CESAJR 1110-4-2
6 November 2006
Change 1

US Army Corps of Engineers®
Jacksonville District

ENGINEERING AND DESIGN

CADD Standards Guide

Main Text and Appendices A, B, C, D, and E
Appendix F

CORPS OF ENGINEERS SOUTH ATLANTIC JACKSONVILLE REGULATION

AVAILABLITY

An electronic copy of this U.S. Army Corps of Engineers South Atlantic Jacksonville District Regulation (CESAJR) publication is available on the Internet at http://www.saj.usace.army.mil/cadd/end/caddmanagementandsupport.htm. The publication is provided in portable document format (PDF).

DEPARTMENT OF THE ARMY CESAJR 1110-4-2
Jacksonville District, Corps of Engineers
P.O. Box 4970
CESAJ-EN-D Jacksonville, Florida 32232-0019

Regulation 6 November 2006
No.1110-4-2 Change 1

Engineering and Design
CADD Standards Guide

1. Purpose. The purpose of this regulation, CESAJR 1110-4-2, is to append the A/E/C CADD Standard ERDC/ITL TR-01-6. Information contained in the CESAJR 1110-4-2 Jacksonville District "CADD Standards Guide" provides additional application and definitions for preparation of contract drawings completed by the Jacksonville District and our AE design contractors as well as sister Districts brokering project work with the Jacksonville District.

2. Applicability. This document serves as the definitive manual for preparation of CADD products and as an addendum to the previously established guidelines set forth in the AEC CADD Standard for the Comprehensive Everglades Restoration Plan (CERP) for all designs produced by or under the auspices of the Jacksonville District.

3. Distribution. Approved for public release; distribution is unlimited. An electronic copy of this U.S. Army Corps of Engineers South Atlantic Jacksonville District Regulation (CESAJR) publication is available on the Internet at http://www.saj.usace.army.mil/cadd/end/caddmanagementandsupport.htm

4. Discussion. Contract drawings and PIR plates are required to meet the compliance guidelines set by the A/E/C CADD Standard as well as the requirements set forth by this guide. This regulation provides guidance how contract drawings are required to be prepared.
Model and sheet files for drawings are required to follow a file organization system shown within the guide. Resources for the implementation of the CADD Standards are provided for working with ProjectWise, Netspex and InRoads. Jacksonville District appended the A/E/C CADD Standard with this CADD Standard Guide to include additional model files relating to work the Jacksonville District performs that was not included in the A/E/C CADD.

FOR THE COMMANDER:

REID A. ROBERTSON
Lieutenant Colonel, Corps of Engineers
Deputy Commander

Jacksonville District
U.S. Army Corps of Engineers

Regulation
No.1110-4-2

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Section 1

Introduction

1.1 **Scope.** This CADD Standards Guide CESAJ EN 1110-4-2 was developed as a supplement to the A/E/C CADD Standard ERDC/ITL TR-01-6, for preparing CADD products within the Jacksonville District by the Jacksonville District, A/E Contractors and other Districts where Jacksonville District work is brokered (see exhibit No. 1).

1.2 **Purpose.** The purpose of this guide is to append the A/E/C CADD Standard ERDC/ITL TR-01-6, to include Jacksonville District's Civil Works CADD requirements, and related CADD implementation relating to the standard serves as Jacksonville District CADD Manual. This document shall also serve as a CADD Standard for the Comprehensive Everglades Restoration Plan CERP.

1.3 **Background.** In accordance with Headquarters memorandum 23 July 2004, CECW-CE (1110) (see exhibit No. 2) all Corps Districts are required to comply with ERDC/I TR-01-6. Jacksonville District modified ERDC/ITL TR-01-6 to include the Civil Work supplement that was not part of the Standard. This document was developed based on the A/E/C CADD Standard ERDC/ITL TR-01-6, and the Joint Jacksonville District and South Florida Water Management Engineering and Design Joint A/E/C Drafting Manual 4th Edition, Dec 7, 2003.

1.4 **CADD Platform.** This manual is applicable to the latest release of Bentley Microstation V8 2004 or later.

1.5 **Additions and Revisions.** This standard is intended to be neither static nor all-inclusive and thus will be updated and enhanced as appropriate. Suggestions for improvements are strongly encouraged so that subsequent updates will reflect the input and needs of CADD users.

Recommendations or suggested additions should be sent to:

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

Or by email: Roger.W.Porzig@USACE.ARMY.MIL

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P.O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

CESAJ-EN

21 March 2005

MEMORANDUM FOR CESAJ-EN DIVISION

SUBJECT: Implementation of the A/E/C Tri-Service CADD Standard in Jacksonville District

1. Reference memorandum, CECW-CE, 23 July 2004, subject: Implementation of the A/E/C CADD Standard in USACE.

2. The referenced memorandum requires implementation and compliance with the A/E/C CADD Standard. Specifically, any projects that have not reached the 30% completion by August of 2004 must be brought into compliance.

3. Because the standard did not adequately address civil works work, elements of the Design Branch developed an A/E/C Child Standard (a supplement to the A/E/C Standard including Civil Works Design Workflows), which was not included in the current publication. This modified standard is being coordinated with ERDC CADD Center for application to other Districts.

4. It is essential that the Standard be implemented in the development of all Engineering CADD products by all contributors and participants. That is, team members that contribute to project drawing development are responsible to follow and be in compliance with the Standard. All EN Branches that are responsible for the design and production process and preparation of each project leading to contract plans must follow the standard format. The contribution of Branches that provide input, but are not directly involved in design, such as EN-G and EN-H, must also follow the standard.

5. The District's ability to share work with other Districts and A/E firms is mandated to follow compliance in order to maintain a standard CADD compliance file management system as a common workflow from all contributors and participants. The work brokered to other Districts and contracted to A/E firms must also meet the requirements the referenced memorandum sets for compliance. Any submission that is in noncompliance shall be deemed unacceptable.

CESAJ-EN-D
SUBJECT: Implementation of the A/E/C Tri-Service CADD Standard in Jacksonville District

6. The Microstation production and InRoads Modeling tools configuration files and/or menu systems were modified to assist project team members in achieving Standard Compliant Designs. These tools are to be utilized in the preparation of Project CADD files. Additional resources have been prepared and are provided on the web at http://w3saj/cadd/end/caddmanagementandsupport.htm. This web page can be accessed through the Jacksonville District home page for A/E's or Brokering Districts at:
http://www.saj.usace.army.mil/cadd/end/caddmanagementandsupport.htm

7. In order to meet the requirements set forth in the referenced memorandum, it is imperative that a procedure be established to ensure we conform. The effort required to comply with the Standard through a compliance check review must be provided for in the development of the Quality Control Plan (QCP). The Jacksonville District and other Corps Districts will use the Netspex file checking compliance software to determine the level of compliance. Contracted A/E work shall be submitted with a file checker report for compliance with each submission to the District. The A/E work should be checked using the Netspex Compliance Checker.

8. It is the responsibility of the EN Division leadership and team members to ensure that we comply with the Standard. We have guidance from Headquarters that this compliance be a part of the performance objectives.

9. Additional guidance will be issued to assist members in their participation.

10. Point of contact for this action is Mr. Pete Kendrick, ext. 3607.

STEPHEN C. DUBA, P.E.
Chief, Engineering Division

Exhibit No. 2

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-CE (1110) 23 July 2004

MEMORANDUM FOR MAJOR SUBORDINATE COMMANDERS

SUBJECT: Implementation of the A/E/C CADD Standard in USACE

1. This is in reference to memorandum, CECW-CE, 2 July 2004, Subject: Watershed Management and the Implementation of Enterprise Geographic Information Systems (eGIS) in the USACE 2012 Environment. Reference memo required compliance with eGIS data standards.

