Plans Preparation Manual

1 Introduction

Purpose

This Plans Preparation Manual sets forth design criteria as well as procedures, for Design Plan Documents created for the U.S. Army Corp of Engineers, Jacksonville District projects. The information contained in this "Plans Preparation Manual" (PPM)applies to the preparation of contract drawings for water control structures, waterways, environmental restoration, facilities, surveys, and shoreline restoration. This document shall also serve as a CAD Standard for the Comprehensive Everglades Restoration Plan (CERP).

Authority

CECW-CE Memorandum for subordinate commanders, Implementation of the A/E/C CAD Standard in USACE, 23 July 2004 and CESAJ-EN Memorandum for EN division, Implementation of the A/E/C CAD Standard in Jacksonville District, 21 March 2005.

Scope

The procedures and criteria contained in this Plans Preparation Manual apply to all U.S. Army Corp of Engineers employees and contractors, including contracted A/E firms, preparing contract drawings for U.S. Army Corp of Engineers, Jacksonville District.

Procedure

The criteria in this manual represent requirements for Jacksonville District contract drawings which must be met for the preparation of project plans and reports unless approved exceptions or variations are obtained in accordance with procedures outlined in this manual.

Revisions and Updates

Plans Preparation Manual holders are encouraged to submit comments and suggestions for changes to the Design Branch CAD Coordinator.

Recommendations or suggested additions should be sent to:

> Jacksonville District
> US Army Corps of Engineers
> ATTN: CESAJ-EN-T/CAD Manager
> 701 San Marco Blvd.
> Jacksonville, Florida 32207

Applicable Documents

The following specifications, standards, and handbooks form a part of this document to the extent specified herein.

A/E/C CAD Standard Rel. 5.0, ERDC/ITL TR-12-X, U.S. Army Engineer Research and Development Center

Uniform Drawing System, The Construction Specifications Institute

AIA CAD Layer Guidelines, The American Institute of Architects

ASME Y14.2, The American Society of Mechanical Engineers

ASME Y14.3, The American Society of Mechanical Engineers

ASME Y14.4M, The American Society of Mechanical Engineers

ASME Y14.24, The American Society of Mechanical Engineers

Variations to this Manual

Only the Jacksonville District, Program CAD Manager or designated representative shall approve deviations from the A/E/C CAD Standard and the Plans Preparations Manual or variations in the preparation of contract drawings. Contact the Jacksonville District CAD Program Manager when the requirements of the A/E/C/ CAD   Standard or this manual interferes with the creation of a clear and concise drawing to determine the graphic presentation or criteria to resolve the conflict.

Plans Preparation Manual Format

This manual is written to provide requirements and guidance for those who are preparing design documents for the Jacksonville District, Corps of Engineers. The format used is targeted at the users preparing the design plans and is intended to be a resource, technical reference, and workflow for how the design work is to be accomplished. The body of the Plans Preparation Manual is a drafting manual describing techniques, procedures, and format requirements, Appendix A is divided into workflows that describe the procedures for Jacksonville District users only. Appendix B includes workflows that describe required workflows and formatting for Corps and Contracted design firms. Appendix C is a proprietary software guide for Jacksonville District Personnel.

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2 Drawing File Organization

Standard File Requirements

The standard requirements listed below are to provide additional guidance not shown in the A/E/C CAD Standard, ERDC/ITL TR-12-X.

Units. All Microstation files shall be prepared with a units definition file. The units definition file shall contain US survey feet and US survey inch. All files prepared with English/Imperial unit format shall use US Survey Feet and US Survey Inch, International Feet will not be used.

Plotted Drawings. Every final plotted drawing sheet shall originate from its own separate electronic sheet file. The electronic sheet file shall be made up of DGN design data referenced to each sheet.

Border File. Only one border file shall be used for each specific project.

Drawing Sheet Assembly

Sheet files are assembled by using option "Design Model Only" method mentioned in the A/E/C CAD Standard, Chapter 2, Page 10.

Drawing File Naming Conventions

Model file project codes will be the project's electronic file abbreviation selected by the Project Engineer/Contracting Officer and a dash (-), model file project codes will not include the project's P2 number.

The model file user definable field can be used to further define the contents of the file or to designate the file's numeric sequence in a group of the same model file types.

Sheet file names will include a project code comprised of the project's P2 number**, a dash (-), and the project's electronic file abbreviation, and a dash then the two character alpha Level 2 Designator, the single character alpha, dash Level 2 Designator followed by the Sheet Sequence Number consisting numeric numbers from 01 through 99 and ending with 3 numeric user definable characters.

 In order to define file status such as Superseded, Modified, and As-built, a single upper case alpha character followed by an under bar (_) character to define the status. . The allowable characters for this field are: S, superseded; M, modified; R, as-built drawing.

** *See the Project Engineer for the Project Code.*

Drawing Numbers (Sheet Identifiers)

Sheet Identifiers are the Identifiers that are place in the Title Block lower-right of the drawing sheet

Projects containing multiple facilities, construction features (structures) of construction will be divided into categories by having a Feature numeric identifier assigned to each feature (or separate structure) of the project. The Feature identifier is a single position alpha code. Other features identified by the project engineer will be assigned a Feature identifier in alphabetical sequence.   Upon forming a Project Delivery Team (PDT) or receiving a Notice to Proceed (NTP) the project engineer or designated representative will publish a memorandum listing all project features and the Feature alpha identifier assigned to each feature or phase of work.

Drawing numbers for use in the sheet identification portion of the sheet title block , reference bubbles, etc consist of the single alpha discipline designator, see table 2-3 of the A/E/C/ CAD Standard, and a dash (-). The Feature identifier precedes the discipline designator and dash are followed by the discipline sequence numbers.

The Discipline sequence numbers are sequential only for each discipline within each Feature of the project plan set. Sheet Numbers are re-sequenced for each feature. See Figure 2-1 below.
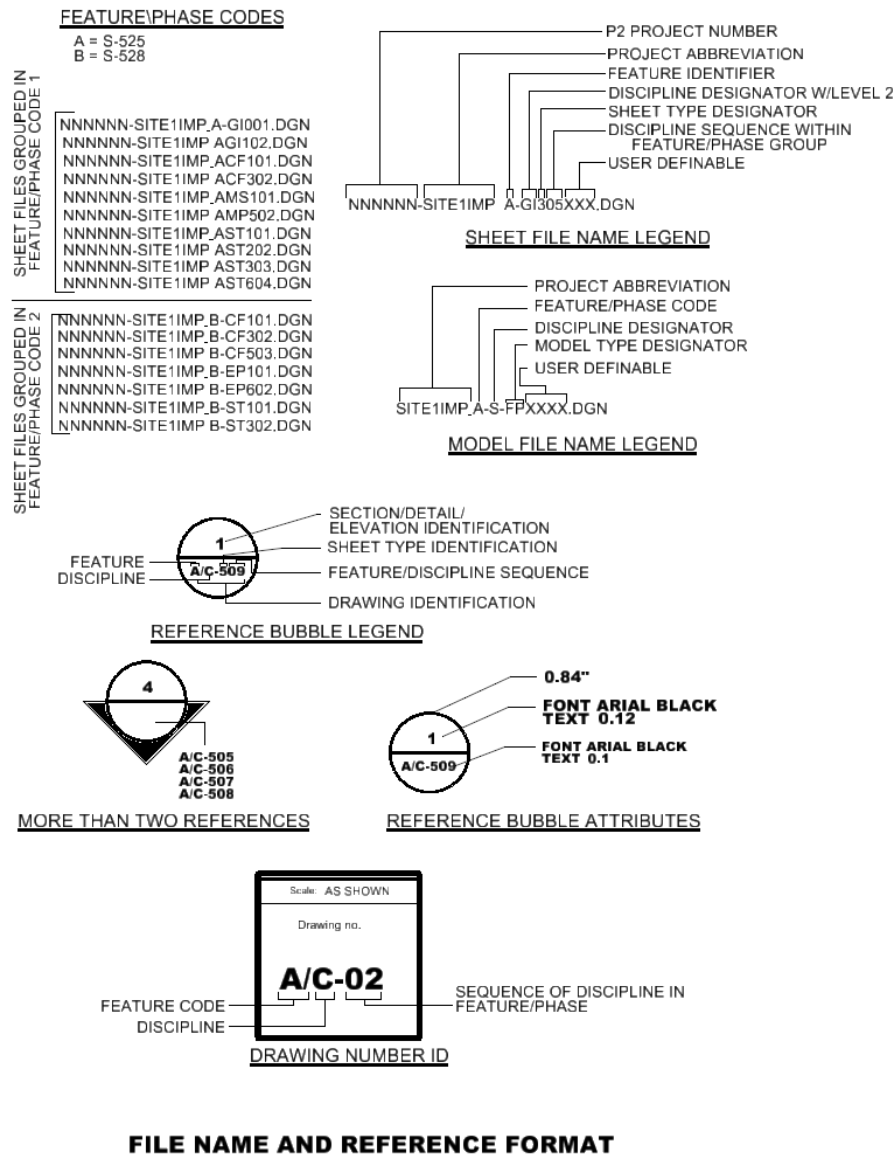
Figure 2-1

3 Preparation of Contract Drawings

Drawing Presentation

Drawings are a graphic design representation of contractual project requirements. Provide only essential details to achieve a clear understanding of the contract requirements. The drawings indicate the relationships between components and materials and should show location, identification, dimension, details, and shape and form. Care shall be exercised in

showing all dimensions and notes necessary for the construction of the object represented. Omit from drawings, repetitive details and unclear contract requirements.

Indicate contract requirements only once on drawings. This shall be indicated at the first opportunity in the drawing set where the feature or item is shown. Do Not include any National Standard Publication identifiers such as ANSI, ASHRAE, or ASHTO standard IDs. These are to be included in the Contract Specifications. If it is necessary to refer to these standards, place a note on the drawing referring to the specification number as a requirement.

Limit cross-hatching or patterns to indicate only enough to clearly designate material. Show hatching and other patterns used for walls and other continuous features at the beginning and end of the representative element. Provide cross-hatching and patterning only at the outline edges of the feature unless it is a long distance, in which case provide intermittent indications to represent the feature.

The drawings indicate the relationships between components and materials and should show location, identification, dimension, details, and shape and form. Information such as physical quantities, chemical constituents, performance requirement, standards of workmanship, required quality of material and equipment. Installation requirements shall not be shown in the drawings but shall be included in the specifications.

Preliminary Preparation For Drawing Layout.

Graphic *Standard Compliance and Quality Presentation Review*. Review the standard requirements of Jacksonville District Plans Preparation Manual and Appendices and the A/E/C CAD Standard ERDC/ITL TR-12-X. The Plans Preparation Manual contains the requirements that apply to the Comprehensive Everglades Restoration Plan (CERP) and non-CERP related projects. The web link http://w3saj/CAD/end/CADmanagementandsupport.htm list the standards as follows:

A/E/C CAD Standard ERDC/ITL TR-12-X. Volume One Narrative portion, Volume Two Appendices portion (Level Assignments and Attribution) located at the web page https://cadbim.usace.army.mil/CAD

Jacksonville District Plans Preparation Manual located at web page http://www.saj.usace.army.mil/CAD/end/CADmanagementandsupport.htm.

Project File Set Up.

If you are working in the Jacksonville District workspace, see Appendix A, Unit 1.

Based on the project type, the border (ANSI size D or E) is selected for the project by the Project Engineer. The standard size border is an ANSI D border . If the project is a large civil works project or a navigation project then the ANSI E border file is appropriate. The copy of the

border file placed within the project folders are renamed to follow the A/E/C CAD Standards naming convention.

The border file contains the border template and title block data used for each contract drawing. A typical border file is shown in figure 3-1.

If you are not working within the Jacksonville District Project Wise Workspace, download the compressed 'ZIP' files containing the necessary resource files and guidance to set up a workspace that will enable the use of resource files and provide guidance prepare compliant project design files according to the Jacksonville District's standard requirements.
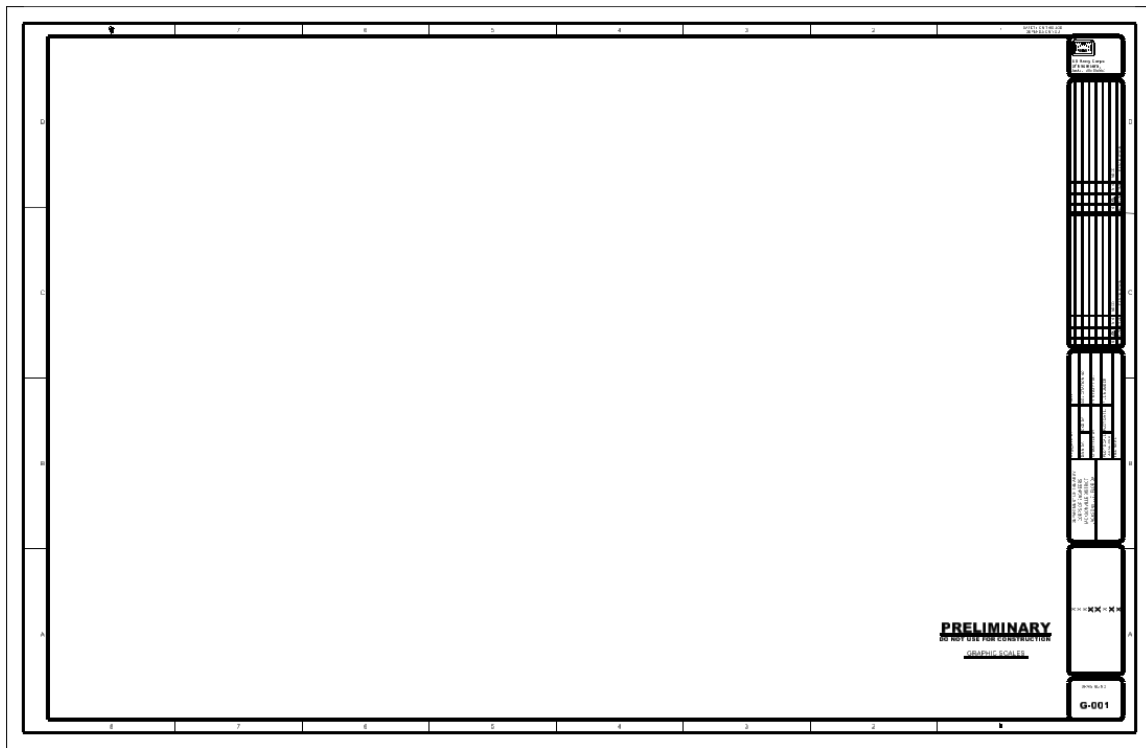
Figure 3-1a

Once a project border file has been created, the title block project information must be edited. In the project identification block change the top 3 "X" (Green) placeholders to reflect the construction program title and the fourth line "X" placeholder to match the project title, see figure 3-2.

Sheet title text shall be obtained from the Companion.cel library either for the ANSI E or ANSI D Border Sheets. The placement origin point for these two cells is the lower extreme right corner of the boundary line of the border file. This cell shall be placed using the same scale factor as the border. Edit sheet title text as necessary. DO NOT change text sizes or fonts.

Figure 3-2

In the management block, edit the Invitation Number and Invitation date place holders to reflect the project's contract number, see figure 3-3.

Figure 3-3

All the text placeholders on the G-ANNO-TEXT-DRWG level shall remain as is. These place holders are copied into a sheet file and used to populate the contract drawing identification, management, and revision blocks. The border companion cell library contains a cell which can be used to populate the title block text blocks.

Based on the project, select a copy of the ANSI cover D or E size shown in figure 3-4 that corresponds to the selected project border sheet. The cover sheet is renamed to match the project naming convention that follows the A/E/C CAD Standards

Figure 3-4

Edit the cover sheet Program Title line 1 Program Title Line 2, Project title and Additional Project Title, To Accompany Invitation No., and YYYY placeholders to reflect the construction program title and the project title as required.

Based on the selected ANSI size of border the same size index is selected for the project. The index sheet file is preconfigured for the user to start developing the drawing index. The index sheet file template is shown in figure 3-5. Edit the project title place holders to reflect the project's information.

Figure 3-5

For small projects with a limited number of drawings a combined index sheet maybe used, containing the drawing index, vicinity map, project notes, project legend, abbreviations, etc. The format of this drawing will change from project to project, but it does have some formatting guidelines.

