margins Lower	0.2500
Text Margins Tolerance Left	0.2500

Text Margins Tolerance Sep.	0.2500
General Stack Offset	0:0

Appendix A (continued)

Min. Leader	1.5000
Center Size	0:0

Text Format

Length Format	AEC
AEC Label	x' - x"
Units	English
English	1/16"
Metric	0.12
Angle Format Accuracy	0.12
Angle Format Display	DD ^ MM'SS"
Angle Measure	Length
Scale Factor	1.0000
Leading Zero	On
Trailing Zeros	Off
Comma for decimal	Off

Display Depth	-1000, 1000
---------------	-------------

<u>Active Angle</u>	0
---------------------	---

Angle Lock	Off
Angle Tolerance	1.000
Active Scale	X & Y locked together
X Scale	1.000
Y Scale	1.000
Scale Lock	Off
Tolerance	1.000

Grid

Grid Lock	Off
Master/Grid	0:6
Reference Grid	1.000
Configuration	Orthogonal
Aspect Ration (Y/X)	1.000

Stack Fractions	Off
-----------------	-----

Appendix B
Standard Level Definitions

Table 1
Appendix B

Standard Level Definitions

TABLE 1

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1	0	1	54	GEOMETRY TEXT AND NOTES
2	0	0/1	18	DIMENSIONS / DIMENSION TEXT
3	0	4/1	105	REVISION CLOUD / REVISION TEXT & TRIANGLE
4	0	4/2	24	DEMOLITION CLOUD / DEMOLITION CROSSHATCH
5	0	1	27	GENERAL NOTES & NORTH ARROW
6	0/4	0/0	0	COMPRESSED FLOOR PLAN / COLUMN LINES
7-10	-	-		HOLD FOR FUTURE ITEMS
50	0	1	29	TITLE AND REVISION BLOCK TEXT - RESERVED
51	0	1		REVISION REFERENCE DATA - RESERVED
52-55	0	1		FUTURE USE - RESERVED

* Customized MMES color table used. File name = mmesclr.tbl)

Appendix B (continued)

FMS PIPING PLANS AND DETAILS

(2D Format Used)

TABLE 2

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1-10				SEE TABLE 1
11	6	1	**	EXISTING ABOVE GROUND PIPING
12	0	2	**	NEW ABOVE GROUND PIPING
13	2	1	**	EXISTING BELOW GROUND PIPING
14	3	2	**	NEW BELOW GROUND PIPING
15	0	1	84	NEW EQUIPMENT
16	6	0	84	EXISTING EQUIPMENT
17	2	1	28	FUTURE ITEMS
18	4	0	18	CENTERLINES
19	2	5	160	FIRE ZONES
20	0	3	1	NEW FIRE PROTECTION SPRINKLERS
21	4	3	13	SAFETY SHOWERS
41	0	1	1	EXISTING FIRE PROTECTION SPRINKLERS
42-45	-	-	-	MISCELLANEOUS
50-55				RESERVED (SEE TABLE 1)

* Customized MMES color table used. File name = mmesclr.tbl

** Refer to Table 4 for color assignments on specific types of piping systems.

Appendix B (continued)

FMS FLOWSHEETS AND P&ID DIAGRAMS
(Non-Dimensional Drawings,
2D Format Used)

TABLE 3

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1-10				SEE TABLE 1
22	0	2	0	INSTRUMENTATION
23	6	1	**	EXISTING PIPING
24	0	3	**	PRIMARY FLOW LINES
25	0	1	**	SECONDARY FLOW LINES
26	0	2	84	NEW EQUIPMENT
27	6	1	84	EXISTING EQUIPMENT
28	2	1	28	FUTURE ITEMS
46-49	-		-	MISCELLANEOUS
50-55				RESERVED (SEE TABLE 1)

* Customized MMES color table used. File name = mmesclr.tbl

** Refer to Table 4 for color assignments on specific types of piping systems.

Appendix B (continued)