2. To make the USACE 2012 goal of "One Corps operating virtually" a reality, implementation and compliance with the A/E/C CADD Standard (the Standard), is required. Under USACE 2012, Regional Business Centers will leverage resources through a Virtual Engineering Environment (VEE). The success of the VEE depends on sharing Computer-Aided Design and Drafting (CADD) information seamlessly. Implementing the Standard is the first step toward realizing the VEE and CADD/Geographic Information System (GIS) integration under the eGIS initiative.

3. In August 2002, the HQUSACE Chief of Engineering and Construction Division signed a letter to all districts and divisions, requiring the implementation of the Standard. Earlier HQ guidance was provided in 1998 stating, "All CADD produced projects which are 35% or less complete shall henceforth comply with the Standards."

4. With the implementation of USACE 2012 underway, a renewed emphasis on the implementation of the Standard is critical. Developing our CADD assets within the VEE structure will ensure USACE realizes the Science and Engineering Technology (SET) Initiative to integrate systems and provide common implementation tools. Achieving the goals of SET, as described in the USACE 2012 report, will provide long term payoffs through improved efficiency and better partnering opportunities with our sponsors and other Federal agencies.

5. Working with the National Institute of Building Sciences (NIBS), the CADD/GIS Technology Center (the Center) developed the Standard to be compliant with the U.S. National CAD Standard and to provide additional Federal and USACE-specific requirements not addressed in the U.S. National Standard. As the 2012 process proceeds, the Center will be your partner in implementation, assuring additions and enhancements are addressed promptly. Future CADD standards are also being addressed through the Industry Alliance for Interoperability (IAI). Working with the IAI, USACE laboratories are positioning our CADD program to migrate successfully into the three dimensional object-oriented environment featuring the latest technologies.

CECW-E (1110)
SUBJECT: Implementation of the A/E/C CADD Standard in USACE

6. Enclosure 1 is an implementation plan for compliance to the Standard. An 18-month transition period is provided to reduce the impact of this requirement on districts and divisions not currently complying with the Standard. The plan also provides compliance reporting metrics for recording USACE progress in completing the implementation. Your Regional Management Board (RMB) should monitor these metrics and we will also monitor them at HQ through periodic submissions to the Commander's Critical Information Requirements (CCIR).

7. Enclosure 2 is a proposed communication plan. There is an existing network of Corps volunteers that collaborate among each other and the Center to improve CADD productivity and aid in using the standards. The plan recommends using these existing networks to help districts implement the standards.

8. Additionally, HQ is evaluating the Bentley Systems ProjectWise A/E/C content management solution as a potential method for sharing CADD data within the VEE. Currently the system is being used for an R&D facility at Picatinny Arsenal and other non-secure programs throughout USACE. District and divisions are encouraged to review this technology for possible use across USACE as a design tool in support of 2012.

9. I understand that the initial implementation and compliance with the Standard will be a challenge. Fifteen years ago, USACE led the challenge in the Federal government to deploy CADD as a baseline organizational engineering tool. USACE 2012 is our opportunity to demonstrate to the nation our continued engineering prowess by building an integrated CADD environment through the VEE and Regional Business Centers.

FOR THE COMMANDER:

Encls

DONALD L. BASHAM, P.E.
Chief, Engineering and Construction
Directorate of Civil Works

Section 2

Drawing File Organization

2.1 **Standard File Requirements.** The standard requirements listed below are to provide additional guidance not shown in the A/E/C Standard ERDC/ITL TR-01-06.

2.1.1 *Units*. All Files shall be prepared with a units definition file. The units definition file shall contain US survey feet and US survey inch unless the Project Engineer requires metric file for work outside the Continental United States.

2.1.3 *Layer/Level Names*. Appendix F of this document supplements the A/E/C CADD Standard Appendix A "Model File Layer/Level Names" of ERDC/ITL TR-01-06 with additional model files, levels, colors, and weights required by Jacksonville District.

2.1.4 *Plotted Drawings Files*. Every final plotted drawing sheet shall have its own separate electronic sheet file. The electronic sheet file shall be made up of design data for each sheet.

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

2.2 **Electronic Drawing File Naming Conventions.** Naming conventions for electronic drawing files (both model files and sheet files) indicate contents of a drawing without actually displaying the file. They also provide a convenient and clear structure for organizing drawing files within project directories.

2.2.1 *Model File Naming Convention.* A model file contains the physical components of civil work elements (e.g., structural culvert, mechanical riser diagram, etc.). Model files are drawn at full scale and typically represent plans, elevations, sections, etc. The character-naming field shown in figure 2-1 has Project Description, Hyphen Separator Field, Discipline Designator, Model File Type and User Definable Field.

2.2.1.1 *The Project Description*. The project description is a field is a field that is a short representation of the project name.

2.2.1.2 *Discipline Designer*. Following the Project Code, the first two-character field represents the *Discipline Designator*. The allowable characters for the first character in the Discipline Designator are listed in Table 2-3 of the A/E/C Standard Chapter 2 "Drawing File Organization". The second character of the Discipline Designator field is always a hyphen "-".

2.2.1.3 *Model Field Type*. The Model Type Field is a two- character field that represents the model file type. The Model Field Types are listed in Table 2-2 of A/E/C Standard Chapter 2 "Drawing File Organization".

Appended Table 2-2A

2.2.1.4 *User Definable Field*. Following the model field type is four-character field defined by the user.

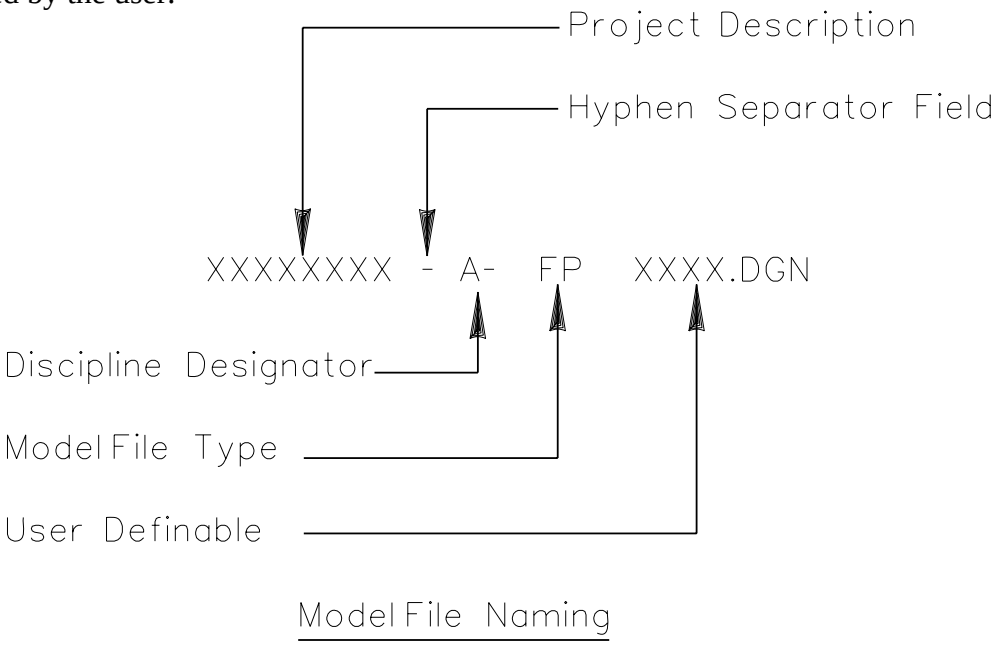


Figure 2-1

2.2.2 *Sheet File Naming Convention***.** A sheet model file is related to a ready to plot CAD drawing. A sheet file has a combination of model files referenced to it with sheet specific text and symbols. The sheet file character-naming field shown in figure 2-2 is composed of a P2 Code, Hyphen Separator Field, Project Description, Hyphen Separator Field, Design Designator with Level 2 Designator, Sheet Type Designator, Sheet Sequence Number, and a User Definable Field.