The layout will have the project title centered along the top edge, drawing index in the top left drawing block, location map, vicinity map, contractor staging area map, etc. All project notes, legends, schedules, abbreviations, and key maps will be located in the far right drawing area of the sheet. The presentation and layout of this sheet should follow the idea a drawing is read from top-left to bottom-right. An example of this drawing type is shown in figure 3-6.
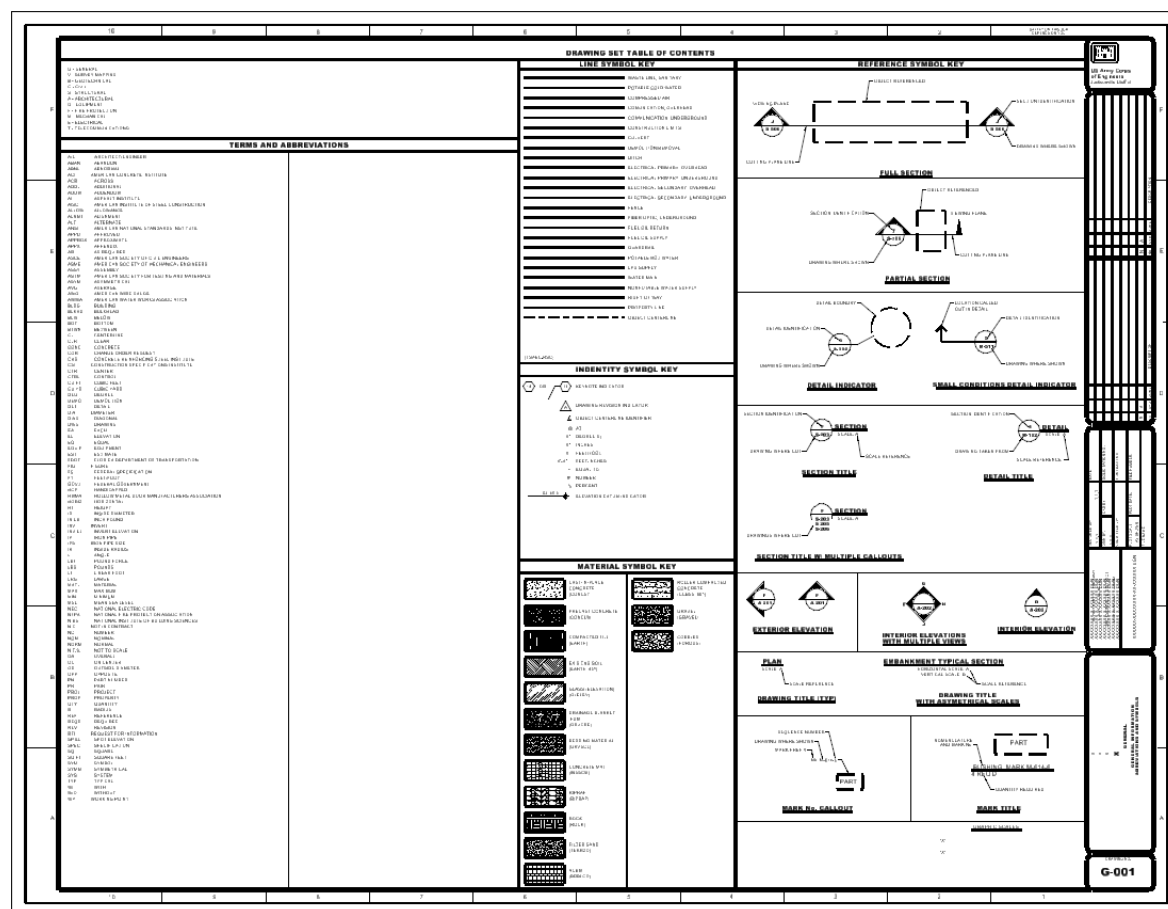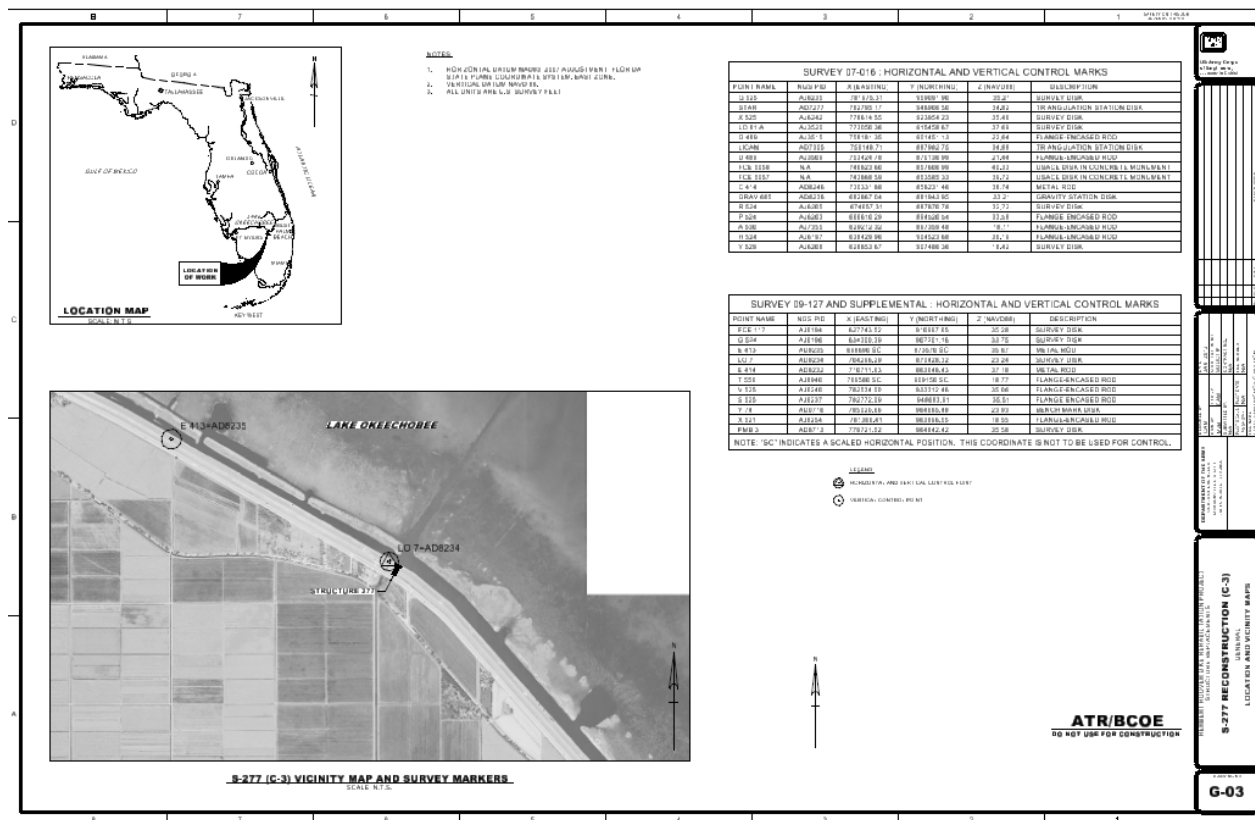

Figure 3-6a

Standard Abbreviations and Symbols sheets have been supplied for both ANSI D and ANSI E sizes and shall be included in all projects. An exception is granted for exceptionally small projects that can fit all used legend symbol and abbreviation indexes on the Combination Location, Vicinity Map and Index Sheets. Generally this is done only on small Dredging or Shore Protection Contract Documents sets.

Figure 3-6b

Design Files

For design preparation of drawings is using the Jacksonville District workspace, see Appendix A, Unit 1.

Preparation of model files depends upon knowing the associated sheet file(s) plot scale. Be sure all model file symbology is proportional to the sheet file plot scale and will be legible after being referenced to a sheet file(s). For detail and text based model files select a sheet file plot scale prior to creating text and dimension elements.

Elevation Views

Place the elevations in a logical order; normally the front elevation is placed at the top-left corner of the sheet file. Other elevations are then placed to the right and below the front elevation. When a sheet file contains multiple views of a facility or structure, place the Plan View at the top-left corner of the sheet file. Then "unfold" the other views to the right and below the Plan view, see figure 3-7. The examples shown below are excerpts from the National CAD Standard and do not adhere to Jacksonville District's text/font standards but are show as an example only.
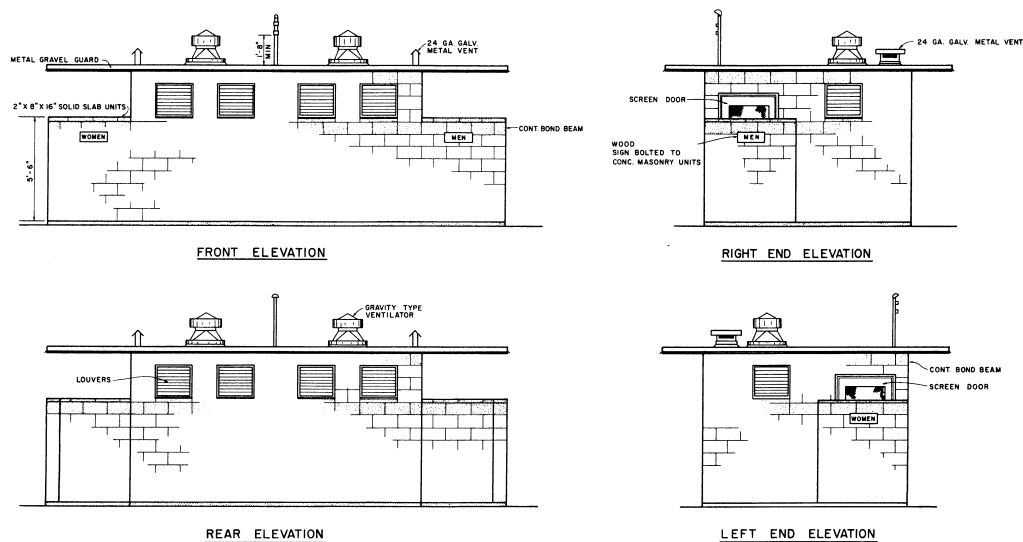

FRONT ELEVATION   RIGHT END ELEVATION

REAR ELEVATION   LEFT END ELEVATION

Figure 3-7

Cut sections from the bottom of the sheet to the top of the sheet, see figure 3-8.
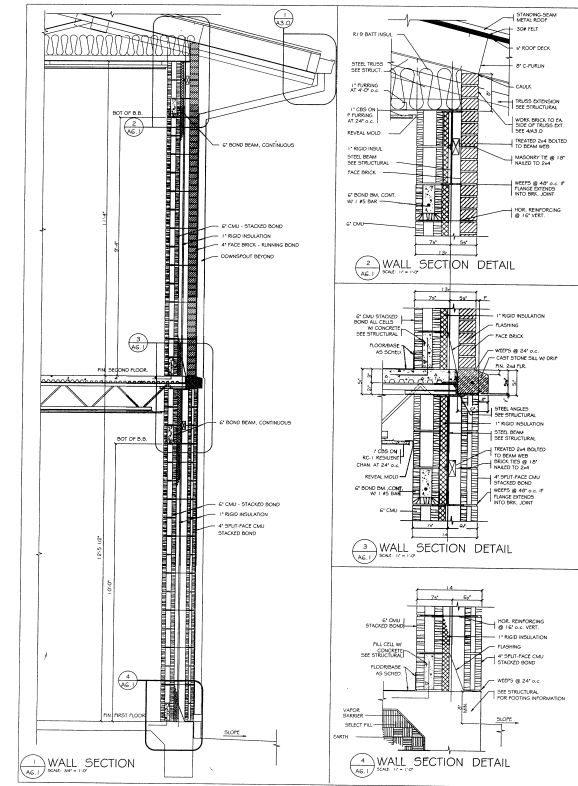
Figure 3-8

Set the views in a sequential flowing logical order, see example figure 3-9. If the sheet contains a plan view, place the plan view in the top-left corner of the drawing. When the drawing is laid out set all the views and sections in proper orientation to each other.
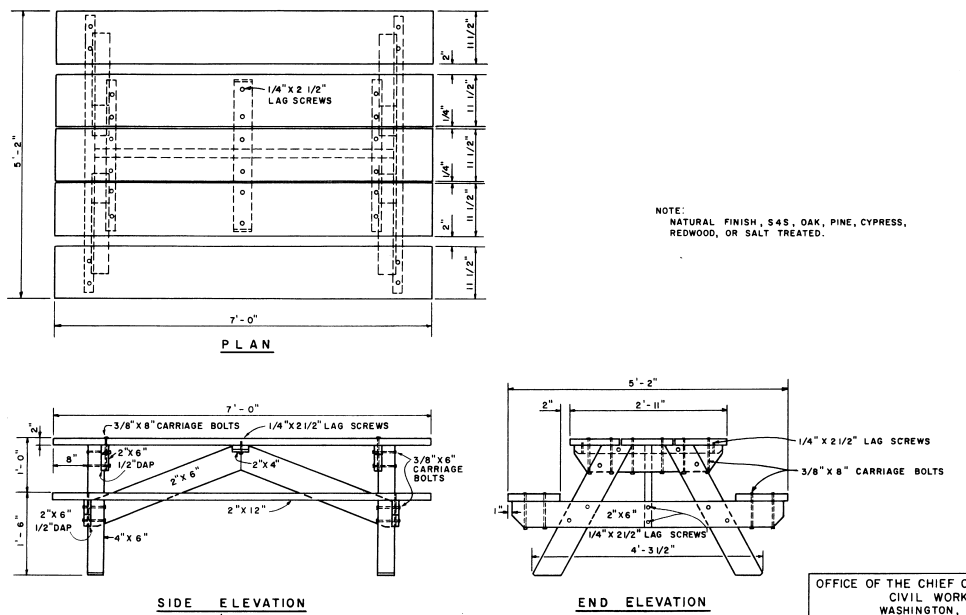
Figure 3-9

Detail Layout.

Set the details in a sequential flowing logical order, see figure 3-10. Details should be laid out in a grid pattern with a margin between adjoining details. You should ensure details do not overlap in any manner. When details are shown on a multi-view drawing, make sure the details are separated by a margin from the orthographic views or sections.
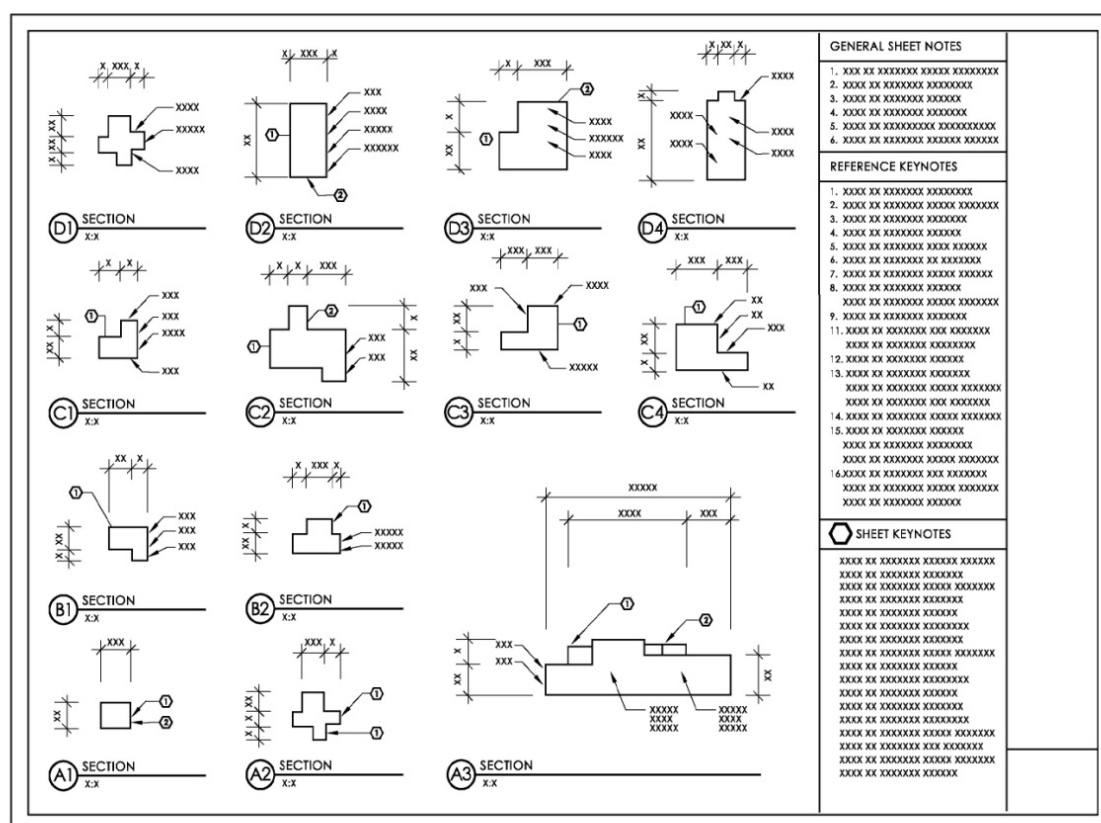
Figure 3-10

Model File Scale

Model files are drawn at real world scale and typically represent an existing or proposed object or surface as seen in plan view, elevation, section, etc. All details and sections are drawn at full size. Enlarged elements such as details are referenced and resized at desired scale. Model file plans and elevations do not contain any plot scale dependent information such as text, dimensions or graphic symbols. This type of information is placed on Sheet files.

Sheet File Development

The sheet file serves as a container to which the model files are referenced. The sheet file is a container "holding one or more models and general information".

Border File Attachment.

Reference the border file to the sheet file at the desired plot scale size for plotting the drawing using the border saved view. Set the scale of the border to the dominant scale to be used on the drawing.

Note: The border file should only be referenced to the sheet file and not copied into the sheet file.

Valve House Example.

This example of preparing a contract drawing illustrates the use of a border file, sheet file and multiple model files to create a finished drawing. Creation of a contract drawing begins with creating a sheet file to serve as a container for model files, border, dimensions, text, notes, etc.