TABLE 4

COLOR*	DESCRIPTION
6	ACETONE PIPING SYSTEMS
0	ACETYLENE
6	ANHYDROUS AMMONIA
160	ANHYDROUS HYDROFLUORIC ACID (HYDROGEN FLUORIDE)
6	ANHYDROUS HYDROGEN FLUORIDE GAS
74	ARGON, HELIUM, AND NITROGEN
67	CHEMICAL DRAINS
17	COOLING WATER - PLANT AIR
6	COOLANT PIPING SYSTEMS & REFRIGERANTS (EXCEPT METHYL ALCOHOL)
6	DEGREASING FLUIDS
30	DRY, OIL-FREE COMPRESSED AIR
6	FLUORINE AND CHLORINE TRIFLUORIDE
7	VACUUM SYSTEMS
161	HYDRAULIC OIL AND LUBRICATING AND PROCESS OILS
160	HYDROCHLORIC ACID
0	HYDROGEN AND OXYGEN
30	INSTRUMENT AIR (COPPER OR PLASTIC TUBING)
3	METHYL ALCOHOL COOLANT (BRINE)
0	NATURAL, PROPANE, AND ANNEALING GAS
17	POTABLE AND PROCESS WATER
17	PROCESS COOLING WATER, RAW AND COOLING TOWER WATER
67	SANITARY AND STORM DRAINS
6	SODIUM HYDROXIDE
6	STAINLESS STEEL SYSTEMS
47	STEAM AND CONDENSATE (0 TO 150 PSIG)
23	STEAM AND CONDENSATE (151 TO 250)
160	SULFURIC ACID
6	UF ₆ GAS AND EVACUATION PIPING SYSTEMS

*Customized MMES color table used. File name = mmesclr.tbl

Appendix B (continued)

FMS HVAC PLANS AND DETAILS

(2D Format Used)

TABLE 5

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1-10				SEE TABLE 1
30	0/2	3/1	4	NEW EXHAUST DUCT / HIDDEN
31	0/2	3/1	3	NEW SUPPLY DUCT / HIDDEN
37	0	3	1	NEW FIRE DAMPERS
32	0/2	1	4	EXISTING EXHAUST DUCT / HIDDEN
33	0/2	1	3	EXISTING SUPPLY DUCT / HIDDEN
38	0	1	1	EXISTING FIRE DAMPERS
34	Varies	Varies	12	FLOW/CONTROL DIAGRAM
35	0	1	6	TABLES AND SCHEDULES
36	4	0	18	CENTER LINES FOR DUCT (SUPPLY & EXHAUST)
37-40	-	-		MISCELLANEOUS
50-55				RESERVED (SEE TABLE 1)

* Customized MMES color table used. File name = mmesclr.tbl

Appendix B (continued)

INSTRUMENTATION
(2D Format Used)

TABLE 6

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1-10				SEE TABLE 7
11	0	1		SCHEDULES
12	0	1/2	0	ELEM DIAG., LOOP SHEETS, SCHEMATIC
13	0	1	3	CONTROL EQUIPMENT
14	0	1	3	EQUIPMENT LOCATION
15	0	2	5	CONDUIT, PULL BOXES, J. B.'S/RACEWAYS
18	0	1	3	SAFETY SYSTEMS & IT'S COMPONENTS
20	0	1	6	COMMUNICATION EQUIPMENT
21	0	1	7	COMMUNICATION CABLING
23	4	2	0	U/G CONDUIT & CABLE (POWER)
24	0	1	3	CABINET ASSEMBLY
25	0	1	4	PANEL ASSEMBLY
26	0	1	2	PANEL DETAILS
27	-	-	0	POLE LOCATION
33	0	1	0	CONTROL EQUIPMENT
35	0	1	3	SECTIONS, ELEVATIONS & DETAILS
50-55				RESERVED (SEE TABLE 1)

* Intergraph default color table used. File name = color.tbl

Appendix B (continued)

ELECTRICAL
(2D Format Used)