2.2.2.1 *P 2 Code***.** The first field required by this supplement to the A/E/C CAD Standard ERDC/ITL TR-01-06, is the P2 code that consists of six characters.

2.2.2.2 *The Project Description*. The project description is a field is short representation of the project name.

2.2.2.3 *Discipline Designator with Level 2 Designators*. The *Discipline Designator with Level 2 Designator* is a two-character field. The Discipline Designator with Level 2 Designator are listed in table 2-3 of A/E/C CADD Standard Chapter 2 "Drawing File Organization" and the appended Civil related types to the A/E/C CADD Standard are listed below in table 2-3A.

Appended A/E/C Table 2-3A ***Discipline Designators with Level 2 Designators***			
Discipline	Designator	Description	Content
Electrical			
	EC	Cathodic Protection	Cathodic protection systems
	EG	Grounding & Lighting	Devices interior and exterior grounding. Lightning protection
Structural			
	SR	Structural Reinforcement	Concrete reinforcement and anchors
	ST	Superstructure	Walls, decks, abutments, gates and weirs
	SM	Components	Gates, armor, bulkheads, and railings
Telecommunications			
	TS	SCADA & Automation	SCADA systems and equipment Supervisory control and remote control for items such as Pump Stations, etc.

Appended Table 2-3A

2.2.2.4 *Sheet Type Designator*. The sheet type is a one-character field listed in table 2-4 of the A/E/C CADD Standard Chapter 2 “Drawing File Organization”ERDC/ITL TR-01-6. Occasionally, more than one model type (e.g., plan, elevation, detail) will be represented in one sheet file. If this is the case, the dominant model type determines the sheet type designator.

2.2.2.5 *Sheet Sequence Number*. The sheet sequence number is normally a two-character *Sheet Sequence Number* (01-99). If more than 99 sheets are required for one discipline's drawings, the user should follow the sheet sequence number guidance of the A/E/C CADD Standard.

2.2.2.6 *User Definable*. Following the model file field type field is three-character field defined by the user.

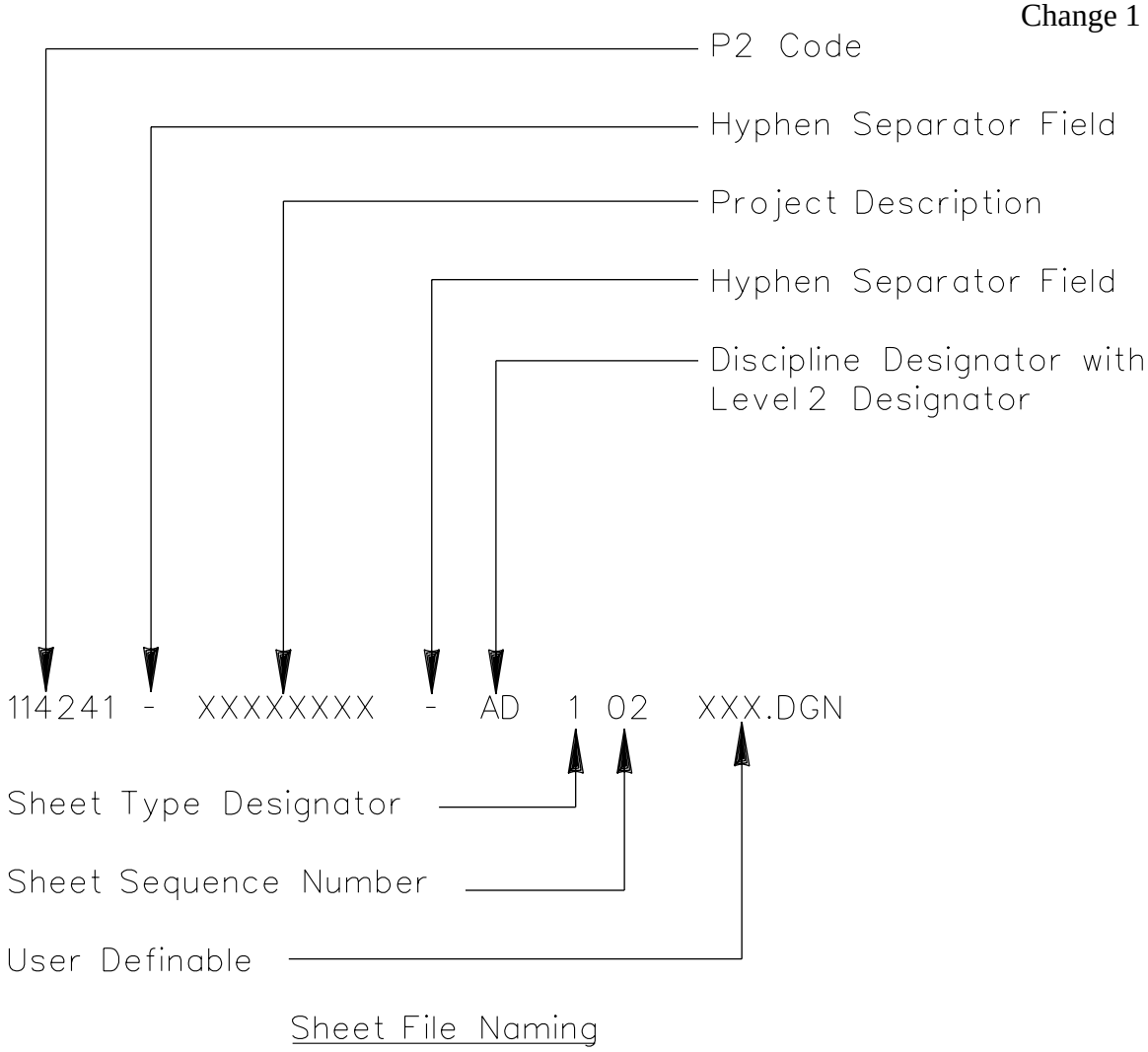


Figure 2-2

2.3 **Use of Sheet Files and Model Files.** CADD files consist of two distinct types, model files and sheet files. An example is shown below of a sheet file with model files shown on figures 2-3 to 2-6. The example represents a sheet file that has a model project border referenced to the sheet file and model files referenced to the sheet file for the drawing.