Begin with the blank sheet file and insert the first model file reference. For this example the first model file reference is a structural drawing of the building floor plan., see figure 3-11.
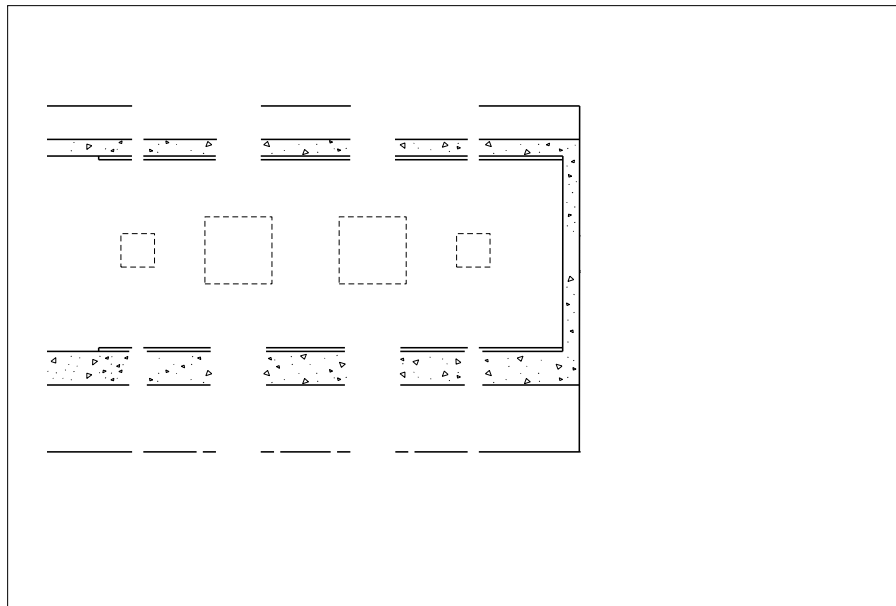

Figure 3-11

Continue adding other model files as required to complete the contract drawing. The second model file referenced in this example is a mechanical model of the piping and valves, see figure 3-12.
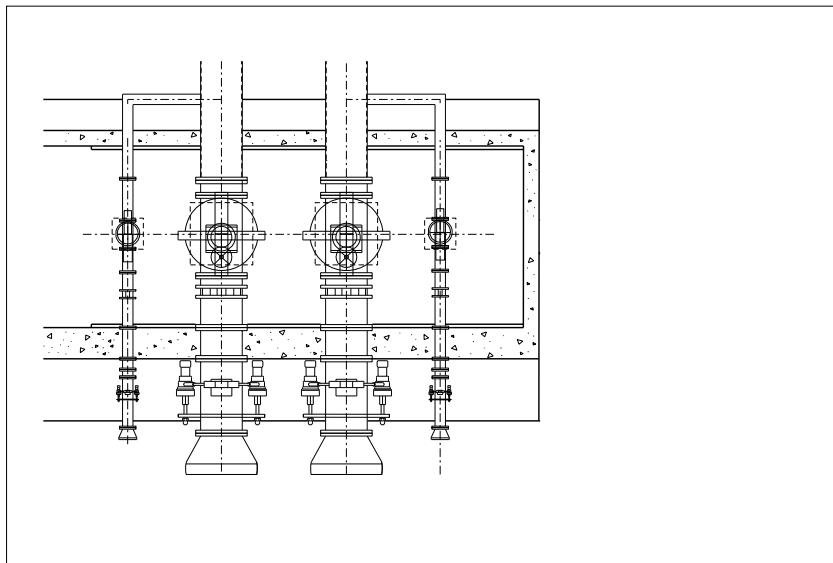
Figure 3-12

The border file is attached to the sheet file as a reference file using 'Save View' or 'Top Standard View' to set the orientation, see figure 3-13 Set the scale to the sheet file plot scale.
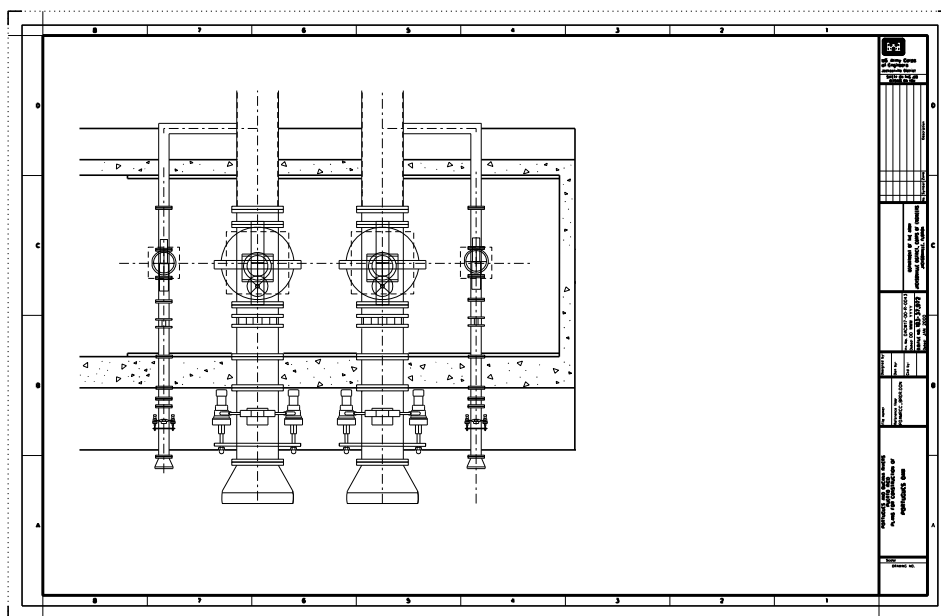
Figure 3-13

Finish the contract drawing by adding dimensions, text, notes and symbols to the sheet file, see figure 3-14. The title block information is prepared by copying the G-ANNO-TEXT-DWG (orange) text place holders into the sheet file and turning off that level in the border file reference. The border companion cell library contains a cell which can be used to populate the

title block text as an alternative to copying the text elements. Edit these place holders to reflect the contract drawing identification information.

Figure 3-14

Annotation.

Place text, scales, symbols, dimensions and notes on the drawing by using the border companion cell library, dimensioning tools and text tools to annotate the drawing. See figure 3-15 for drawing general notes and symbology guidelines. Key plans are considered as annotation, but are referenced into the sheet file from a model file.

Figure 3-15

<u>**Site Plan.**</u>

Indicate on the site plan, all work and construction limits applicable to the project. Clearly delineate the right-of-way, work limits and access and indicate topographic detail that may affect or restrict the construction.

<u>**Orientation.**</u>

General maps and site plans shall be oriented with north toward the top of the drawing. Vicinity maps shall be orientated in the same direction as the main map or the principal plan on the drawing.

Projects are laid out horizontally on a sheet.

Orient general and detail plans of canals, channels, locks, dams, and similar structures with the direction of water flow from top to bottom of the sheet, if practicable, or from left to right.

Riverbank orientation is **always** determined as being right bank or left bank by facing in direction of the water flow (downstream) see figure 3-16.

Cross sections are generally shown as if the observer were looking downstream.

However, some construction drawings of flood control projects will require the section to be shown looking upstream. For instance, downstream elevations will be unique for some projects and drawn as shown in Figure 3-17.

Work Orientation on Existing Projects: The orientation of work on existing projects shall match existing project drawings, general plans, elevations, and longitudinal sections of channels, locks, dams, and similar hydraulic control structures to match existing project drawings.
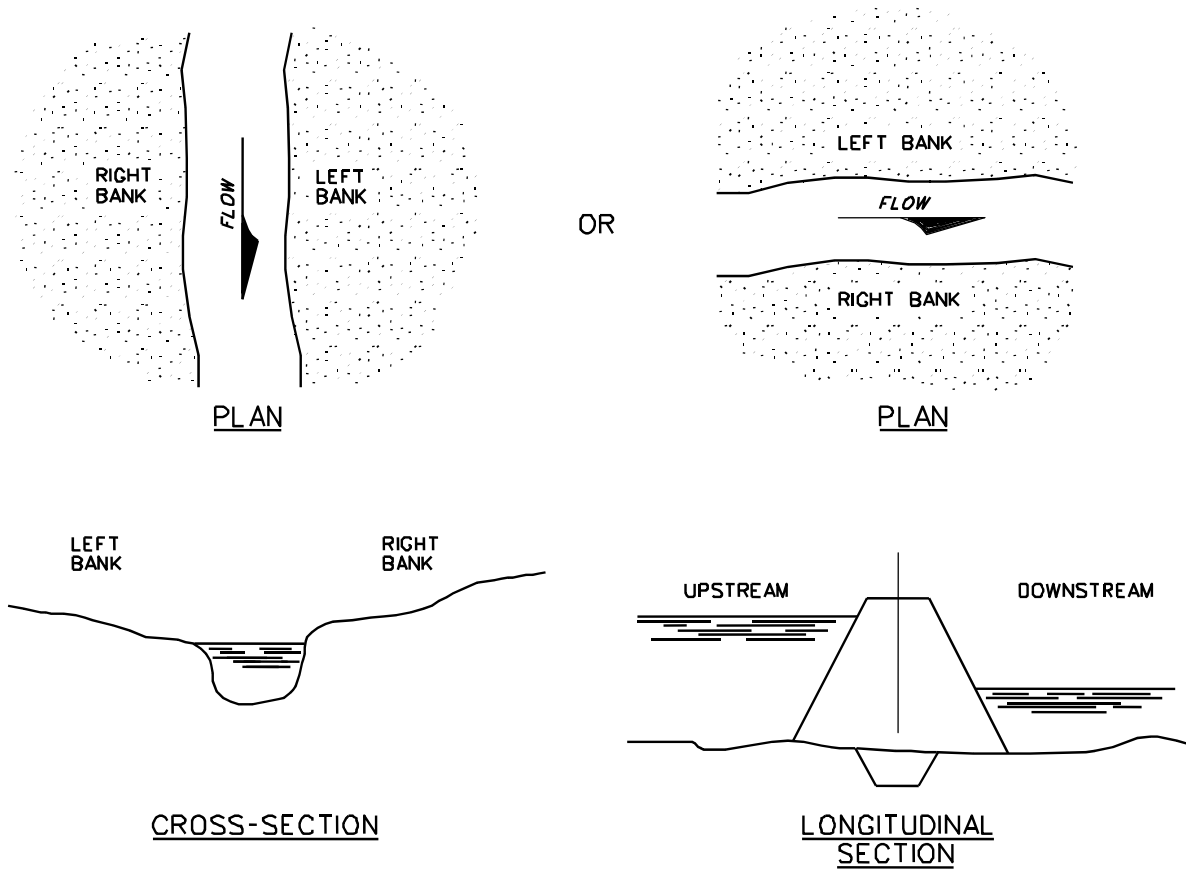
RIGHT
BANK

FLOW

LEFT
BANK

PLAN

OR

LEFT BANK

FLOW

RIGHT BANK

PLAN

LEFT
BANK

RIGHT
BANK

CROSS-SECTION

UPSTREAM

DOWNSTREAM

LONGITUDINAL
SECTION

Figure 3-16

RIGHT BANK   LEFT BANK

PLAN

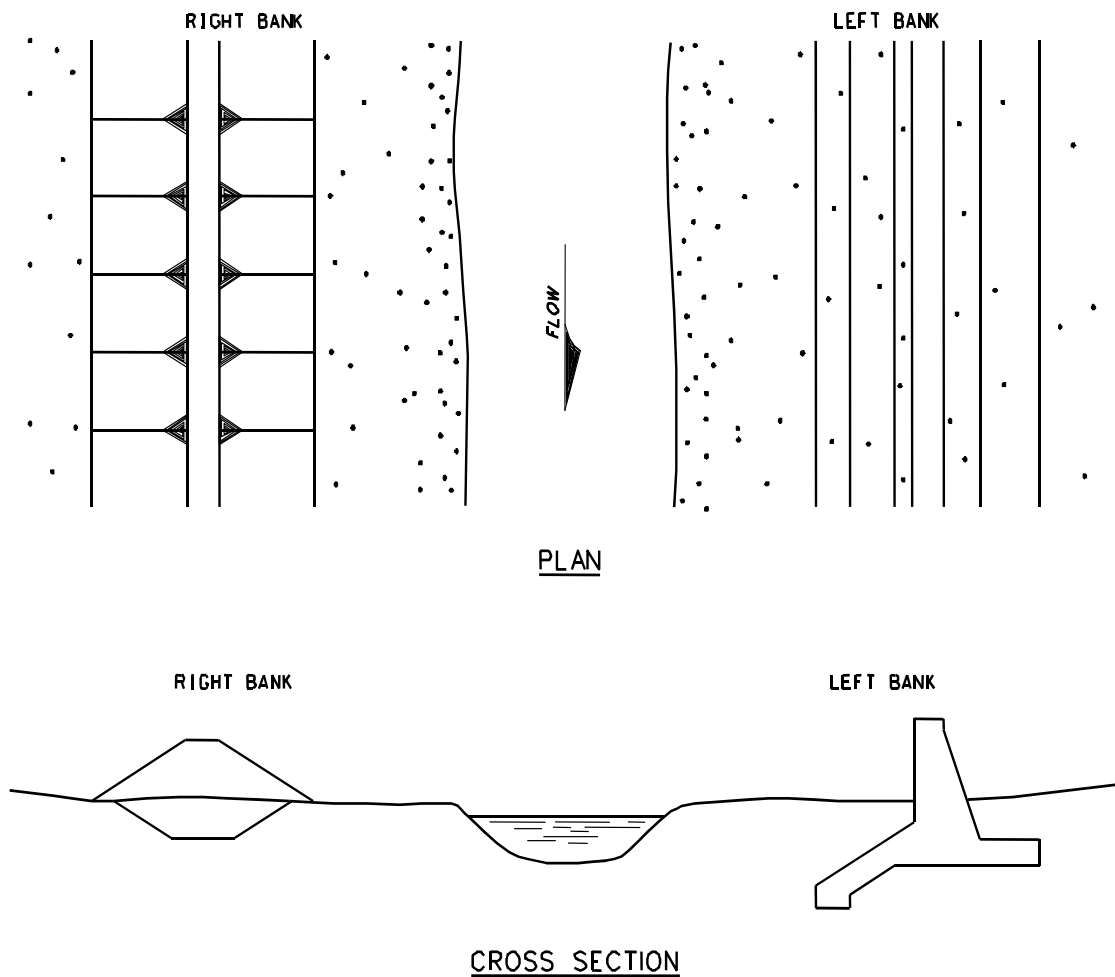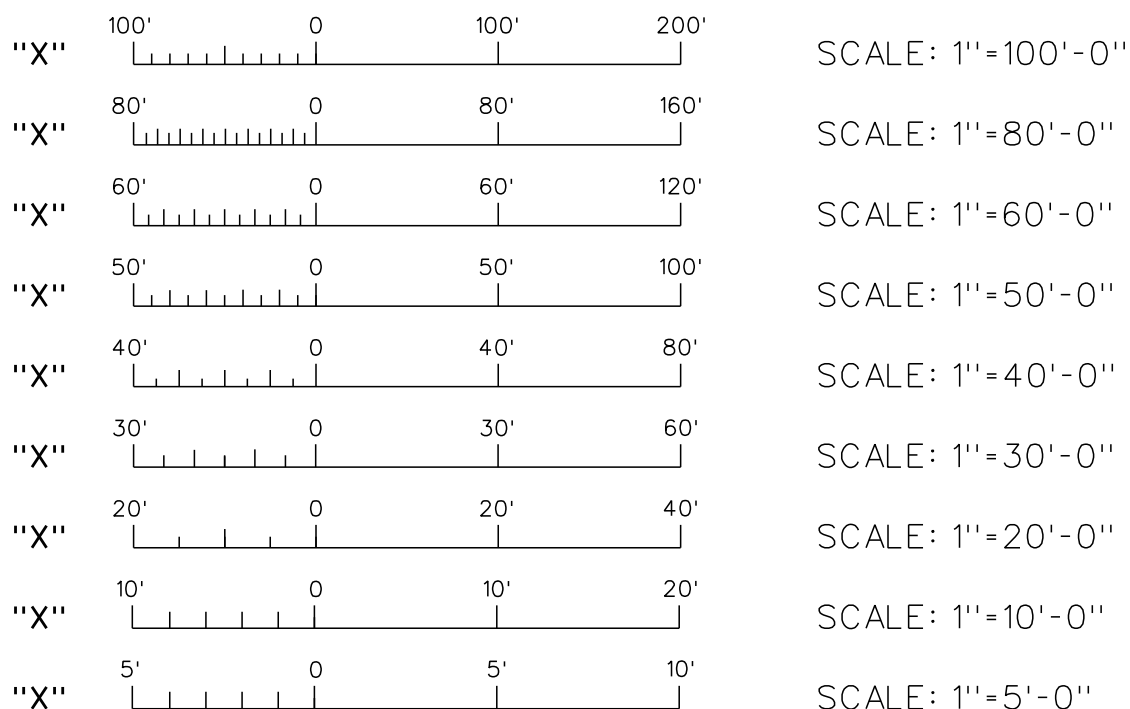RIGHT BANK   LEFT BANK
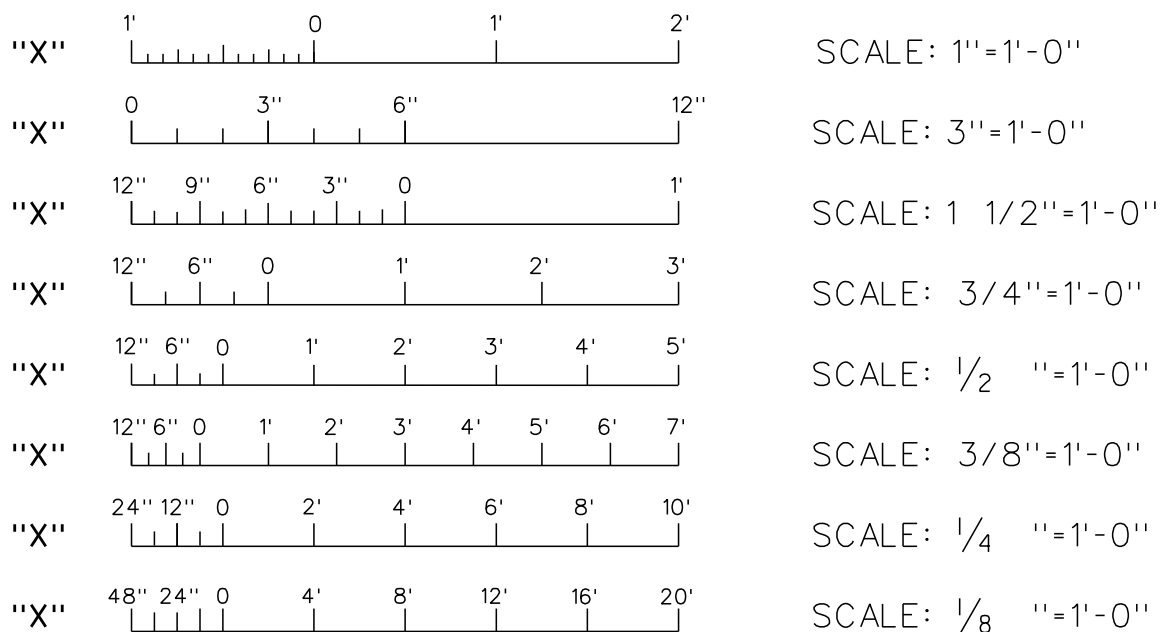
CROSS SECTION

Figure 3-17

Scales.

Use scales as exemplified in figure 3-18. The drawing shall scale to the size the drawing was prepared and scale to the indicated graphic scale size. The scale of each view, detail, or section drawn shall be indicated by a reference to a graphic scale located on the drawing. The graphic scale reference shall be entered directly below the title of the detail, view, or section using the format "SCALE: "*scale ID letter*"" under the title. In the case of diagrams, pictorials, and other drawings not prepared to any scale the word "N.T.S." not to scale shall be entered after "SCALE" under the detail, view or section title, for example: "SCALE: N.T.S."