TABLE 7

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1	0	1	0	TEXT, NOTES
2	0	0/1	2	DIMENSION / REVISION TEXT & TRIANGLE
3	0	4/1	3	REVISION CLOUD & LETTER
4	0	4/0	5	DEMOLITION
5	0	1	0	GENERAL NOTES & NORTH ARROW
6	0	0	0	FLOOR PLAN (COMP, NOT REF FILE)
11	0	1	0	SCHEDULES
12	0	1/2	0	ELEM. DIAG., ONE-LINE DIAG, SCHEMATICS
13	0	1	3	RECEPTACLES
14	0	1	3	LIGHTS
15	0	2	5	CONDUIT, PULL BOXES, J.B.'S/RACEWAYS
16	0	1	2	EMERGENCY LTS, EXIT LTS, LIFE SAFETY
17	0	1	3	DISTRIBUTION EQUIPMENT
18	0	1	3	SAFETY SYSTEMS & IT'S COMPONENTS
19	0	1	3	FIRE ALARM EQUIPMENT
20	0	1	6	COMMUNICATION EQUIPMENT
21	0	1	7	COMMUNICATION CABLING
22	0	1	9	PLANT PUBLIC ADDRESS SYSTEM
23	4	2	0	U/G CONDUIT & CABLE (POWER)
24	4	1	3	CATHODIC PROTECTION
25	0	1	4	TELEPHONE DUCTS & MANHOLES
26	3	2	2	GROUNDING
27	0	1	0	POLE LOCATION
28	0	2	0	2400 V CABLE ROUTING
29	0	2	2	13.8 KV CABLE ROUTING
30	0	2	3	161 KV CABLE ROUTING
31	0	1	0	EMERGENCY NOTIFICATION SYSTEMS
32	0	1	5	RADIATION SYSTEMS
33	0	1	0	CONTROL EQUIPMENT
35	0	1	3	SECTIONS, ELEVATIONS & DETAILS
50-55				RESERVED (SEE TABLE 1)

* Intergraph default color table used. File name = color.tbl

Appendix B (continued)

ARCHITECTURAL

(2D Format Used)

TABLE 8

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1	0	1	0	TEXT
2	0	0/1	18	DIMENSIONS / TEXT
3	0	4/1	105	REVISION CLOUD / REVISION TEXT & TRIANGLE
4	2	2	95	DEMOLITION
5	0	1	27	GENERAL NOTES AND NORTH ARROW
6	0	0	84	BACKGROUND
11	4	0	2	COLUMN CENTER LINES
12	0	1	8	COLUMNS
16	0	1	9	WINDOWS & FRAMES
17	0	1	11	ROOM NAMES & NUMBERS
18	0	2	7	HANDRAILS
19	0	1	1	ELEVATORS & ESCALATORS
20	0	1	14	STAIRS
22	0	0	6	SLABS, AREA PATTERNING
23	0	1	17	INTERIOR WALLS
24	0	1	4	EXTERIOR WALLS
25	0	0	26	DOORS DOOR SWINGS, FRAMES
30	0	1	53	TOILET FIXTURES
35	0	1	12	CABINET & MILLWORK
36	0	1	15	EQUIPMENT
39	0	1	5	CEILINGS
42	0	1	3	DOOR NUMBERS
43	0	1	16	WINDOW SYMBOLS
44	0	1	24	FIRE WALL RATINGS
46	0	2	66	SECTIONS, DETAIL CUTS & TITLES
48	0	1	29	LEGEND GRAPHICS & TEXT

* Customized MMES color table used. File name = mmescr.tbl

Appendix B (continued)

STRUCTURAL

(2D Format Used)

TABLE 9

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1	0	1	0	TEXT
2	0	0/1	18	DIMENSIONS / DIMENSION TEXT
3	0	4/1	105	REVISION CLOUD / REVISION TEXT & TRIANGLE
4	2	1	95	DEMOLITION
5	0	1	27	GEN. NOTES AND NORTH ARROW
6	0	0	84	BACKGROUND
11	4	0	2	COLUMN CENTER LINES
12	0	1	8	COLUMNS
13	0	0	10	WOOD (EXISTING)
14	0	1	7	WOOD (NEW)
15	0	3	14	REINFORCING STEEL
21	0	2	6	FOUNDATIONS / FOOTERS / GRADE BEAMS
25	0	1	26	DOORS AND WINDOWS
26	0	0	45	STEEL (EXISTING)
27	0	1	34	STEEL (NEW)
28	0	0	21	CONCRETE AND MASONRY (EXISTING)
29	0	1	82	CONCRETE AND MASONRY (NEW)
50-55				RESERVED (SEE TABLE 1)

* Customized MMES color table used. File name = mmescr.tbl

Appendix B (continued)

CIVIL/GIS

(3D Format Used)