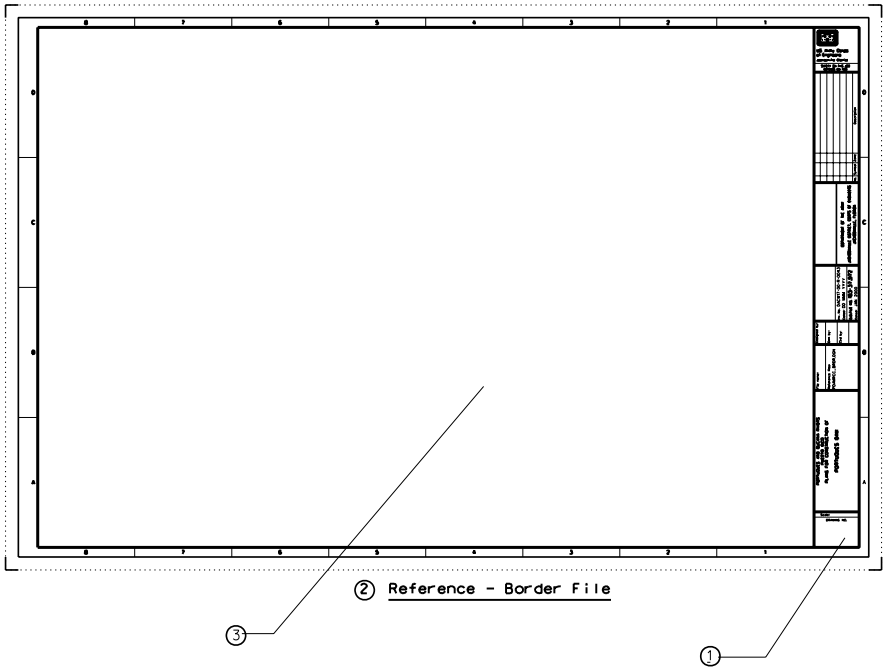


Figure 2-3

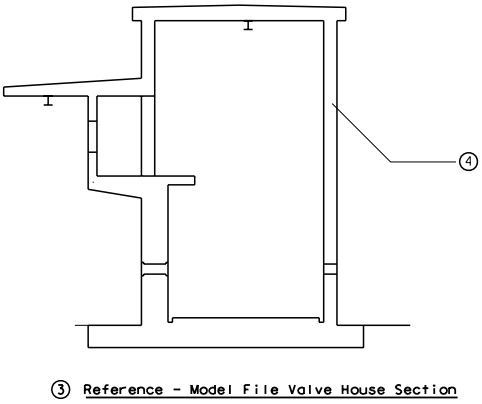
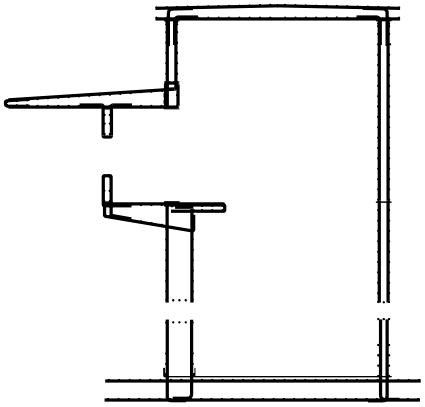
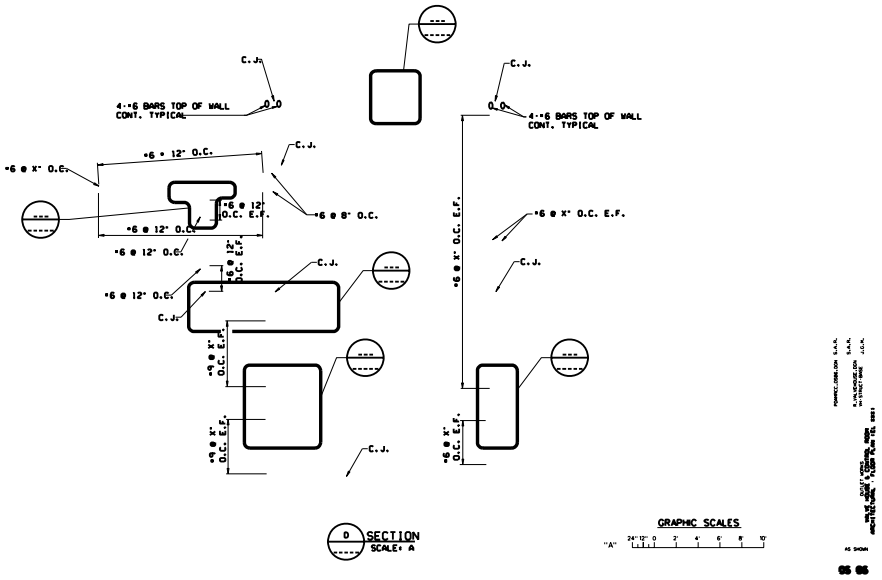


Figure 2-4



④ Reference - Model File Reinforcement Section

Figure 2-5



① Sheet File

Figure 2-6

Notes:

1. The referenced Project Border file no. 2 shown in figure 2-3 is referenced to the sheet file no. 1 shown on figure 2-6.
2. The model file Valve House Cross Section no. 3 shown on figure 2-4 is referenced to the Sheet file no. 1 shown on figure 2-6.
3. The Model file Valve House Reinforcing no. 4 shown on figure 2-5 is referenced to the Sheet file no. 1 shown on figure 2-6.

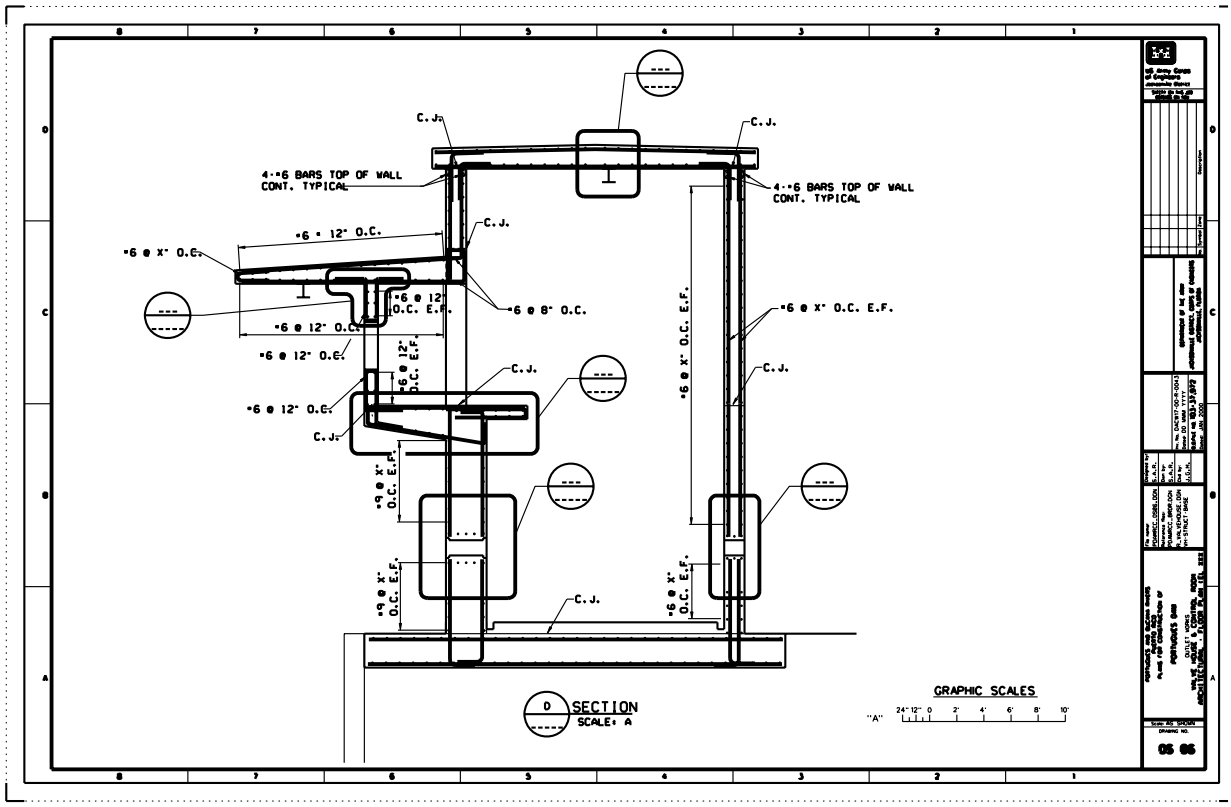


Figure 2-7

Figure 2-7 represents the sheet file figure 2-6, where the model files shown on figures 2-3 to 2-5 have been referenced into the sheet file.