ENGINEERING GRAPHIC SCALES

"X" SCALE: 1"=100'-0"

"X" SCALE: 1"=80'-0"

"X" SCALE: 1"=60'-0"

"X" SCALE: 1"=50'-0"

"X" SCALE: 1"=40'-0"

"X" SCALE: 1"=30'-0"

"X" SCALE: 1"=20'-0"

"X" SCALE: 1"=10'-0"

"X" SCALE: 1"=5'-0"

ARCHITECTURAL GRAPHIC SCALES

"X" SCALE: 1"=1'-0"

"X" SCALE: 3"=1'-0"

"X" SCALE: 1 1/2"=1'-0"

"X" SCALE: 3/4"=1'-0"

"X" SCALE: 1/2 "=1'-0"

"X" SCALE: 3/8"=1'-0"

"X" SCALE: 1/4 "=1'-0"

"X" SCALE: 1/8 "=1'-0"

NOTES:

SCALES TO BE IDENTIFIED ALPHABETICALLY, "A", "B", "C" PER SHEET.

Figure 3-18

Key Plan.

A key plan representing a smaller image on a single drawing should be used when plans of larger buildings, structures or site work would be too large to show on a single drawing.

The key plan shall be placed in the notes area and shall indicate the represented plan area shown on the drawing by crosshatching.

A sheet key plan is not used to show segments of a linear project with adjacent sheets. Match-line symbology is used to indicate adjoining drawings of a linear project. An optional Key Sheet may be used in the drawing set to indicate the placement of each plan sheet on the overall project. A Key Sheet shall be placed in the drawing set prior to the first plan sheet shown on the Key Sheet.

Utilization of Record Drawings Within the Contract Set.

Referenced "As-Built" drawings from previous contracts are deemed necessary for information purposes only, the words "FOR REFERENCE ONLY" shall be printed in bold letters immediately above the title block or as near thereto as practical. The original title blocks shall not be changed. All reference drawings shall be identified as such and listed in the Index of Drawings as "REFERENCE ONLY- name of record As-Built Drawing."

When 'As-Built Drawings' are used within the contract drawing set to depict work being preformed under the current contract or provide any other type of contractual requirement, each contract drawing containing an 'As-built Drawing' shall have this note included:

"THREE-QUARTER SIZED DRAWING SHOWN IS A CONTRACT DRAWING FROM PREVIOUS PROJECT(S) AND MAY NOT REPRESENT CURRENT CONDITIONS. THESE DRAWINGS ARE INCLUDED FOR REFERENCE ONLY. THESE RECORD DRAWINGS ARE NOT TO SCALE AND SHALL NOT BE USED TO DETERMINE LINEAR OR ANGULAR MEASUREMENTS. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING RECORD DRAWING INFORMATION USED DURING THE PERFORMANCE OF THIS CONTRACT. ALL KEY NOTES, GENERAL NOTES, AND NEW DETAILS SHOWN BESIDE OR BELOW THE RECORD DRAWINGS APPLY TO THIS CONTRACT."

When reference to 'As-Built Drawings' from previous contracts are deemed necessary for information only purposes, but have been destroyed, are illegible or are missing, a developed current condition drawing may be prepared as a substitute. Any contract drawing created, as a developed current condition drawing will have this statement included in the general notes.

"DEVELOPED CURRENT CONDITION DRAWING SHOWN HAS BEEN CREATED FROM AVAILABLE AS-FOUND AND/OR AS-BUILT INFORMATION. IS FOR INFORMATION ONLY, CONDITIONS, ARRANGEMENTS, DIMENSIONS AND APPLICATION HAVE NOT BEEN VERIFIED."

When the 'As-Built Drawing' is of poor quality, digital image of existing condition should be utilized to represent the condition.

Redline Procedures

These procedures are mandatory for all Army Corp of Engineers Jacksonville District employees or contracted employees, and do not apply to any outside agency or contractor.

Check prints shall be marked-up by the engineer or drawing checker using the following color notations:

Red – indicates correction, revision, or addition is required.

Green – indicates information to the technician or draftsman.

Purple – indicates deletion.

Blue – indicates information to the engineer or drawing checker.

The designer or draftsman shall mark-up redline prints with a yellow highlighter as each correction, revision, or addition is accomplished. Once all corrections, revisions, or additions are completed the redline print and a current check print of the drawing will be returned to the engineer or drawing checker.

Drawing Revision (see figure 3-19).

During the contract advertisement period revisions are amendments, after a contract has been awarded revisions are modifications.

All contract drawings to be amended or modified shall have an archive copy of the applicable sheet file(s) and model file(s) created of the pre-revision version of the file. These archive copies of amended or modified files shall be segregated from contract drawings and electronically identified as to what amendment or modification they are linked to.

Revision Symbol. Revision Symbol shall be an equilateral triangle. This triangle shall be 1.5 times the revision block size in the drawing area.

All revisions shall be flagged by a revision symbol. The revision symbol should be positioned adjacent to the change or revision. Revision symbols shall be uppercase letters in alphabetical sequence. The letters "I", "O", "Q", and "X" shall not be used.

When revisions are numerous enough to exhaust the alphabet, the revision symbol following "Z" shall be "AA", followed by "AB" and so on. The drawing index sheet shall be updated to include a revision symbol at the index listing for that drawing. When numerous changes are made to one area on the sheet and the revision symbols crowd the drawing, use a single revision symbol at the subtitle or title of the view.

How many times or locations the revision symbol is used on the drawing shall be indicated in the Number column of the Revision Block.

Location of the revision symbol on the drawing shall be shown in the Zone column of the Revision Block. If numerous revision symbols populate the entire drawing, a dash (hyphen) may be placed in the zone column.

A short description shall be placed in the Revision Block when amendment changes are to be furnished to bidders by issuing a revised drawing and the amendment documents together. The wording in the Revision Block Description column shall be "REVISED TO ACCOMPANY" the amendment. If drawings are revised descriptively, then the drawing shall be revised after the amendment, modification is issued, and the wording in the revision block description column shall be "revised to conform to amendment

You need to contact the contracting officer or project engineer to determine the type of contract revision being done. Some examples of amendment and modification revisions:

    a. Modification; "THIS DRAWING ADDED MODIFICATION SUFFIX "A""
    b. Amendment; "REVISED TO CONFORM TO AMENDMENT NO 0002"
    c. Amendment; "REVISED TO ACCOMPANY AMENDMENT NO 0005"

Filenames of contract drawings modified or amended will remain unchanged. File name of the pre-modification archive copy shall be changed according to Drawing File Naming Conventions section of this document.

When a drawing is to be replaced to consolidate numerous revisions into one change, the revision letter next in sequence shall be entered in the Revision Block. The description of the change shall be entered in the description column or reference made to a change authorization document describing the change. The following note shall be added to the drawing immediately above the Title Block "THIS DRAWING REPLACES PREVIOUS DRAWING CONTAINING REVSIONS "?" THROUGH "?"". The replaced drawing shall have the word "SUPERSEDED," added to the old original one beside the title block. The drawing file that has been replaced shall have the code "sup" added at the end of the file name.

When drawings are added to or deleted from an existing advertised/awarded contract project, a revision symbol shall be placed on the index of drawings adjacent to the added drawing. For deleted drawings, a line should be drawn through the index listing for that drawing with the word "deleted" inserted at the end of the title. The revisions block of the index drawing should also be flagged and the addition/deletion noted. For added drawings a revision symbol is placed inside the drawing identification block of the added drawing and the revision block of the index drawing should also be flagged and the addition/deletion noted.

When a drawing has received extensive revisions a single revision symbol shall be placed within the title block border, just inside the border frame, near the drawing identification block. This method should be used when the number or amount of revisions to the drawing graphics makes listing the zone of each revision impractical.

No.	Symbol	Zone	Description
1	⚠B	F5	REVISED TO ACCOMPANY AMENDMENT NO. 0007
3	⚠A	C2,B7	REVISED TO ACCOMPANY AMENDMENT NO. 0005
No.	Symbol	Zone	Description

⚠A THE GRAPHIC REVISION SYMBOL SHALL BE 1.5 LARGER THAN THE REVISION BLOCK SYMBOLOGY

NOTES:

1. START ON THE BOTTOM LINE AND GO UP.

2. BLOCK "NO." SHOWS HOW MANY TIMES THE REVISION IS SHOWN ON THE DRAWING. I.E. 3.

3. BLOCK "SYMBOL" INDICATES THE REVISION SEQUENCE SYMBOL. WE USE LETTERS.FIRST REVISION ON THE DRAWING IS 'A'. SECOND WILL BE 'B' AND SO ON. ALL REVISIONS SYMBOLS ARE ENCLOSED BY A TRIANGLE.

4. BLOCK "ZONE" INDICATE WHICH ZONE THE REVISION SYMBOL IS SHOWN ON THE DRAWING. IF THE SYMBOL IS USED IN MULTIPLE ZONES. SHOW ALL ZONES IN THIS BLOCK. IF NECESSARY THE TEXT SIZE IN THIS BLOCK MAY BE REDUCED TO FIT ALL REQUIRED INFORMATION INSIDE THE BLOCK.

5. BLOCK "DESCRIPTION" SOME STANDARD STATEMENTS ARE LISTED BELOW:
    --"THIS DRAWING ADDED MOD SUFFIX "Y" OR THIS DRAWING ADDED
       TO CONFORM TO AMENDMENT"
    --"REVISED TO CONFORM TO AMENDMENT NO 0002" (IF DRAWING IS
       DONE AFTER AMENDMENT IS ISSUED).
    --"REVISED TO ACCOMPANY AMENDMENT NO 0005 (IF DWG IS DONE
       PRIOR TO THE AMENDMENT BEING ISSUED).
    --"MODIFIED TO CONFORM TO MOD SUFFIX "Y".

6. WE DO NOT USE A REVISION CLOUD ON OUR DRAWINGS.

7. THE REVISION SEQUENCE SYMBOL ALONG WITH TRIANGLE WILL BE PLACED AT EACH LOCATION ON THE DRAWING WHERE THE REVISION APPLIES.

8. THE REVISION SEQUENCE SYMBOL ALONG WITH TRIANGLE CAN BE PLACED ON THE DETAIL. SECTION. ETC IF THERE WAS A MAJOR REVISION OF THE DETAIL.

REVISION BLOCK CONVENTION

Figure 3-19

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4 Graphic Concepts

Resources

See Appendices A and B of this document

Digital resource files can be obtained at
http://www.saj.usace.army.mil/About/DivisionsOffices/Engineering/DesignBranch/CADDManagementSupport.aspx

The sub-titles below for line Types/Styles, Dimensions, and Text should be used in accordance with the guidelines established in the PPM Appendix B. PPM Appendix B provides information on the use of DGNLIBs to manage standard presentation quality within project documents.

Line Work Delineation

Proper line work graphic delineation is essential to prepare contract drawings. The line types specified by the A/E/C CAD Standard are included in the tsaec.rsc file for Microstation users and tsaec.lin for AutoCAD users.

Line Types/Styles

Centerlines
Centerlines should extend uniformly and distinctly a short distance beyond the object or feature of the drawing unless a longer extension is required for dimensioning or for some other purpose.

Dimension Lines
Dimension lines are used to indicate the extent and direction of dimensions and are normally terminated with arrowheads.

Extension Lines
Extension lines are used to indicate the point or line on the drawing to which the dimension applies.

Leader Lines
Leader lines are used to direct notes, dimensions, or symbols on the drawing. A leader is a straight inclined line, not vertical or horizontal, except for a short horizontal portion extending to the center of the height of the first or last letter or digit of the note. Leader lines should not be bent in any way unless unavoidable. Terminate leader lines with: a loop if they end on a dimension line; with a dot, if they end within outlines of an object; with an arrowhead, if they end on the outline of an object.

Hidden Lines
Hidden Lines are line style 2, the hidden line is used to depict features that are not visible in the drawing view.

Patterning
    Cross-hatching, patterning, elements are line style 0 with a line weight of 0.

Cutting Plane
    Cutting plane line is a phantom or line style 6 and a line weight of 5. Cutting plane lines are used with section bubbles to indicate the perpendicular cutting plane passing through the drawing view.

Freehand Break Line
    Freehand break line is a solid line of line style 0 and a line weight of 5. A freehand break line is used to provide a local parallel cutting plane to depict objects located within the interior of a major feature.

Phantom Line
    Phantom line is line style 6 and a line weight of 1. Use a phantom line to show an alternative location of movable parts, object features being shown in the view for reference purposes only, or existing objects not included in the current project, but could affect the contract.

Object Lines
    An object line is a solid line of line style 0 and a line weight of 2, 3, or 5. Object lines are used for representing visible edges or shape of an object.

Line Color
    The default color table supplied with Microstation shall be used for the creation of all drawings.

Text Styles/Fonts
    The text styles/Fonts are required to conform to the Plans Preparation Manual Appendix B-7 "Text Usage"

Dimensions and Leaders

Dimension Lines
    In Architectural and Civil Works drafting the dimension line shall be a continuous, solid, line weight 0.25 mm line placed between the extension lines with filled arrow terminators at both ends. The dimension line nearest the outer most object line should be 3/8" to 1/2" from the object line. All succeeding parallel dimension lines should be 3/8" apart. The spacing of parallel dimension lines shall be uniform throughout the drawing.

Extension Line
    An extension line is a line width of 0.25 mm solid line (weight 2) that "extends" from a point on the drawing to which the dimension refers. A gap of about half of the text size should be left where the extension line would join the object outline. The extension line should extend about equal to the text size beyond the dimension line. A centerline may be used as an extension line
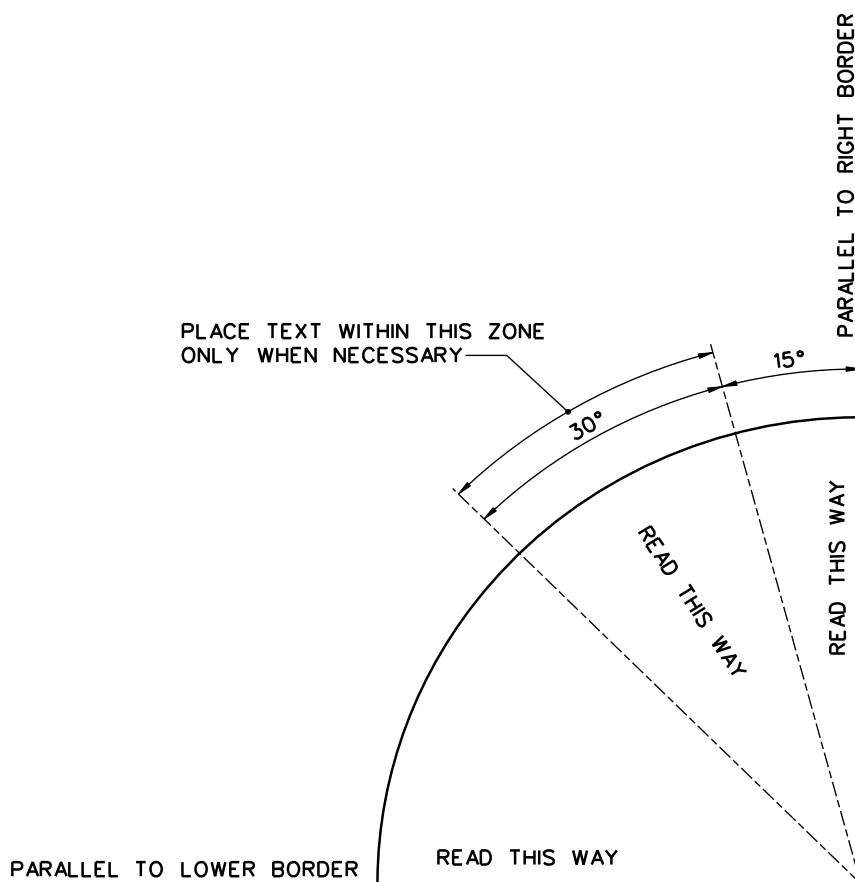
for dimensioning purposes. This commonly occurs when symmetrical, spherical, or center features are being dimensioned.

Placement of Dimension and Extension Lines

The shorter dimensions are nearest the object line. Dimension lines should not cross extension lines. It is permissible for extension lines to cross over each other. Dimension lines should not cross over each other. Dimension lines shall not overlay or be a continuation of any object line. Dimension should be aligned and grouped together as much as possible. Where a leader line crosses a dimension line the dimension line shall be continuous and the leader line shall be broken at the point it crosses the dimension line. Should an extension line cross a leader line both will be shown as solid continuous lines.

Dimension Line Terminators

There are two allowable terminators used with dimension lines. The primary terminator is a closed filled arrowhead. As an alternative a dot may be used where space does not allow use of an arrowhead. All arrowheads shall have a length equal to 1.3 times the text size and a width of 1/2 (0.5) the text size. Dot terminators shall have a diameter equal to 1/2 (0.5) of the text size.

PARALLEL TO RIGHT BORDER

PLACE TEXT WITHIN THIS ZONE
ONLY WHEN NECESSARY

15°

30°

READ THIS WAY

READ THIS WAY

READ THIS WAY
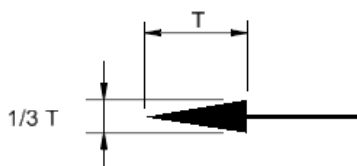
PARALLEL TO LOWER BORDER

NOTE:

1. A DRAWING SHOULD BE LETTERED SO AS TO BE
    PROPERLY READ WHEN OBSERVED FROM THE
    LOWER BORDER.

2. REQUIRING THE READER TO TURN THE DRAWING
    TO READ DIMENSIONS AND LOCAL NOTES SHOULD
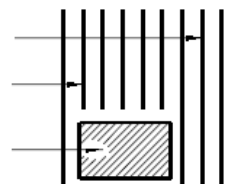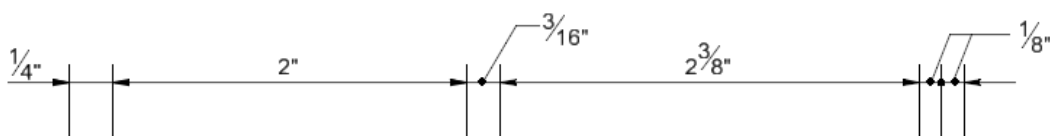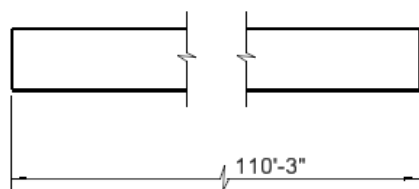   BE AVOIDED IF POSSIBLE.