TABLE 10

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1	0	0	21	FENCING
2	0	0	0	MISC. BOUNDARIES
3	6	4	56	229 BOUNDARIES
4	4	4	0	COUNTY BOUNDARIES
5	0	2	37	PRIMARY BLDG OUTLINE
6	0	1	37	SECONDARY BLDG OUTLINE
7	0	1	38	MISC. STRUCTURES
8	0	0	38	CANOPIES
9	0	0	38	DOCKS/PADS
10	0	0	37	BUILDING COMPARTMENTS
11	0	0	39	BUILDING SHADOWS
13	0	0	70	BUILDING TEXT
15	0	0	143	PRIMARY ROADS
16	2	0	142	SECONDARY ROADS
17	2	0	0	GRAVEL ROADS
18	3	0	0	TRAILS
19	0	0	142	CURBING
20	0	0	127	SIDEWALKS
21	0	0	142	PARKING DETAILS
22	0	0	18	PAVED AREAS
23	0	0	0	RAILROADS
24	0	1	0	BARRIERS
25	0	1	79	SIGNAGE
27	0	0	0	ROAD TEXT
29	0	1	29	MAJOR CONTOURS
30	0	0	0	CONTOUR TEXT
31	0	0	28	MINOR CONTOUR
32	0	0	118	MAJOR DEPRESSION
33	0	0	118	MINOR DEPRESSION

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
34	0	0	18	SPOT ELEVATIONS
35	0	0	30	FORESTRY COMPARTMENTS
36	0	0	30	SINGLE TREES
37	0	0	198	GRASSED AREAS
38	0	0	230	COUNTOUR - GRID
39	0	0	246	COUNTOUR - TRIANGLATED
40	0	0	86	HYDROLOGY
42	0	0	87	PONDS/RESERVOIRS
43	0	2	105	WEIRS
44	0	1	0	CULVERTS
45	0	1	0	BRIDGES
46	0	0	85	WETLANDS
47	0	1	83	FLOODPLAINS
49	0	0	0	HYDROLOGY TEXT
50-53				RESERVED (SEE TABLE 1)
54	0	0	213	ELECTRIC/LIGHT POLES
55	0	0	0	FIRE HYDRANTS
56	0	0	0	CATCH BASINS
57	0	0	0	MANHOLES
58	0	0	0	BENCHMARKS
59	0	0	0	CONTROL POINTS
60	0	4	0	BORDER
61				LEGEND
62	0	0	0	GRID COORDINATES
63	0	0	0	TIC MARKS

* Customized MMES color table used. File name = mmesclr.tbl

Appendix B (continued)

CIVIL

(3D Format Used)

TABLE 11

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1	0	0	0	TEXT & NOTES
2	0	0	0	DIMENSIONS
3	0	0	0	REVISION CLOUDS
4	0	0	0	DEMOLITION
5	0	1	1	PRIMARY BUILDING OUTLINES
6	0	0	0	BUILDING TEXT
7	0	0	0	UTILITY TEXT
8	0	0	0	GENERAL NOTES
9	0	0	17	STORM SEWERS
10	0	0	15	SANITARY SEWERS
11	0	0	3	POTABLE WATER
12	0	0	4	FIRE WATER
13	0	0	10	STEAM LINES (UNDERGROUND)
14	0	0	10	STEAM LINES (ABOVE GROUND)
15	0	0	82	CONDENSATE LINES
16	0	0	54	PROCESS DRAINS
17	0	0	0	PROCESS WATER
18	0	0	0	CHILLED WATER (S&R)
19	2	0	0	HOT WASTE (LLW)
20	3	0	0	PLANT AIR
21	0	0	0	EXHAUST DUCT
22	0	0	0	NATURAL GAS
23	0	0	0	OFF GAS
24	0	0	0	DEMINERALIZED WATER
25	0	0	0	HYDROGEN/HELIUM
26	0	0	0	OXYGEN LINES
27	0	0	0	NITROGEN LINES