Section 3

Project Development Using CADD and ProjectWise

3.1 **Project Design and Presentation Planning:**

3.1.1 *Assemble meeting* with the lead technician/CADD Coordinator and design team.

3.1.2 *Develop* the index of drawings, estimate the number of sheets, and the level of effort required.

3.1.3 *Discuss* project drawing format criteria such as scales, areas of importance, etc.

3.1.4 *Identify* Survey data considered necessary to include in project drawings.

3.2 **Project Wise (PW) Setup:**

3.2.1 *Contact* a ProjectWise Administrator to create a project folder (design project). A parent and sub-folder will be created. A "general" folder will be included within the created folder that contains the standard border, the border companion, cover, and the index dgn files. Re-name the files in the general folder using the standard naming convention.

3.2.2 *Create* the PW project subfolders based upon section, subsection with categories names from the index of drawings, and include folders for any data supporting the project. A PW administrator will set the new PW permissions for the project with input from the Project Engineer.

3.3 **Develop Design Files in Microstation**:

3.3.1 *Develop all drawings using X and Y coordinates where appropriate* for the prescribed standard model files and reference files.

3.3.2 *Develop Model files* that reflect entire features such as a channel, levee or road for the project. The models, (civil site, structural plan, etc.) will be referenced to individual sheet files and clipped in as many sheet files as necessary in order to present the entire design feature.

3.3.3 Maintain design elements real world locations when referencing model files that span large areas or features that require match lines in successive sheet files.

3.3.3.1 *Large reference models* when required to be referenced onto more than a single sheet shall be clipped and placed into successive sheet files.

3.3.3.2 *Elements or focus areas rearrangements* shall be accomplished by moving the border file.

DO NOT move design elements from their "real world locations".

3.3.4 *Maintain the north arrow on the top of border* where project layout permits. The north arrow may require north arrow placement at another location when a view is rotated to utilize more space on a sheet file on length alignments.

3.3.5 *Attach reference files to sheet files* using "coincident-world" method at a 1 to 1 scale relationship with real world coordinates.

3.3.6 *Attachment of the border or companion file* shall be made at the intended plotting scale; for example, 100:1 or 20:1.

3.3.7 *Sheet file contents* should contain as non-referenced elements text, symbols, section keys, and graphic scale, notes, etc.

3.3.8 *Place notes and dimensions on the sheet files* as much as practical, rather than in the model file. Consistency of text heights will be easier to maintain by placement of text and dimensions on the sheet file.

3.4 **Design Software and Tools and A/E/C CADD Standards Compliance:**

3.4.1 *Design work production* shall be produced in Microstation using prepared seed files containing standard model or sheet file levels.

3.4.2 *NetSpex* (software installed on all Design Branch Stations) standards management and design software shall be used to create and develop design sheet and model files.

3.4.3 *Earth modeling* such as site work, navigation, or beach nourishment will be modeled using InRoads and the A/E/C compliant standard configurations. All sheet files containing the referenced InRoads model files shall be prepared using Netspex configured design files.

3.4.4 *Noncompliant Engineering software* that prepares designs without regard for standard A/E/C CADD Standard requirements shall be edited and all design file elements should be brought into graphic compliance.

3.4.5 *Review the CADD Standards Guide* for examples of proper design.

3.5 Standard Compliance Checking and Design Reviews:

3.5.1 *At all scheduled review milestones* electronic design files and printed sheet files will be reviewed for compliance with **A/E/C CADD Standards** and **CADD Standards Guide** Jacksonville District Regulation **CESAJR-1110-4-2**.

3.5.2 *Compliance Checking* should be a continuous goal during project development so that at review intervals no errors are discovered causing undue correction of files not meeting standard requirements.

3.5.3 *Users should have an understanding of the standards* by keeping a copy of both the A/E/C CADD Standard and the Jacksonville CADD Standards Guide as a reference. Resource tools relating to the CADD Standards should also be understood by the user.

Section 4

Preparation of Contract Drawings

4.1 **Drawing Presentation**.

4.1.1 Drawings are a graphic representation of contractual project requirements. Provide only essential details to achieve a clear understanding of the contract requirements. Omit from drawings, repetitive details and unclear contract requirements. Avoid using excessive sectioning, repetition of dimension and notes.

4.1.2 Indicate contract requirements only once on drawings. This shall be indicated at the first opportunity in the drawings where the feature or item is shown.

4.1.3 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.

4.2 **To the Detailer**.

4.2.1 In order to expedite final Contract drawings, the Detailer will prepare sketches and marked up drawings essentially complete and accurate. The rule is contract drawings will not be scaled for dimensions; therefore, care shall be exercised in showing all dimensions and notes necessary for the construction of the object represented.

4.2.2 Methods of representation not covered in these instructions shall be determined by reference to a drawing in the files similar to the drawing in question. The Detailer should check worksheets and preliminary drawings for accuracy and uniformity before having the final Contract drawing completed.

4.2.3 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.

4.2.4 Provide sufficient information to the Engineering Technician when assigning work to ensure the assigned details can be properly developed.

4.3 **To the Engineering Technician**

4.3.1 Engineering Technicians must be familiar with elementary drawing methods and the proper use of CADD equipment. The Engineering Technician is cautioned to bear in

mind accuracy, neatness and uniformity are desired on all drawings; haste to complete drawings shall not sacrifice these drawing requirements.

4.3.2 During the course of preparing a map or drawing, the Engineering Technician should exercise good judgment in making decisions and should request assistance when needed. Upon completion of an assignment the Engineering Technician should take, time to check work and to assure the drawing is complete. The completed drawing should be delivered to the Detailer, care should be taken to return all notes, sketches, sample sheets, check prints, etc. that were used to develop the drawing.

4.3.3 Access to the electronic file manager requires permission from the Project Engineer (PE). Drawings desired from the file server must be obtained through Project Wise.

4.4 **Preliminary Preparation For Drawing Layout**.

4.4.1 *Standard and CADD Review*. Review the standard requirements of CADD Standards Guide CESAJR 1110-4-2 and the A/E/C CADD Standard ERDC/ITL TR-01-6. The CADD Standards Guide contains the requirements that apply to the Comprehensive Everglades Restoration Plan (CERP) and NonCERP related projects. The web link http://w3saj/cadd/end/caddmanagementandsupport.htm list the standards as follows:

A/E/C CADD Standard ERDC/ITL TR-01-6. Volume One Narrative portion, Volume Two Appendices portion (Level Assignments and Attribution) located at the web page http://www.saj.usace.army.mil/cadd/end/caddmanagementandsupport.htm.

CADD Standards Guide CESAJR 1110-4-2 located at web page http://www.saj.usace.army.mil/cadd/end/caddmanagementandsupport.htm.

4.4.2 *Select Drawing File Names*. Select the proper sheet and model file names for the project as required by the CADD Standards Guide CESAJR 1110-4-2 and the A/E/C CADD Standard ERDC/ITL TR-01-6.

4.4.3 *ProjectWise Initiation.* At the start of the project, the PE determines the type of disciplines required for project, users who will be developing the project and individuals requiring access to the drawing files are furnished by the PE to the ProjectWise Administrator. The PE provides the ProjectWise Administrator with project information that is required needed to set up the file structure for a project on ProjectWise. The ProjectWise Administrator sets up the project folders as required.