Figure 4-1

DIA = ½ T

SOLID DOT

T
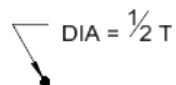
1/3 T

CLOSED ARROWHEAD

LEAVE CLEAR SPACE
AROUND ARROWHEAD

TERMINATORS

¼"   2"   3/16"   2⅜"   ⅛"

STANDARD DIMENSIONING

110'-3"

BROKEN DIMENSION LINE
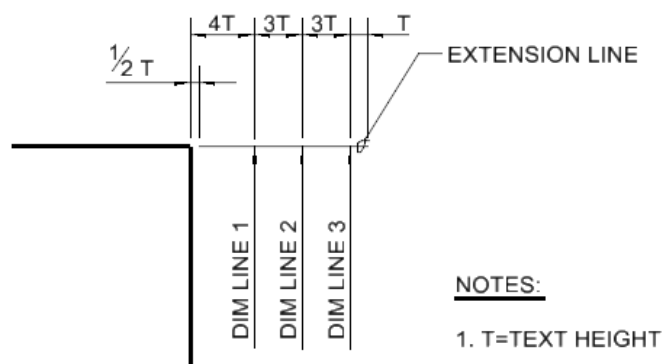
8'-0"

FOR CONTINUATION

2'-0"
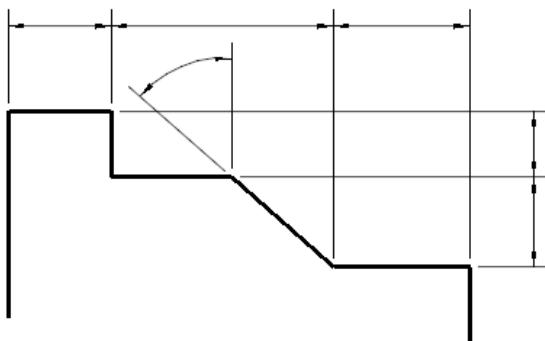* N.T.S.
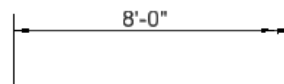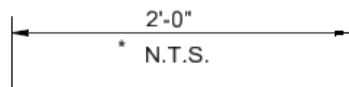
* NOT TO SCALE
  USE WHEN REQUIRED

DIMENSIONING IN CROWDED AREAS
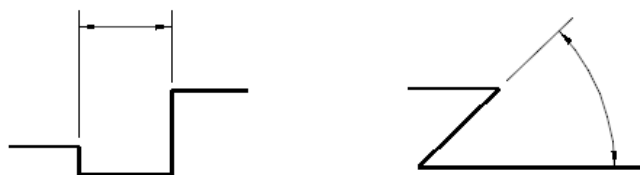
DIMENSIONS

Figure 4-2

DIMENSION AND EXTENSION LINE SPACING

NOTES:

1. DO NOT BREAK EXTENSION LINES THAT
   CROSS OTHER EXTENSION LINES OR
   DIMENSION LINES.

USE OF EXTENSION LINES

Figure 4-3

Leaders.

A leader line is a solid, 0.25 mm weight, continuous line leading from a local note or dimension to an object line, ending in a terminator. In Architectural and Civil Works drafting there are three allowable terminators for leader lines, closed filled arrowhead, solid dot, and a loop. When the leader refers to a geometric shape or feature the leader line should terminate in a closed filled arrowhead touching the object line. When the leader line refers to an area inside a geometric shape or feature, the leader line shall terminate in a solid dot. If the leader line is referring to a linear feature or object the leader line shall terminate in a loop.

Leader Line Composition

All leader lines shall be composed of one element with two or three segments. As a minimum each leader line shall have a leader shoulder consisting of a horizontal line about twice the text size in length and one or two straight leader lines going from the leader line shoulder to the object line. There shall be a half text size gap between the note text and the leader line shoulder. The leader line shoulder shall begin at mid height of the note text at the beginning or end of the note for single line text. If the note has multiple lines of text leader lines to the left shall have the leader line shoulder start at mid height of the top line of text and continue start at mid height of the bottom line of text and continue on to the right side of the note. For multiple line notes with a right side leader line the leader line shoulder may be longer than twice the text size and should be as long as required.

Leader Line to a Circle

A leader to a circle should point to the center of the circle but terminate at the circle object line. Leader lines in proximity to each other should be drawn parallel to each other. Leaders should cross as few lines as possible. If a leader line must cross a dimension line the leader line shall be broken at the crossing point. Leader lines shall not cross each other. Leader lines must not be drawn parallel to object or centerline. Do not draw excessively long leader lines, instead repeat the note and leader line as many times as required to adequately explain the feature.

Direction of Dimension Figures and Text

The aligned system of directions shall be used for Architectural and Civil Works drawings. All dimension figures are aligned with the dimension line so that they may be read from the bottom of the drawing or the right side of the drawing. Dimensions and notes with attached leader lines shall always be aligned with the bottom of the drawing.
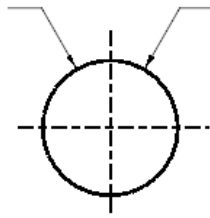
LEADERS TO CIRCLES SHALL
BE IN RADIAL DIRECTIONS
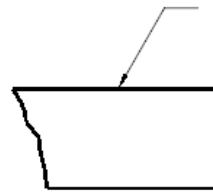
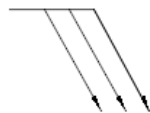LEADERS SHALL BE AT A 30°-60°
ANGLE TO OBJECT SURFACE

SINGLE ELEMENT,
TWO SEGMENT
LEADER

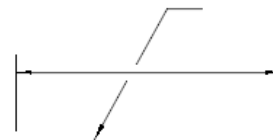MULTIPLE ELEMENT,
THREE SEGMENT
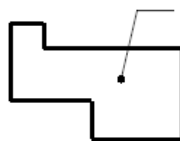LEADER

SINGLE ELEMENT,
THREE SEGMENT
LEADER

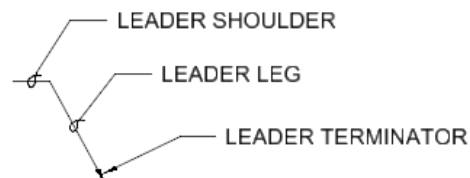MULTIPLE ELEMENT,
MULTIPLE SEGMENT
LEADER

CONTINUOS LEADER

BREAK LEADER LINE
AROUND DIMENSION
LINE

LEADER USED
TO NOTE AN
AREA

LEADER SHOULDER

LEADER LEG

LEADER TERMINATOR

LEADER LINE CONVENTION

Figure 4-4

Dimension Figures

Inches are indicated by the symbol ', such as 5'-9". For metric drawings it is standard practice to eliminate the mm suffix unless confusion could occur. If meters and millimeters are used on the same drawing all meter dimensions will include the suffix m after the numeral and millimeter dimensions will have the suffix mm after the numeral.

Arc Dimensioning

A circular arc is dimensioned in the view in which its true shape is shown by giving the numerical value of its radius, followed by a space and the abbreviation R, such as 11'-3" R. For metric drawings the abbreviation R shall proceed the numerical valued without a space between them, such as R 28.5. The centers of arcs may be marked with a small cross; normally each leg of the cross will be twice the text size. The preferred method to dimension an arc is to place both the dimension line and dimension figure inside the arc, with the dimension line going from the arc center to the object line. If space is limited the dimension line may be placed inside the arc with the text outside of the arc.

For very small arcs or if space is severely restricted arcs may be dimensioned by use of a leader line.

For arcs of very large radii the arc may be dimensioned by the use of a false center. A center mark is placed in the direction of the truce center, but within the allowable drawing area. A dimension line is the started at the false center but is "jogged" or "zigzagged" before touching the arc object line. The dimesionsion figure is then placed over a straight portion of the jogged dimension line.

Dimensions On or Off Views

Dimensions should not be placed upon a view unless doing so promotes the clearness of the drawing. The ideal form is to have all dimensions and notes placed outside the graphic view. Place dimensions outside of the graphic view where they will be closer to the features dimensioned. This must be done particularly for complicated drawings.

Dimensioning of Holes

A standard note with attached leader line usually specifies the size of a hole. The leader of the note is drawn pointing towards the center of the hole but terminates at the hole object line with a closed filled arrowhead. The dimension figure of a hole note shall consist of the numerical value followed by a space and the abbreviation DIA, such as 4'-3" DIA or 1-1/2" DIA. For metric drawings, the diameter symbol shall precede the numerical value within the dimension figure, shown as Ø54.

Notes

It is usually necessary to supplement the graphics and direct dimensions with notes. Notes shall be concise statements using the simplest words and phrases for conveying the intended meaning. Indefinite terms such as "and/or", "etc.", "e.g." and "i.e." shall not be used. Use commas to separate blocks of three digits or any number with four or more digits.

Citing Reference Documents

Reference documents shall be cited using "per", "conforming to", "as specified", and "in accordance with". The word "shall" establishes a mandatory requirement. The word "will" establishes a declaration of purpose on the part of the design agency. The words "should" or "may" are used when it is necessary to express non-mandatory provisions.

Space Utilization

To save space do not use a period after commonly abbreviated words such as max, min, typ, spa, etc. Use a period only after abbreviations that spell a word, such as no., and abbreviations that are not commonly recognized. The ampersand symbol shall not be used in titles, subtitles, and notes, always use the word "and". Refer to the Uniform Drawing System and ANSI Y1.1 for standard abbreviations.

Note Classification

Notes are classified as General Notes when it applies to an entire drawing and as Local Notes when they apply to specific items. Requirements specified by local notes apply only to the areas or points indicated or called out in the note. Keynotes are notes that apply only to the area or point of application but are too lengthy or complicated to place within the graphic area. General notes are grouped together and presented in paragraph form while local notes and keynotes are used in conjunction with leader lines.

General Notes.

General notes shall be numbered consecutively as a single list starting with 1. **Note numbers of deleted notes shall not be reused after plans and specifications have been issued for solicitation and have inserted in place of the deleted note "not used".**

Reference to standardization or other technical documents shall be by basic identifier, excluding revision level, except where identification of a specific issue is essential to drawing interpretation.

Notes shall not include contractual requirements, such as statements of costs; time and place of delivery; methods of payment; and requirements for submission, approval, or distribution of data or reports.

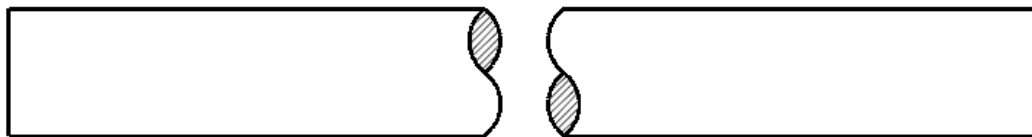General notes, keynotes, and local notes shall use a justification of top-left.

    a. All general notes shall be numbered.
    b. Standard punctuation and grammar rules apply.
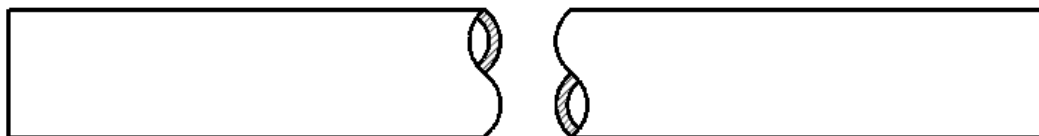   c. For multi line notes the second and successive lines shall be indented to show they belong to the same note.
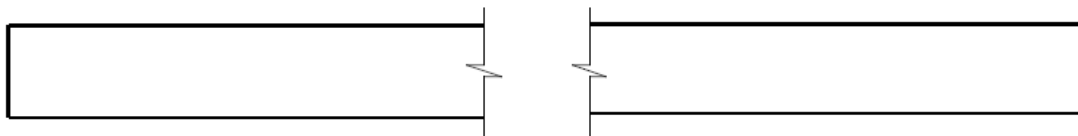
LONG BREAK LINE

SHORT BREAK LINE

SOLID ROUND BREAK LINE

CYLINDER BREAK LINE

CYLINDER BREAK LINE
PARALLEL TO VIEWING PLANE

NOTE:

1. THIN BREAK LINES SHALL BE A LINE WEIGHT OF 0.25mm, LENGTH OF THE
    BREAK ZIGZAG IS 1 TO 1.25 TIMES THE TEXT SIZE.

2. SHORT BREAK LINES SHALL BE A LINE WEIGHT OF 0.50mm, HEIGHT OF THE
    HEIGHT OF THE BREAK LINE IS 1 TO 1.25 TIMES THE TEXT SIZE.

3. SOLID ROUND BREAK LINES AND CYLINDER BREAK LINES SHALL HAVE A
    LINE WEIGHT EQUAL TO THE ADJOINING OBJECT LINE. ANY PATTERNING
    OR POUCHE USED IN THE BREAK SHALL HAVE A LINE WEIGHT OF 0.18mm.

Figure 4-5

Local Notes

Local notes should be located as close as possible to the object it is describing.

Local notes should be connected to the object by a leader line with the correct terminator.

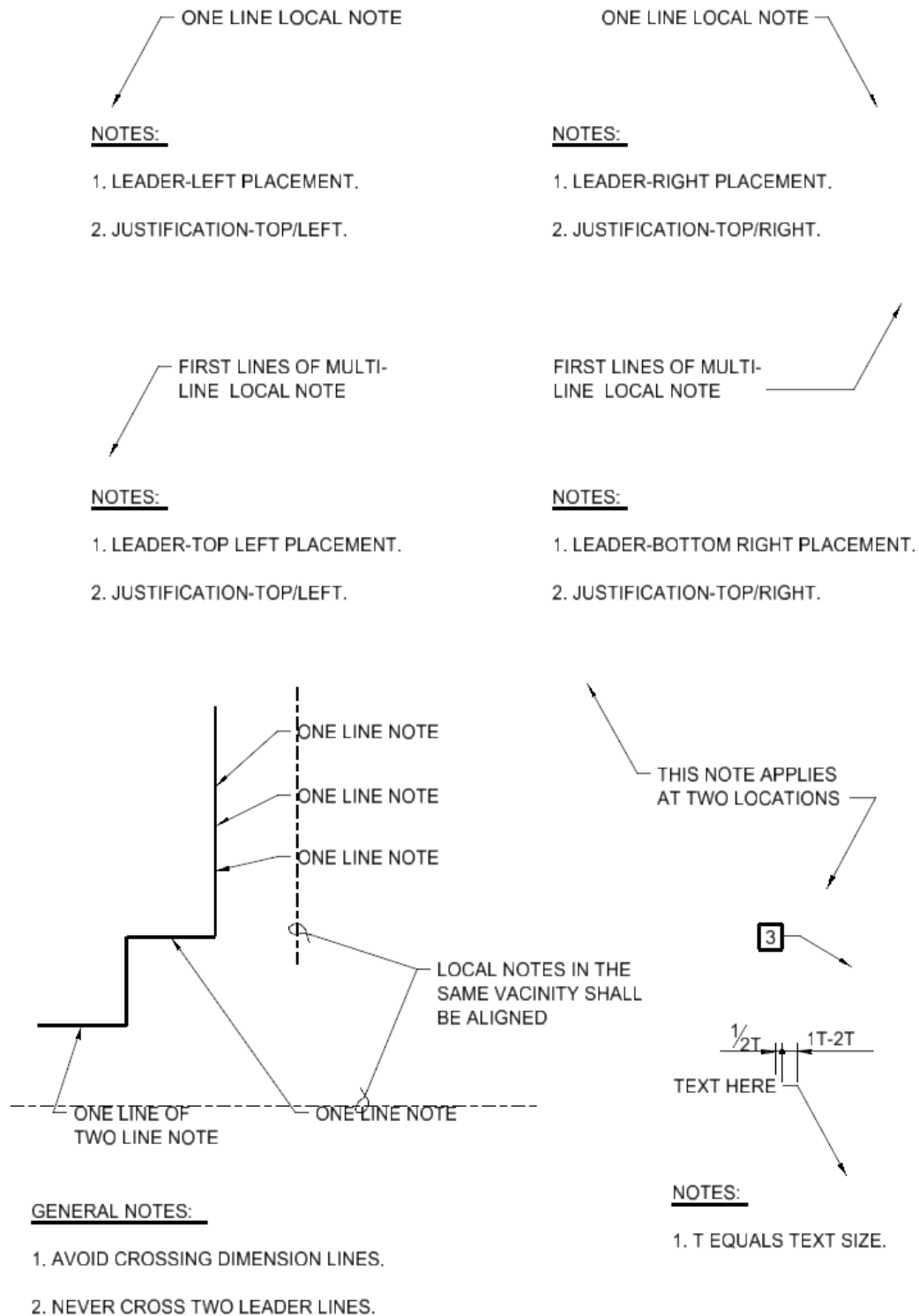Avoid excessively long leader lines by repeating the note at each location it is required.

Lettering

Lettering on drawings shall be legible and scaled correctly to the full size plotted drawing. Either inclined or vertical lettering shall be used based upon the subject matter. The preferred slope for the inclined letters is 22 deg. Uppercase letters shall be used for all lettering on drawings unless the subject matters requires otherwise.