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
28	0	0	0	VACUUM LINES
30	0	0	29	MAJOR CONTOURS
31	0	0	0	CONTOUR TEXT
32	0	0	28	MINOR CONTOURS
33	0	0	0	GPS MONUMENTS
34	0	0	1	PRIMARY MONUMENTS
35	0	0	3	SECONDARY CONTROL
36	0	0	5	NGS/USGS/TVA CONTROL
37	0	0	0	OTHER CONTROL
38	0	0	0	VERTICAL (ONLY)
40	0	0	0	TIN MODELS
41	0	0	0	LATTICE MODELS
42	0	0	0	CROSS SECTIONS
43	0	0	143	ROADS
44	0	0	0	CURBING/SIDEWALKS
45	0	0	0	RAILROADS
46	0	0	222	STREAMS
47	0	0	210	FENCING
48	0	0	0	SPOT ELEVATIONS
49	0	0	1	BORE HOLES
50-55				RESERVED (SEE TABLE 1)
56	0	0	1	ELECTRIC (UG)
57	0	0	21	FIRE HYDRANTS
58	0	0	0	CATCH BASINS
59	7	0	3	MANHOLES/POLES
60	0	0	166	TREE LINES
61			65	LEGEND
62	0	0	18	PLANT GRID/COORDINATES
63	0	0	121	GRID TICKS

* Customized MMES color table used. File name = mmesclr.tbl

Appendix B (continued)

SMALL PROJECTS

(2D Format Used)

TABLE 12

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
1	0	0	54	GEOMETRY TEXT AND NOTES
2	0	0/0	18	DIMENSIONS / DIMENSION TEXT
3	0	4/0	105	REVISION CLOUD / REVISION TEXT AND TRIANGLE
4	0	4/2	24	DEMOLITION CLOUD / DEMOLITION CROSSHATCH
5	0	0	27	GENERAL NOTES AND NORTH ARROW
6	0/4	0/0	0	COMPRESSED FLOOR PLAN / COLUMN LINES
7-10				HOLD FOR FUTURE ITEMS
				PIPING
11	6	1	82	EXISTING ABOVE GROUND PIPING / SPRINKLERS
12	0	3	82	NEW ABOVE GROUND PIPING / SPRINKLERS
13	2	1	30	EXISTING BELOW GROUND PIPING / SPRINKLERS
14	3	3	30	NEW BELOW GROUND PIPING / SPRINKLERS
15	0	2	7	NEW EQUIPMENT
16	6	1	7	EXISTING EQUIPMENT
17				MISCELLANEOUS
18	0	2	24	FIRE ALARMS
19	2	5	24	FIRE ZONES
				ARCHITECTURAL
20	0	0	45	EXISTING
21	0	0	33	EXISTING EXTERIOR WALLS
22	0	0	55	EXISTING INTERIOR WALLS
23	0	1	42	NEW
24	0	1	252	NEW EXTERIOR WALLS
25	0	1	52	NEW INTERIOR WALLS
26	0	0	27	DOORS
27	0	1	73	WINDOWS
28	0	1	222	REFLECTED CEILING PLAN
29				MISCELLANEOUS

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
				HVAC
30	0	3	4	NEW EXHAUST/RETURN DUCT
31	0	3	3	NEW SUPPLY DUCT
32	0	1	4	EXISTING EXHAUST DUCT
33	0	1	3	EXISTING SUPPLY DUCT
34				MISCELLANEOUS
35				MISCELLANEOUS
				STRUCTURAL
36	0	0	21	EXISTING STEEL
37	0	0	94	EXISTING CONCRETE
38	0	0	84	EXISTING CONCRETE REINFORCEMENT/EMBEDDED STEEL
39	0	2	19	NEW STEEL
40	0	2	6	NEW CONCRETE
41	0	3	5	NEW CONCRETE REINFORCEMENT/EMBEDDED STEEL
42				MISCELLANEOUS
43				MISCELLANEOUS
				CIVIL
44	3	2	75	SANITARY SEWER
45	3	2	5	STORM DRAINS
46	3	1	30	PIPING
47	3	1	1	ELECTRICAL
48	0	2	85	BUILDINGS
48	0	1	85	STREETS, SIDEWALKS, ETC.
49	0	0	6	TOPOGRAPHICAL
				RESERVED
50-55				RESERVED (SEE TABLE 1)

LEVEL NAME	LINE STYLE	LINE WEIGHT	COLOR*	DESCRIPTION
				ELECTRICAL
56	0	1	28	LIGHTS
57	0	1	106	RECEPTACLES
58	0	2	104	CONDUIT
59	0	1	47	COMMUNICATIONS SYSTEMS
60	0	1	102	SCHEMATICS
61	0	1	51	SCHEDULES
62	0			MISCELLANEOUS
63	0			MISCELLANEOUS

* Customized MMES color table used. File name = mmesclr.tbl

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