4.4.4 *ProjectWise Set Up by Administrator*. The Project Wise Administrator sets up on ProjectWise the project folder under the related program. The project folder contains subfolders under the project name. Subfolders are created for each feature and feature design disciplines being used for the drawing index. Additionally other subfolders are created to organize project data. As a minimum the subfolders: Imagery will be created, see figure 4-1 example.

Program
Project Title

Imagery
General
Pump Station 444
Discharge Canal

Figure 4-1

4.5 **Project File Set Up**.

4.5.1 *Border File and Border Companion File*. Based on the project type, the border ANSI size (D or E) and border companion ANSI (D or E) file are selected for the project by the Project Engineer or User. The standard size border is an ANSI D border and border companion file. If the project is, a large civil project or a navigation project then use the ANSI E border and border companion files. Based on the selected border size, the Administrator places in the project file a copy of the border file and the border companion file. The copy of the border file and border companion file placed within the project file are renamed to follow the CADD Standards naming convention.

4.5.1.1 Border Companion File. The border companion file shown on figure 4-2, allows the notes, and common graphic symbols to be copied into the sheet file drawing at the proper scale. The border companion file contains the north arrows, notes, section symbols, elevation symbols, as-built drawing note, superceded note, graphic architectural and engineering scales, titles (plan, elevation, section and detail), local notes, subject title, symbol views (elevation, section and detail), flow arrows, elevation datum symbol, revision triangle, drawing reduced 50 % note, and slope arrows. The elements of the border companion that are required for a project drawing are copied into the sheet file on the level required by the CADD Standards Guide and the A/E/C Standard Chapter 4, “Level/Layer Assignments” requirements.

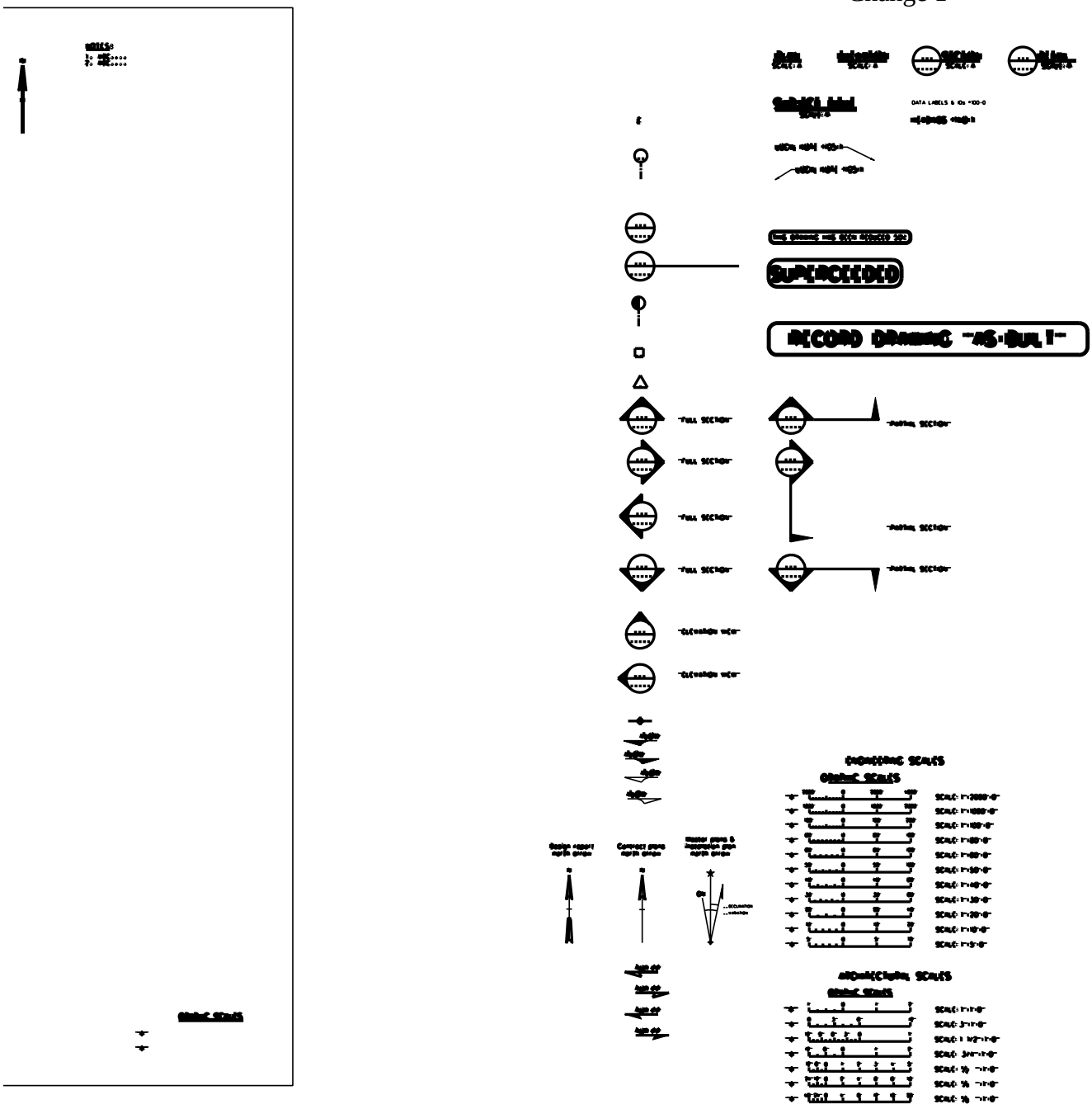


Figure 4-2

4.5.1.2 *Border File*. The border file contains the border information. The border file is shown on figure 4-3.