Text Feature	Font	A&B [1]	D, E & F [1]
General Notes	Arial	0.080"/#80	0.120"/#120
Text & Local Notes	Arial	0.080"/#80	0.120"/#120
Dimensions	Arial	0.080"/#80	0.120"/#120
Symbology Data Fields	**Arial Black**	0.080"/#80	0.120"/#120
Headings	Arial	0.100"/#100	0.140"/#140
Hydrology Text	*Arial (22° slant)*	0.080"/#80	0.120"/#120
Schedules & Tables	Arial	0.080"/#80	0.120"/#120
Section & Detail Data Fields	**Arial Black**	0.080"/#80	0.120"/#120
Subtitles	**Arial Black**	0.125"/#125	0.175"/#175
Titles	**Arial Black**	0.175"/#175	0.200"/#200
Status Markings	**Arial Black**	0.125"/#125	0.175"/#175

[1] Drawing size identification

Table 4-1

ONE LINE LOCAL NOTE

NOTES:

1. LEADER-LEFT PLACEMENT.

2. JUSTIFICATION-TOP/LEFT.

ONE LINE LOCAL NOTE

NOTES:

1. LEADER-RIGHT PLACEMENT.

2. JUSTIFICATION-TOP/RIGHT.

FIRST LINES OF MULTI-LINE LOCAL NOTE

NOTES:

1. LEADER-TOP LEFT PLACEMENT.

2. JUSTIFICATION-TOP/LEFT.

FIRST LINES OF MULTI-LINE LOCAL NOTE

NOTES:

1. LEADER-BOTTOM RIGHT PLACEMENT.

2. JUSTIFICATION-TOP/RIGHT.

ONE LINE NOTE

ONE LINE NOTE

ONE LINE NOTE

LOCAL NOTES IN THE SAME VACINITY SHALL BE ALIGNED

ONE LINE OF TWO LINE NOTE

ONE LINE NOTE

GENERAL NOTES:

1. AVOID CROSSING DIMENSION LINES.

2. NEVER CROSS TWO LEADER LINES.

THIS NOTE APPLIES AT TWO LOCATIONS

3

½T   1T-2T

TEXT HERE

NOTES:

1. T EQUALS TEXT SIZE.

LEADER LINE CONVENTION

Figure 4-6

Symbology Convention

Symbols and conventions serve two purposes. One is to simplify the drawing and improve comprehension. The other is to follow or establish a national standard, which is easily recognized and acceptable. Symbols shall always be shown in the legend on the drawing where it is first used or on a general symbols, notes, and abbreviations drawing.

All symbology used to prepare contract drawings shall conform to the Tri-Service A/E/C CAD Standard; Appendix D. Microstation users shall use the A/E/C CAD Standard Symbols .dgn cell libraries. AutoCAD users shall use the A/E/C CAD Standard Symbols .dwg files.
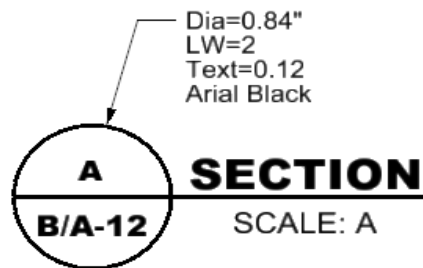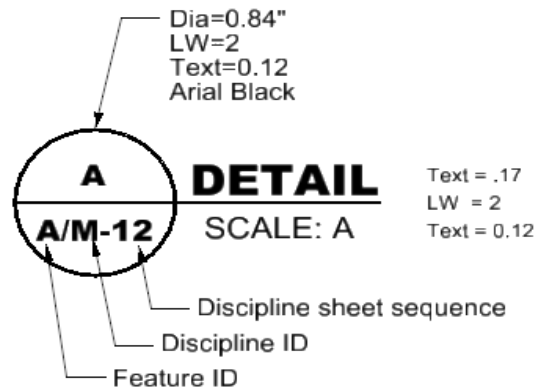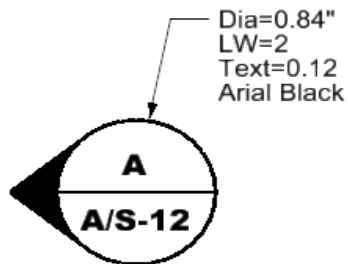
Dia=.36"
LW=2
Text=0.12
Arial Black

0.173"

(A)

LW=2
Text=0.12
Arial Black

▲AB

0.2"

LW=2
Text=0.12
Arial Black

A

0.5"

0.38"

Dia=.36"
LW=2
Text=0.12
Arial

(AB)

LW=2
Text=0.12
Arial Black

ABC

0.412"   0.078"   0.156"

LW=2
Text=0.12
Arial Black

AB

0.25"   0.25"

LW=2
Text=0.12
Arial Black

ABCDE

0.733"   0.251"

LW=2
Text=0.12
Arial Black

A

0.25"   0.25"

LW=2
Text=0.12
Arial

A

0.417"   0.361"

EL 12.0

Dia=.09"
Text=0.12
Line= 2
Arial

LW=1
Text=0.12
Arial Black

5

0.414"   0.358"

LW=1
Text=0.12
Arial Black

F33

0.648"   0.349"

Dia=0.84"
LW=2
Text=0.12
Arial Black

A
A-123

Figure 4-7

Dia=0.84"
LW=2
Text=0.12
Arial Black

A
B/C-12

Dia=0.84"
LW=2
Text=0.12
Arial Black

A
B/E-12

Dia=0.84"
LW=2
Text=0.12
Arial Black

A
A/S-12

Dia=0.84"
LW=2
Text=0.12
Arial Black

A
A/M-12   **DETAIL**
            SCALE: A

Text = .17
LW = 2
Text = 0.12

— Discipline sheet sequence
— Discipline ID
— Feature ID

Dia=0.84"
LW=2
Text=0.12
Arial Black

A
B/A-12   **SECTION**
            SCALE: A

Text = 0.17
Line = 2
Text = 0.12

Figure 4-8

SUBTITLES: FONT: ARIAL BLACK
            TEXT=0.175"
            LW=2
            FONT: ARIAL
            TEXT=0.120"

ELEVATION   **SECTION**
SCALE: SCALE:

⅛ T
¼ T

SUBTITLES WITH
CALLOUT BUBBLE:

A
A/S-13 **SECTION**
        SCALE:
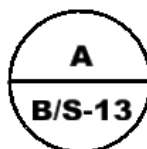
A
B/S-13 **DETAIL**
        SCALE:

NOTES:

1. WHEN ONLY ONE SUBJECT APPEARS ON A DRAWING, AND ITS TITLE APPEARS
   IN THE TITLE BLOCK, A SUBTITLE SHOULD BE SHOWN UNDER EACH VIEW OR
   DETAIL ON THE DRAWING.

2. T EQUALS TEXT HEIGHT.

TITLE: **BULKHEAD RECESS**   **NEEDLE BEAM**

FONT: ARIAL BLACK
TEXT=0.200"   **SECURITY GATE**
LW=3

⅛ T
¼ T

NOTES:

1. WHEN MORE THAN ONE SUBJECT APPEARS ON A DRAWING, A TITLE SHOULD BE
   SHOWN UNDER EACH SUBJECT. A SUBTITLE IS THEN PLACED UNDER EACH
   VIEW OR DETAIL OF THE SUBJECT

2. TEXT HEIGHT IS CALCULATED BY MULTIPLYING THE TEXT BASE SIZE BY THE PLOT
   SCALE. FOR EXAMPLE TITLE TEXT IN A DRAWIGN THAT WILL BE PLOTTED AT 1" = 100'
   WOULD BE EXPRESSED AS .2 X 100 = 20' HIGH TEXT.

3. USERS SHOULD USE THE TEXT STYLES PROVIDED IN THE STANDARD DGNLIB FOR
   TEXT AND DIMENSIONS (USACE-Dim-TextstylesTT.dgnlib).

GENERAL NOTES:

1. SUBJECT TITLES AND VIEW SUBTITLES SHALL BE BRIEF AND SIMPLE.

2. CENTER ALL TITLES AND SUBTITLES BELOW THEIR SUBJECTS.

3. INDICATE UNDER EACH VIEW WHEN NOT DRAWN TO SCALE.
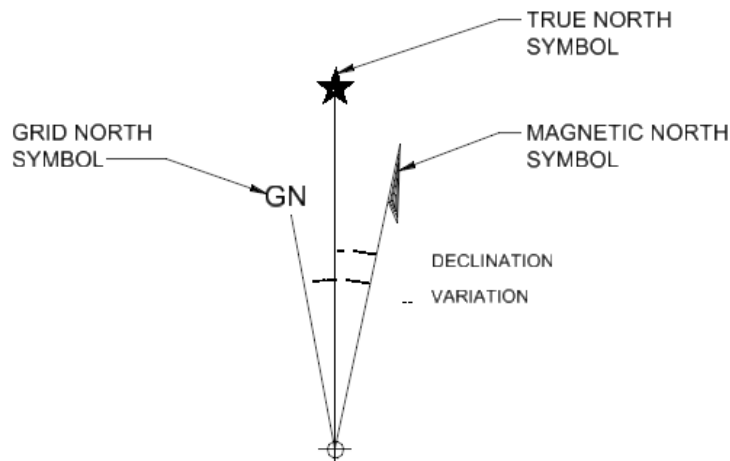
SUBJECT TITLES

Figure 4-9

REPORTS

CIVIL WORKS
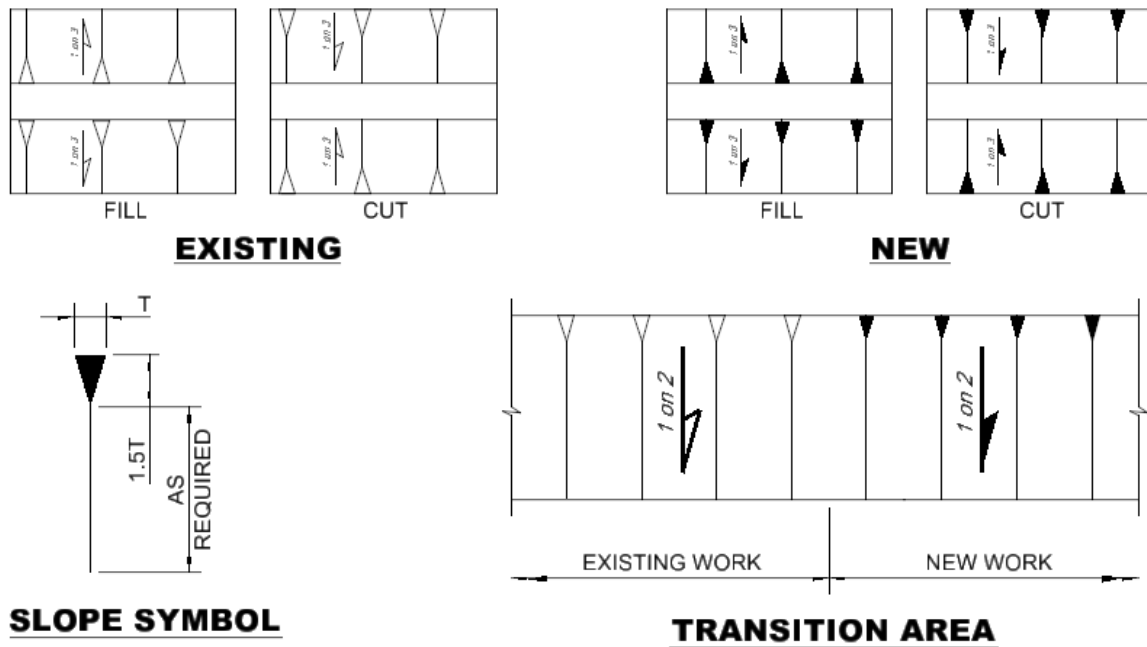CONTRACT DRAWINGS

MILITARY CONSTRUCTION
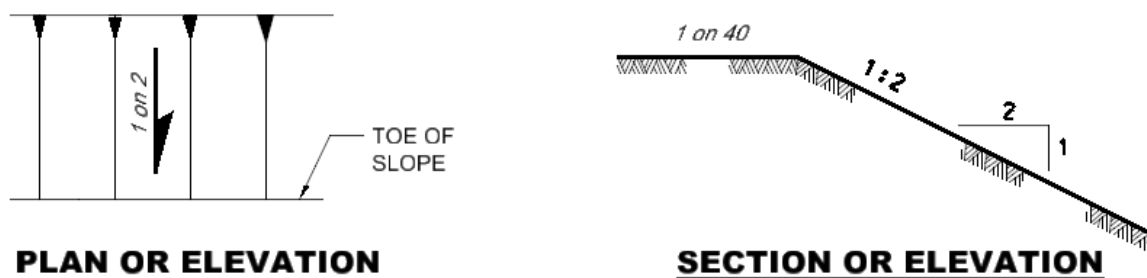CONTRACT DRAWINGS

N

N

N

GEODETIC SURVEYS AND MAPS

TRUE NORTH
SYMBOL

GRID NORTH
SYMBOL

MAGNETIC NORTH
SYMBOL

GN

DECLINATION

VARIATION

NORTH ARROW CONVENTIONS

Figure 4-10

FILL   CUT   FILL   CUT

EXISTING   **NEW**

SLOPE SYMBOL   **TRANSITION AREA**

EXISTING WORK   NEW WORK

GRADE SYMBOLOGY

PLAN OR ELEVATION   **SECTION OR ELEVATION**

TOE OF SLOPE

1 on 40

1:2

2
1

NOTES:

1. GIVE SLOPE AS RATIO OF THE VERTICAL RISE ON A HORIZONTAL DISTANCE.

2. NEW WORK WILL BE STRAIGHT LINES.
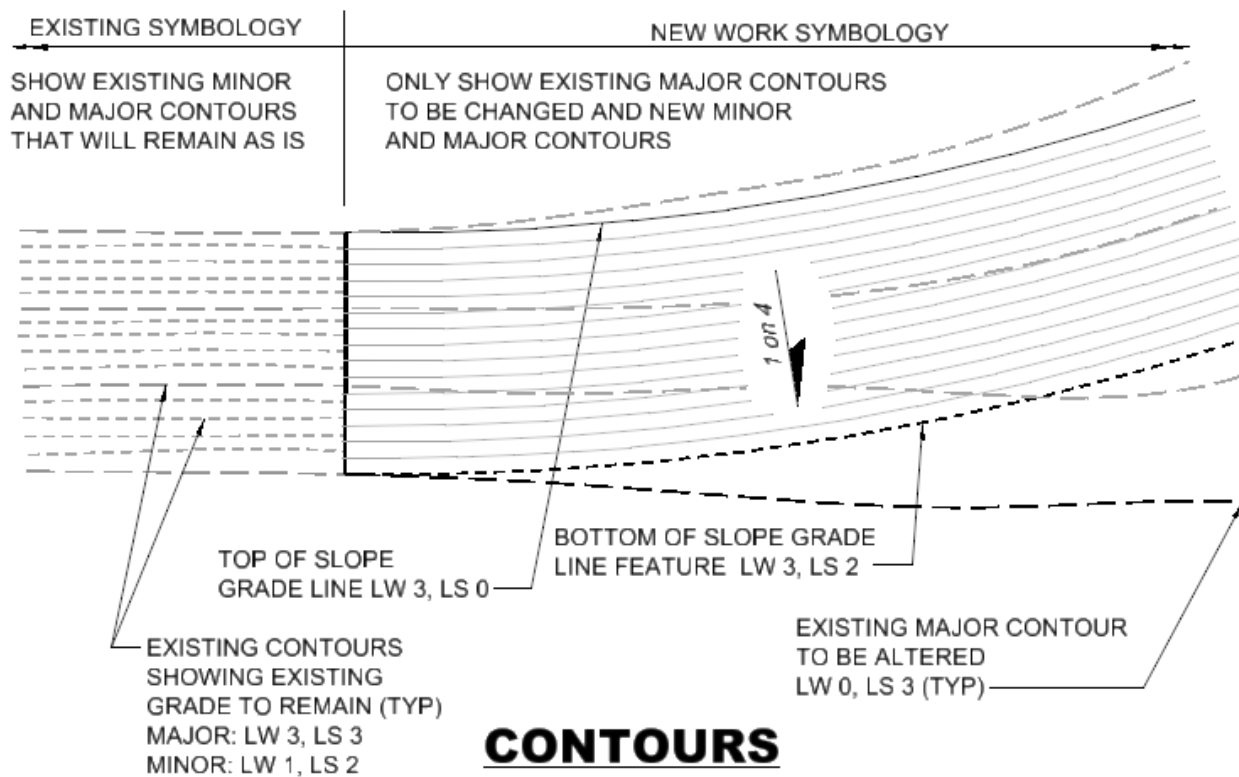
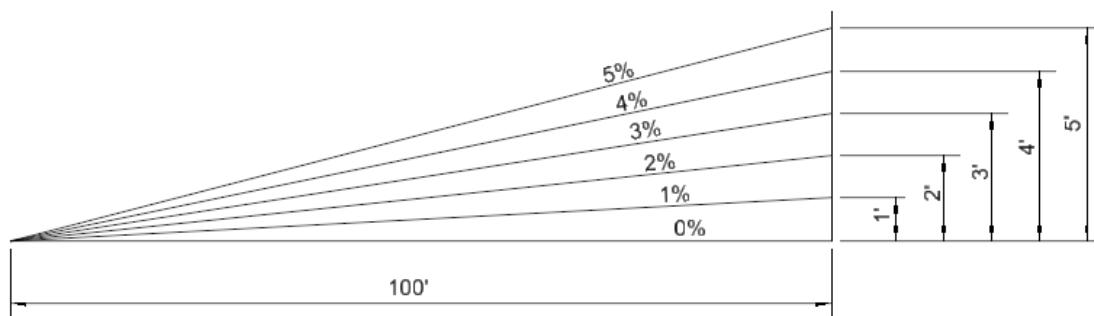3. VARY SPACING OF SLOPE LINES TO SUIT SCALE OF DRAWING.