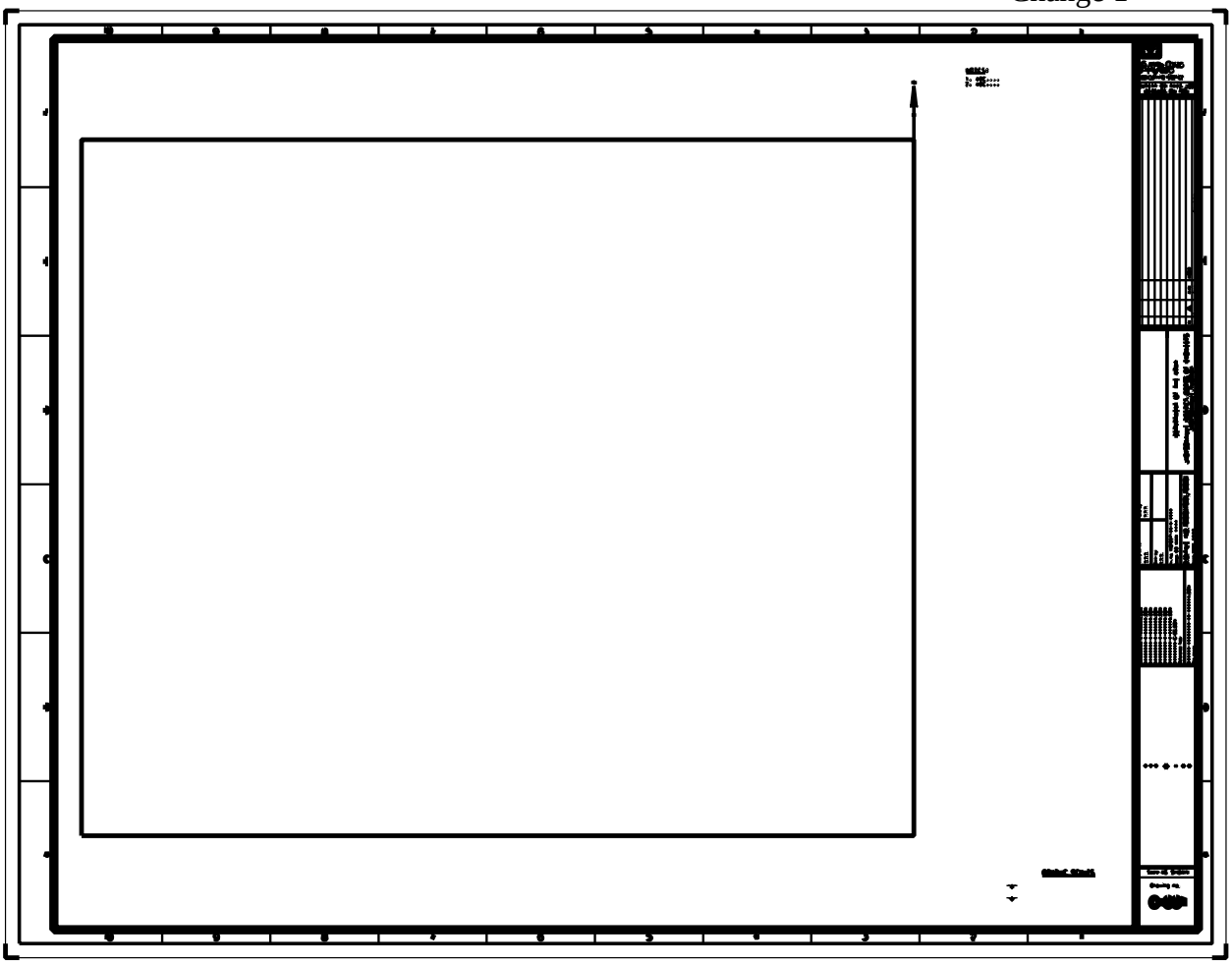


Figure 4-3

In the project general directory click on the border file that was renamed in the project general folder to open in Microstation. Use the text edit command and change the x placeholders where the text goes to the project title information of the border, see figures 4-4, 4-5 and 4-6. The title text placeholder is on G-ANNO-TEXT-PROJ level. The internal box located on level G-ANNO-FRME serves as a placeholder for placing images and aligning work. When plotting turn off the G-ANNO-FRME so the image box does not show up when plotting. In the border file text exit click on the title placeholders and revise the project title in the upper three xxx in the area between A and B shown in figure 4-4.

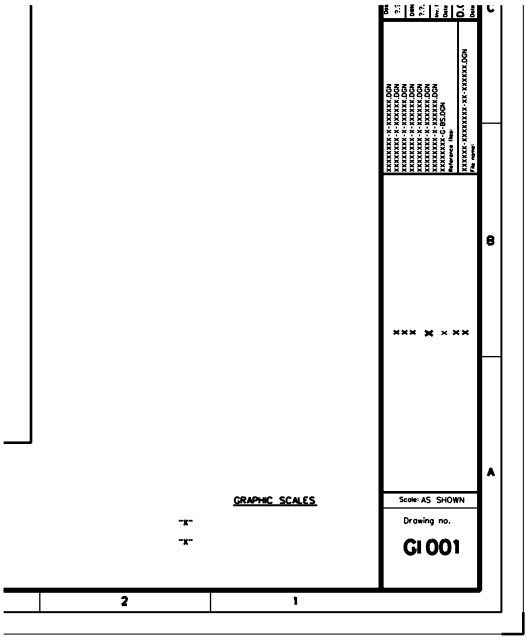


Figure 4-4

On figure 4-5. Under reference file edit, the first line that is located on G-ANNO-TEXT-PROJ and change to the project reference file name for the border file. Edit the text on G-ANNO-TEXT-PROJ that follows Inv No., Dated, DO FILE No., and Dated to match the related information concerning the project.

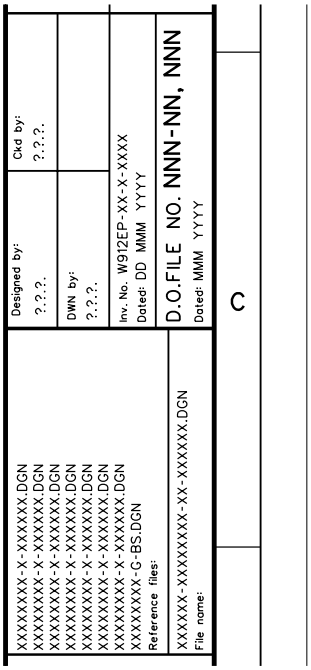


Figure 4-5

Turn off X-ANNO-TEXT-DRWG elements shown on figure 4-6. The X-ANNO-TEXT-DWG elements are on this sheet to be placeholders to be copied onto a sheet file when there is an amendment or modification to serve as a guide for making the information the proper preset heights and widths.

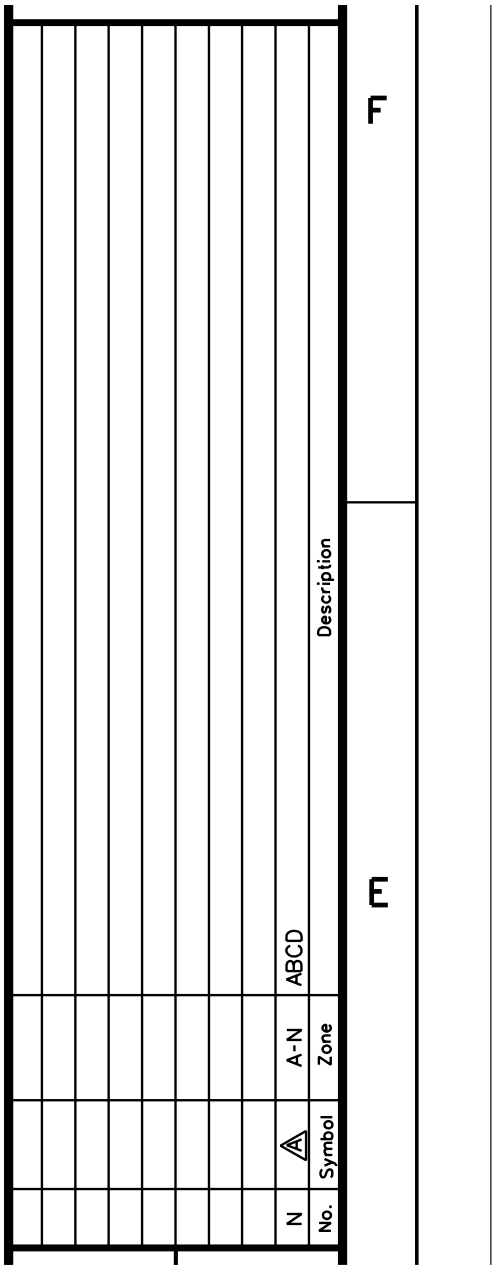


Figure 4-6

4.5.2 *Cover Sheet*. Based on the project, the Administrator places a copy of the ANSI cover D or E size shown in figure 4-7 that corresponds to the selected project border sheet. The cover sheet is renamed to match the project naming convention that follows the CADD Standards.