S=0.005

+2.8750 %   -3.30 %

(WHEN CROWDED)

GRADES

Figure 4-11

EXISTING SYMBOLOGY | NEW WORK SYMBOLOGY

SHOW EXISTING MINOR
AND MAJOR CONTOURS
THAT WILL REMAIN AS IS

SHOW NEW SLOPE SYMBOLS

1 on 4

BOTTOM OF SLOPE GRADE
LINE FEATURE LW 3, LS 2

TOP OF SLOPE GRADE
LINE FEATURE LW 3, LS 0

EXISTING CONTOURS
TO REMAIN (TYP)
MAJOR: LW 3, LS 3
MINOR: LW 1, LS 2

SYMBOLOGY

EXISTING SYMBOLOGY | NEW WORK SYMBOLOGY

SHOW EXISTING MINOR
AND MAJOR CONTOURS
THAT WILL REMAIN AS IS

ONLY SHOW EXISTING MAJOR CONTOURS
TO BE CHANGED AND NEW MINOR
AND MAJOR CONTOURS

1 on 4

BOTTOM OF SLOPE GRADE
LINE FEATURE LW 3, LS 2

TOP OF SLOPE
GRADE LINE LW 3, LS 0

EXISTING CONTOURS
SHOWING EXISTING
GRADE TO REMAIN (TYP)
MAJOR: LW 3, LS 3
MINOR: LW 1, LS 2

EXISTING MAJOR CONTOUR
TO BE ALTERED
LW 0, LS 3 (TYP)

CONTOURS

TOPOGRAPHY

Figure 4-12

1% SLOPE RISE 1' IN DISTANCE OF 100'
2% SLOPE RISE 2' IN DISTANCE OF 100'
2.5% SLOPE RISE 2½' IN DISTANCE OF 100'
2.75% SLOPE RISE 2¾' IN DISTANCE OF 100'

PERCENTAGE
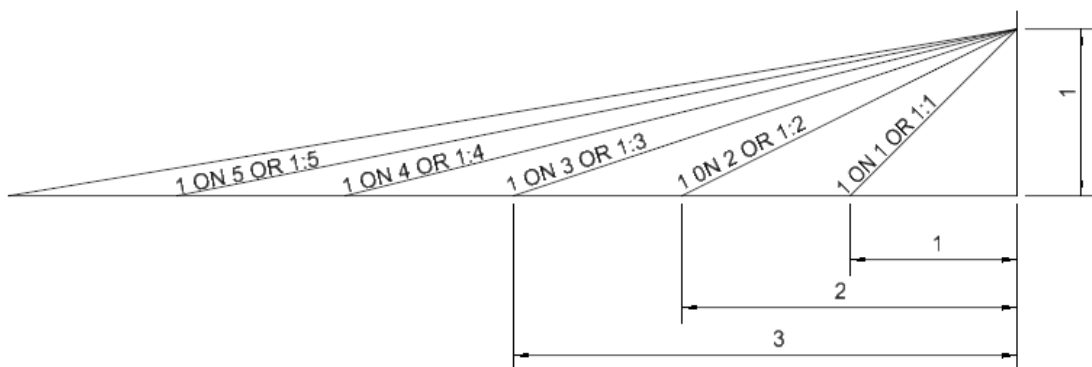
1 ON 1 OR 1:1 SLOPE RISE 1' IN DISTANCE OF 1'
1 ON 2 OR 1:2 SLOPE RISE 1' IN DISTANCE OF 2'
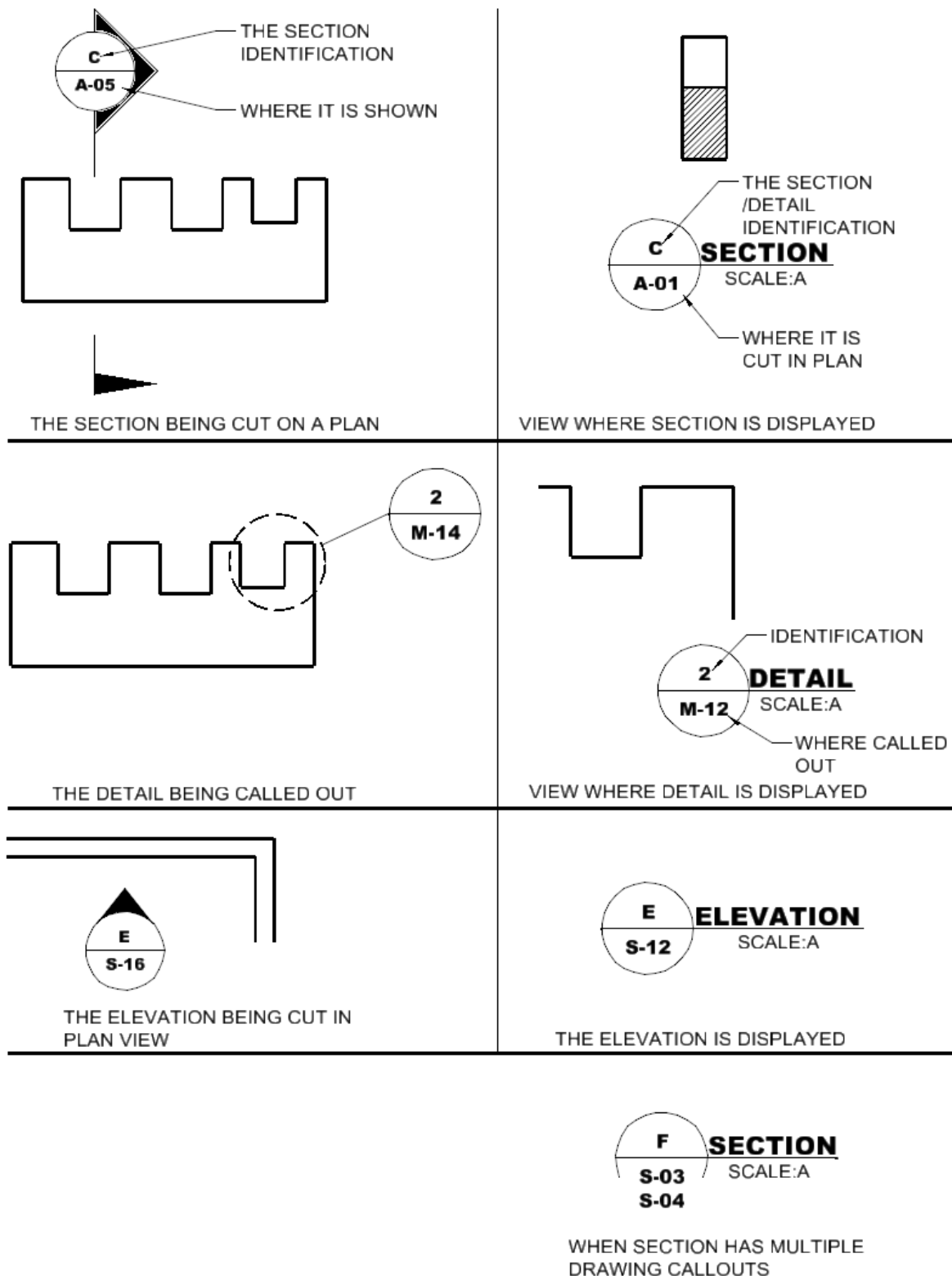1 ON 3 OR 1:3 SLOPE RISE 1' IN DISTANCE OF 3'

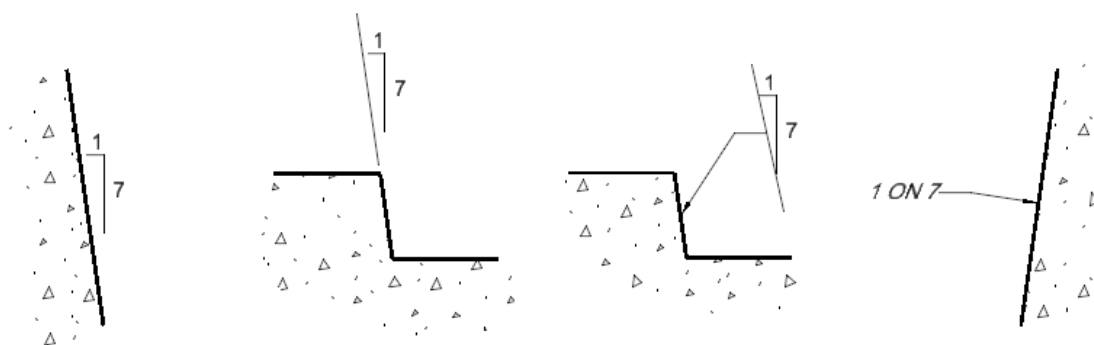### RATIO
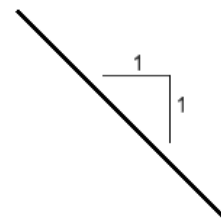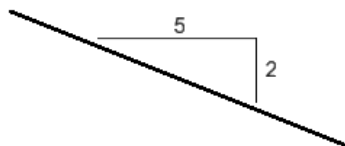
ILLUSTRATION

SLOPE EXPRESSIONS

Figure 4-13

THE SECTION
IDENTIFICATION

C
A-05

WHERE IT IS SHOWN

THE SECTION BEING CUT ON A PLAN

THE SECTION
/DETAIL
IDENTIFICATION

C
A-01

SECTION
SCALE:A

WHERE IT IS
CUT IN PLAN

VIEW WHERE SECTION IS DISPLAYED

2
M-14

THE DETAIL BEING CALLED OUT

IDENTIFICATION

2
M-12

DETAIL
SCALE:A

WHERE CALLED
OUT

VIEW WHERE DETAIL IS DISPLAYED

E
S-16

THE ELEVATION BEING CUT IN
PLAN VIEW

E
S-12

ELEVATION
SCALE:A

THE ELEVATION IS DISPLAYED

F
S-03
S-04

SECTION
SCALE:A

WHEN SECTION HAS MULTIPLE
DRAWING CALLOUTS

DETAIL AND SECTION CALLOUTS

Figure 4-14

PLAN VIEW

SECTION VIEW

KEY NOTES:

1 ONLY FOR CROWDED CONDITIONS.

ELEVATION (HEIGHT) INDICATIONS

Figure 4-15

SECTION OR ELEVATION

BATTER

NOTES:

1. GIVE BATTER AS A RATIO OF THE VERTICAL RISE TO THE HORIZONTAL OFFSET.

2. APPLICABLE FOR CONCRETE WORK OR ROCK EXCAVATION.

CENTERLINE INDICATIONS

NOTES:

1. SIZE OF THE "C" SHOULD BE EQUAL TO THE TEXT SIZE.

Figure 4-16

Drawing Scales

Typical drawing scales for both SI and inch-pound measurements are indicated in ERDC/ILT TR-01-6 Tables 13 and Table 14.

Dual Units

Only one unit system should be used on the projects.

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5 CAD Standards Compliance

Resources

See PPM Appendices A and C

Compliance Review

Each sheet file and model file included in the contract drawings shall be reviewed for compliance with the Jacksonville District's standards. The referenced CAD Resources web link contains the Workspace including the configurations to incorporate the Microstation Standards Checker which has been preset with the settings conforming to the AEC CAD Standard graphic definistions.

Preparation of CAD Drawings Prior to Publication

Prior to releasing contract plans CAD files for publication or issuing to external agencies, customers, and Contractors the electronic files shall be prepared according to the following procedure prior to publication of contract drawings for each sheet file in the contract plan set.

Select File for Review and Cleanup

Open the selected file for reviewing and cleanup in Microstation. All elements outside of design border should be removed from the graphics. Model files should not have any unused details or previous design scenarios still in files. Files should be "clean" without any information not required in the contract.

Activate Reference Manager.
Verify reference paths prior to detaching the reference file.

For every reference file that has display turned *OFF*, *detach* the reference file. Be certain the these files are not required and that they have not been turned off inadvertently.
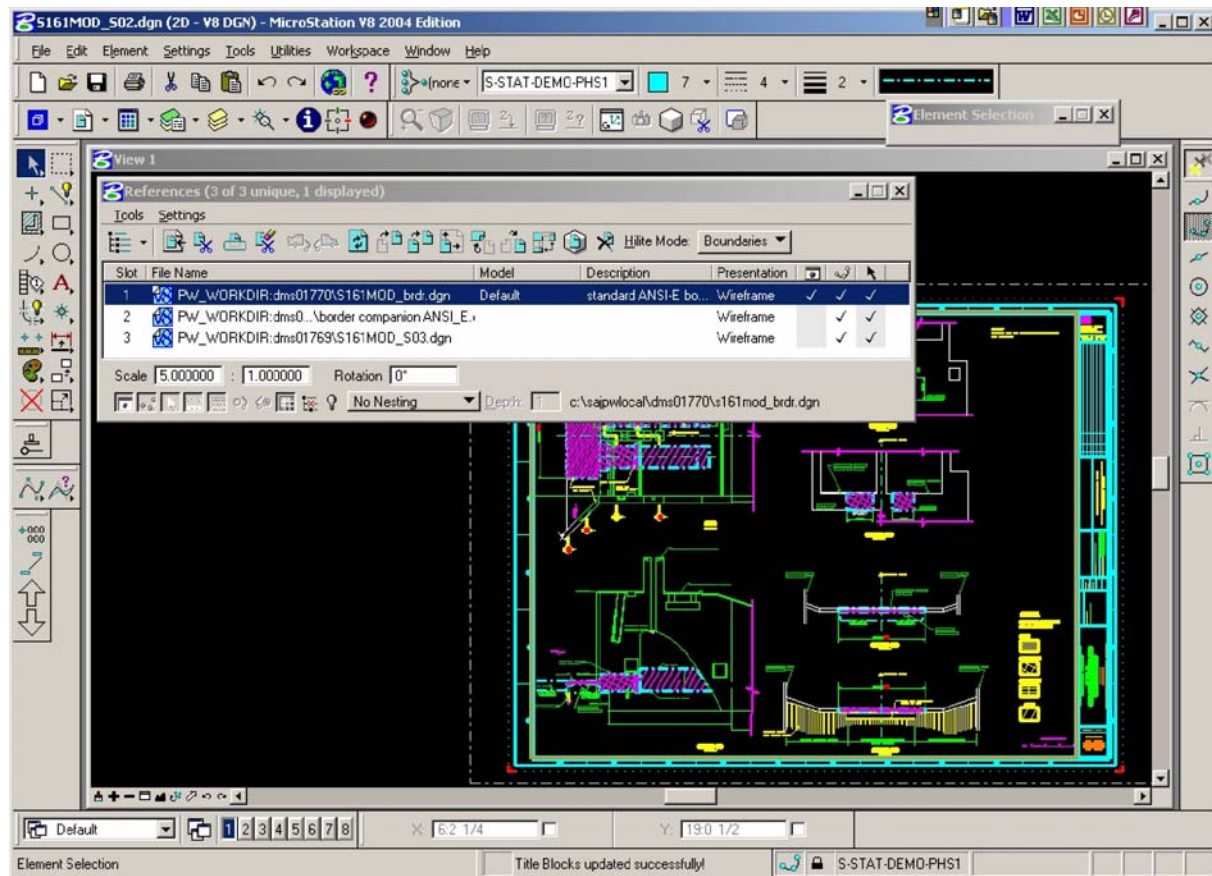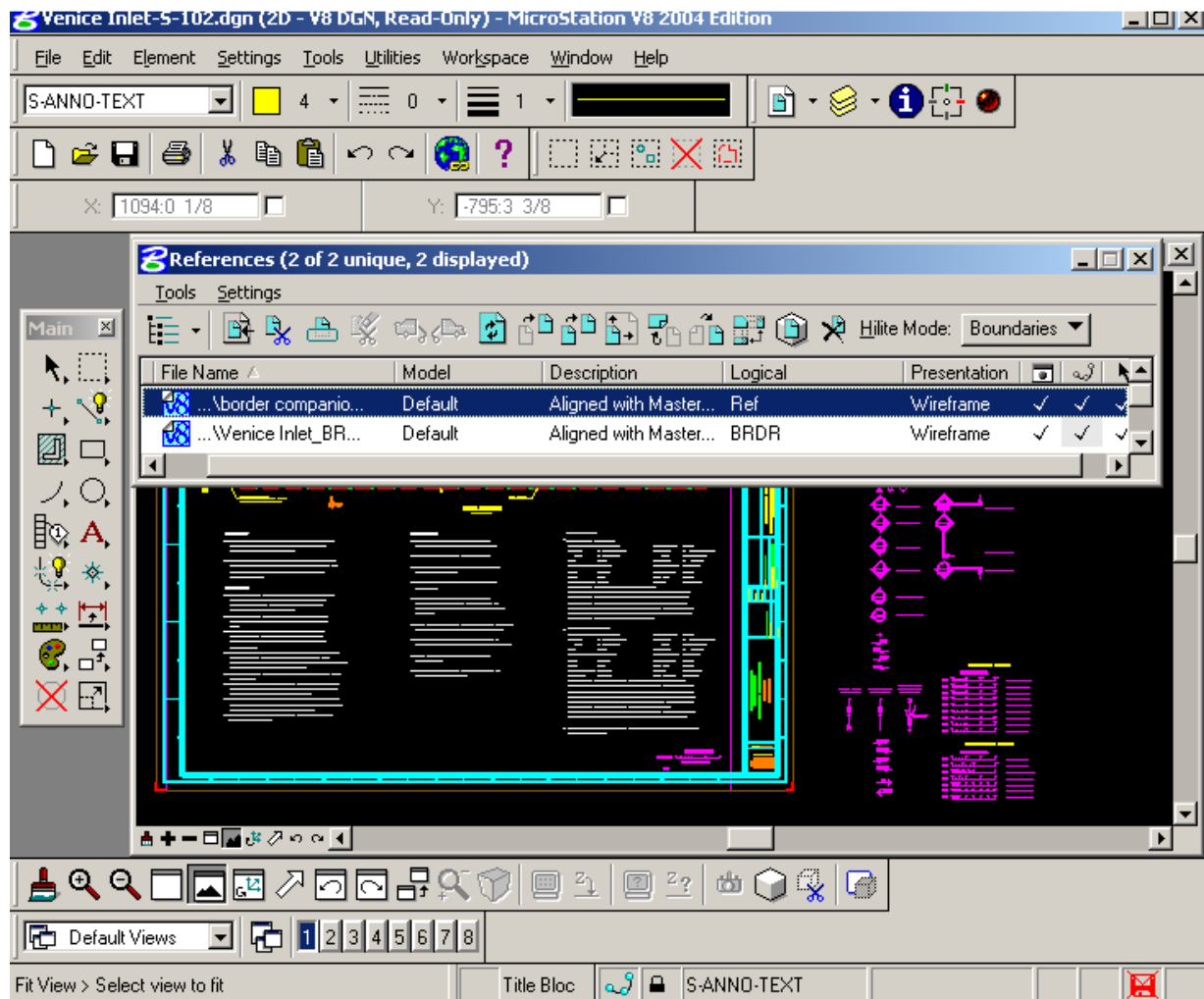
Figure 5-1

Figure 5-2

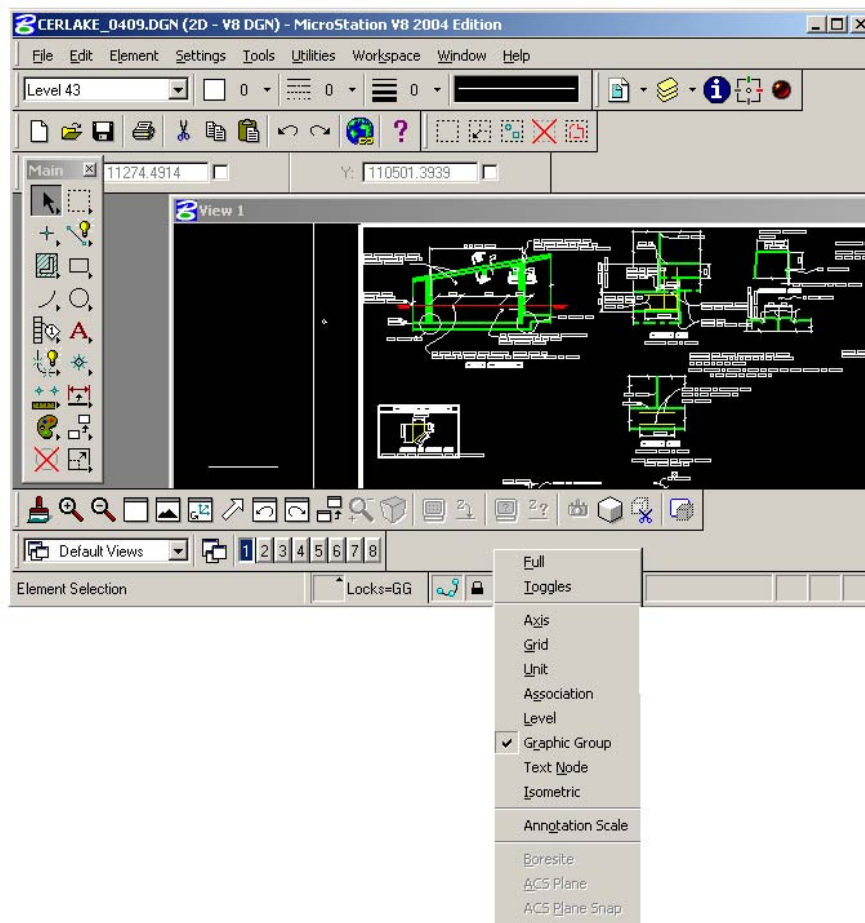Open Settings/Locks and turn off the graphic group lock on.

Figure 5-3

Check to see if the sheet file is referenced to itself, if any circular references are found within the sheet file; create a model file of the required detail(s) or section(s). The sheet file should not contain any model type graphics. Replace the sheet file graphics circular reference with the created model file.
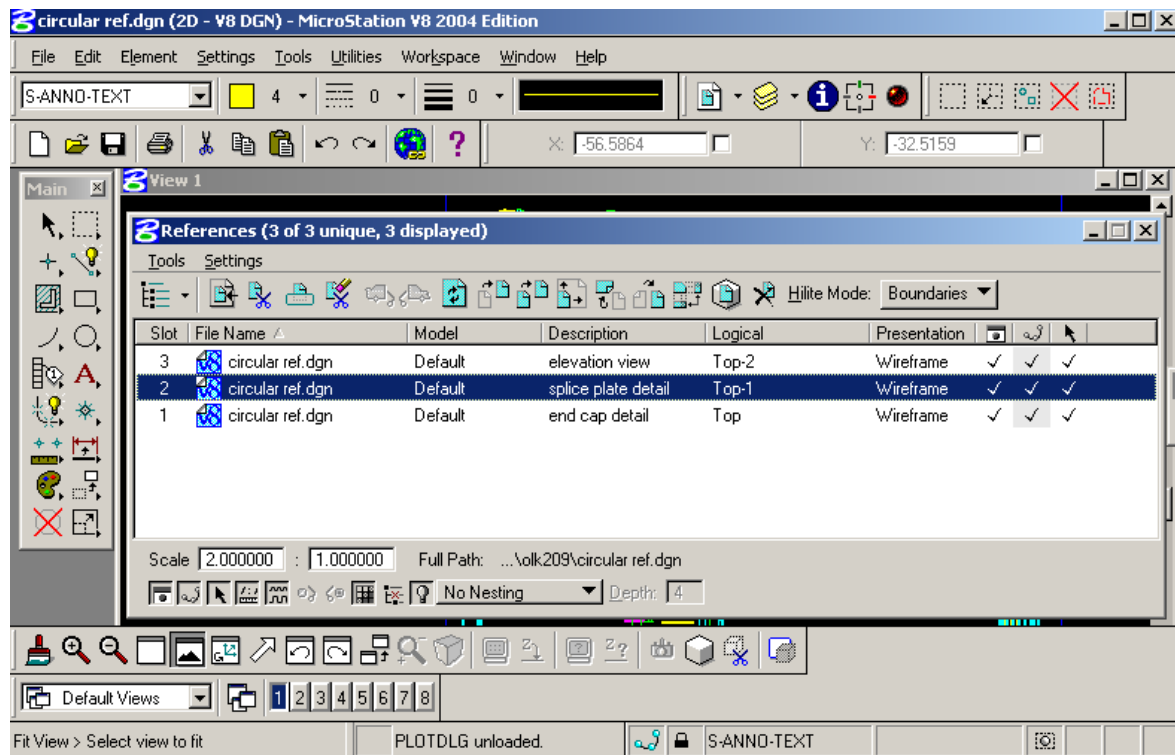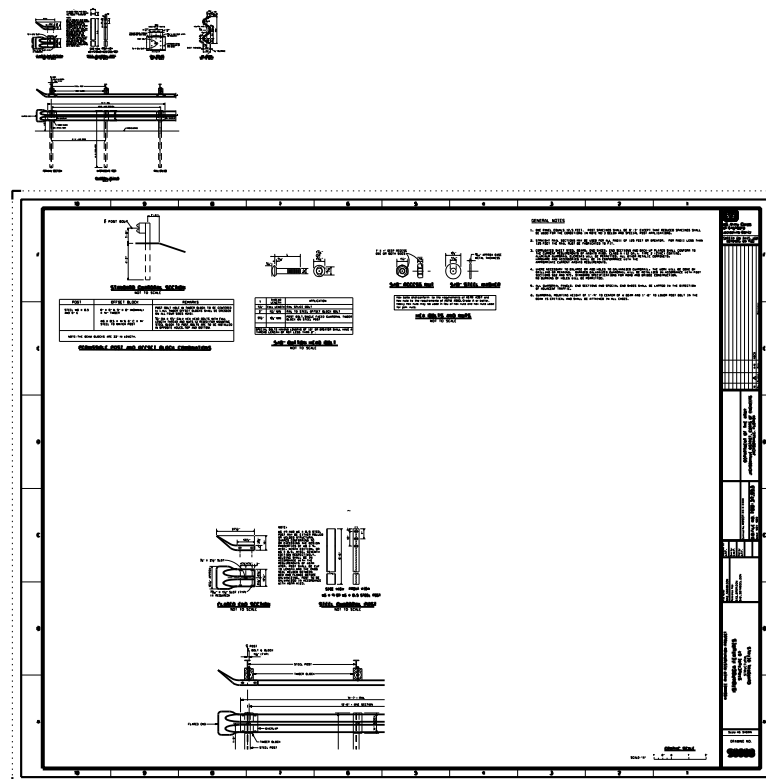
Figure 5-4

Figure 5-5

In Reference Manager, replace the sheet file circular reference by changing the reference path to the newly created model file.

Delete Graphics Outside the Border

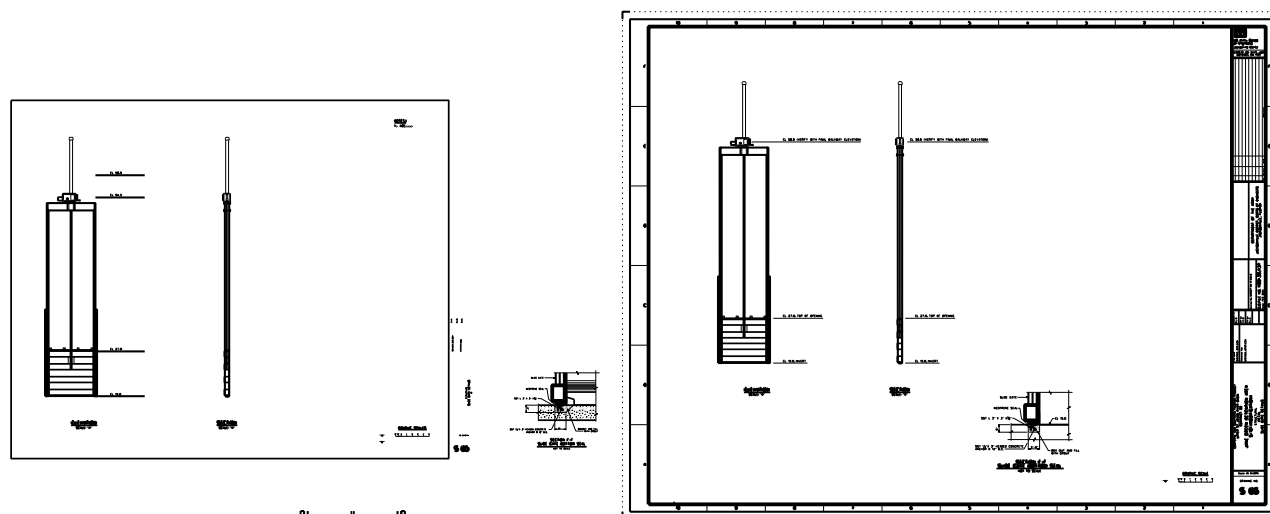Delete all working/construction graphics outside the margin area of the border.

Figure 5-6

Activate Raster Manager

Check the display setting for each attached raster file and delete any file not being used.

For each raster being used in the sheet file make sure the raster file is only being displayed in 1 view window.

NOTE
Do not delete any Tri-service A/E/C CAD Standard levels, used or unused.

Open Level Manager

Check if non-standard levels are being used. If non-standard levels are being used, move those graphic elements from the non-standard level to the correct level.

NOTE
Cells used in the sheet file may contain non-standard levels. Since these levels can't be deleted they may remain in the sheet file.

Correct any non-standard fonts being used for text elements.

Open Cell Library Manager

Detach the cell library.

Turn on Use Shared Cells and delete any unused shared cells.

Open Design File Cleanup Manager

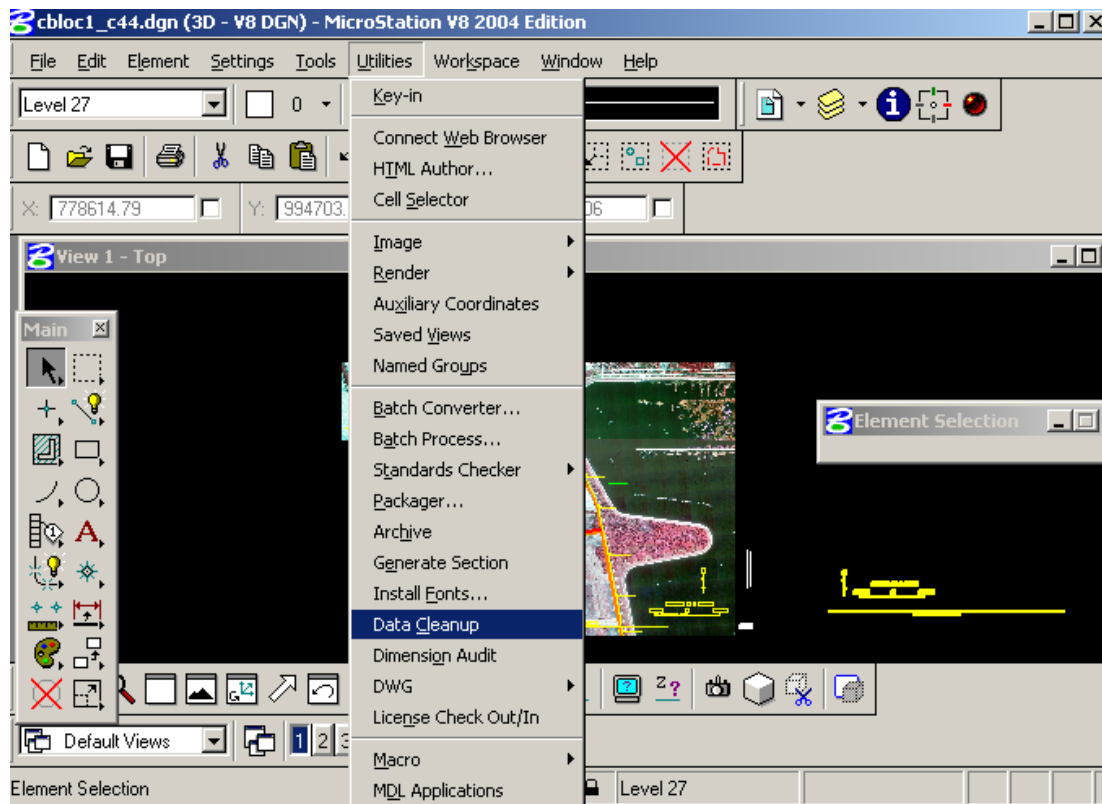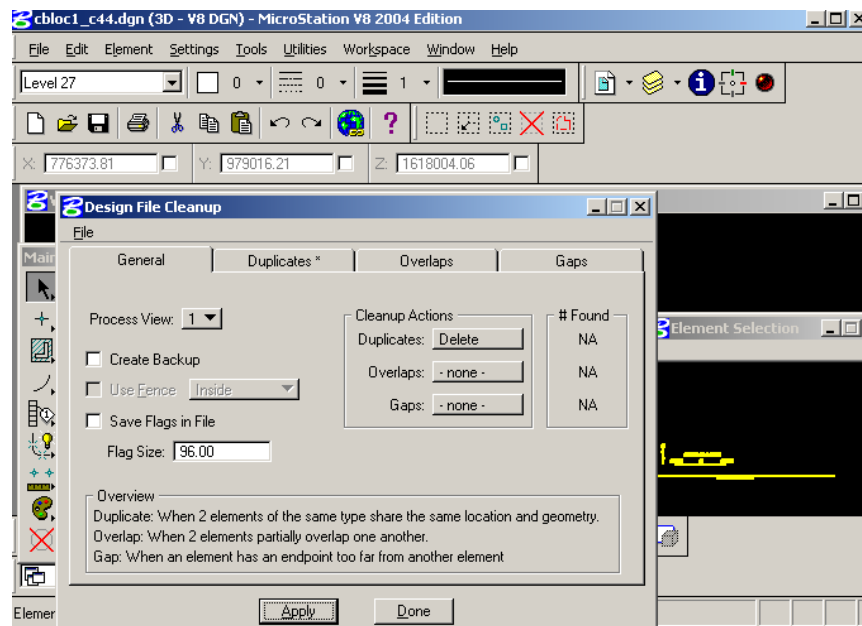Use Design File Cleanup to delete duplicates on the same level.

Figure 5-7

Figure 5-8

Open the file menu and Save Settings
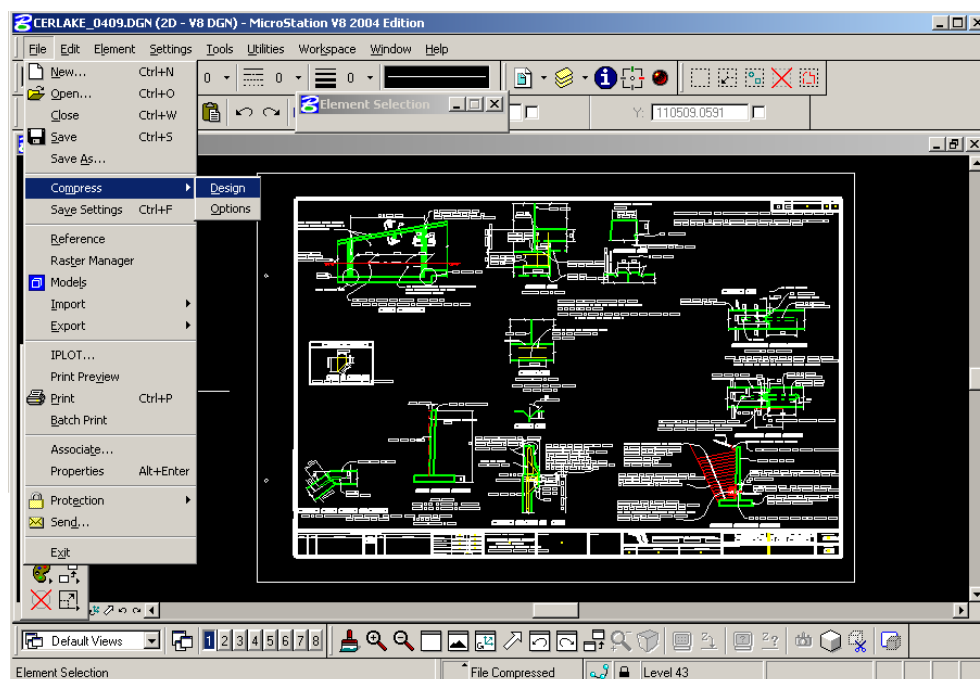
Compress the file.

Figure 5-9

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6 Plotting

Resources

Users of the Jacksonville District's workspace should refer to Appendix A, Unit 8.

Plotting Concepts

Refer to the PPM Appendix for the Print Organizer procedures. The SAJ_Workspace provides all necessary configurations to plot batch Project Design Plans.

Project Deliverables

The contract drawing deliverable is a 2D, monochrome, full size sheet PDF file. The preferred deliverable format is to have all contract drawings in a single PDF file. If a single PDF file is impractical, the alternative is to create a PDF file for each structure, feature or construction phase of the project.

Single PDF files of individual sheet files shall only be used for amended or modified drawings. Contract drawing sets shall not be published/delivered as single PDF files.

The Jacksonville District's border includes a plot shape representing the cut paper size with attributes of; Level: G-ANNO-NPLT, Color: 134, Line Style: 0, Line Weight: 0. These attributes shall be used to extract or establish the area of each sheet file to be plotted.