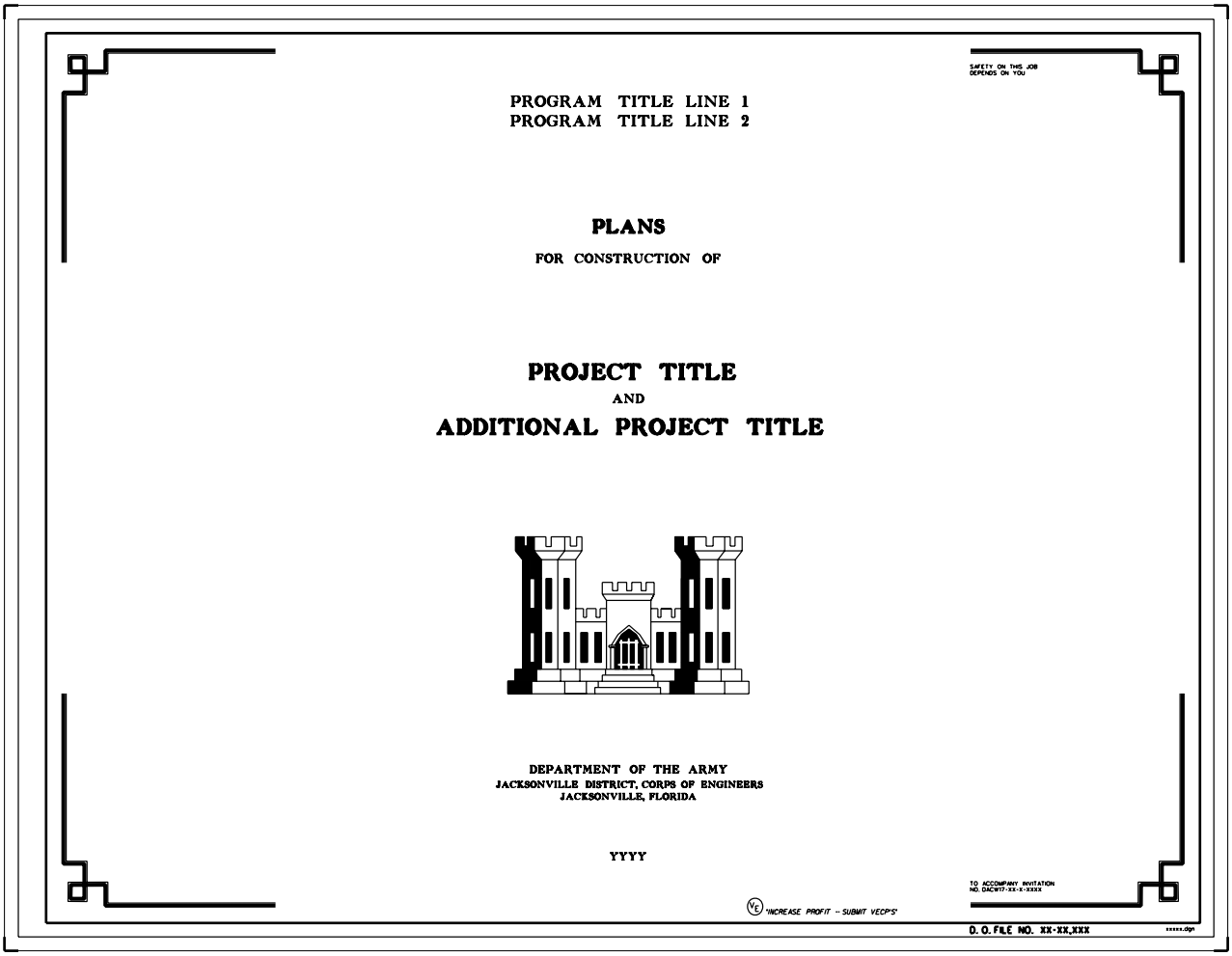
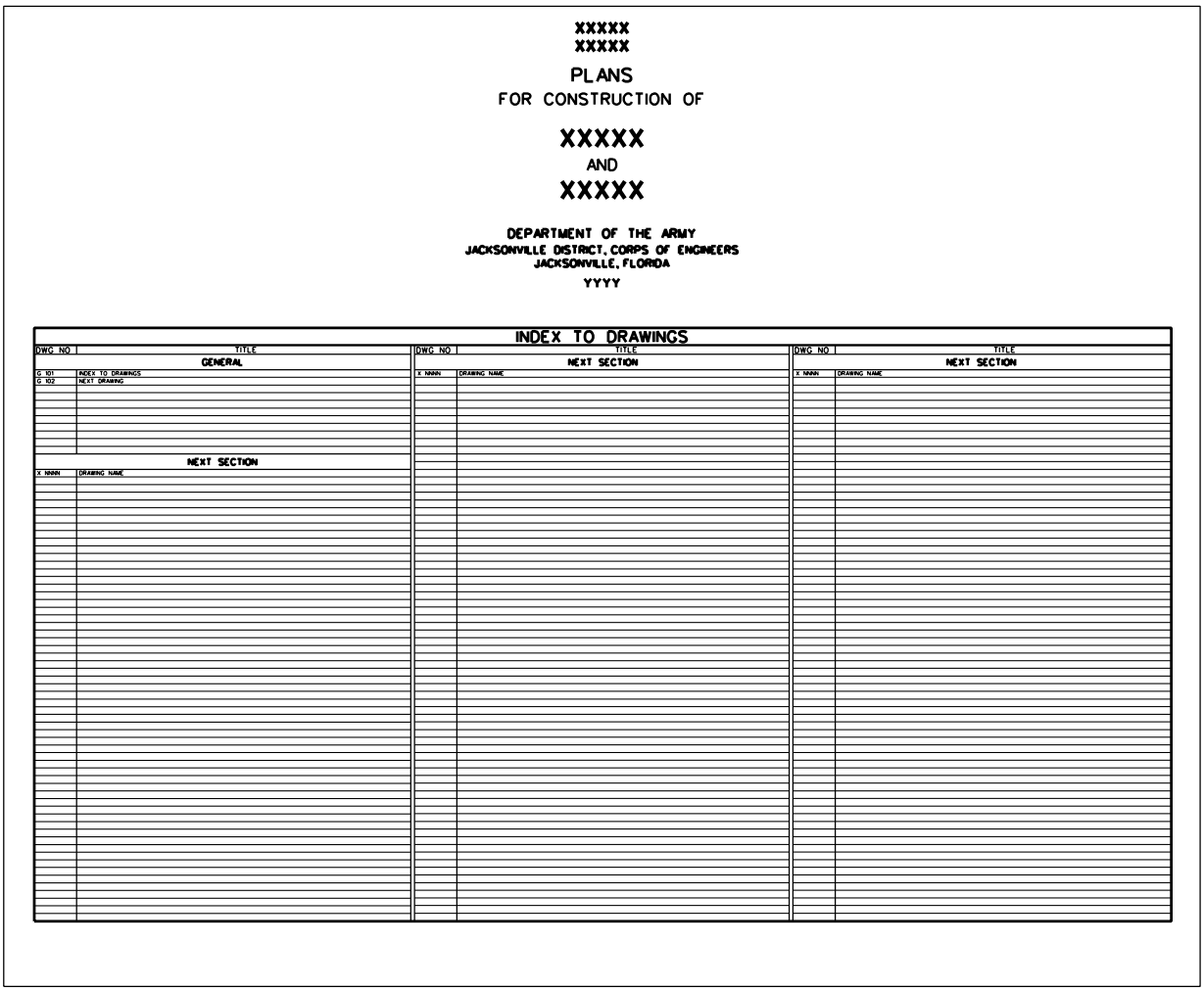


Figure 4-7

In Microstation on the level G-ANNO-NOTE, text edit the cover Program Title line 1 Program Title Line 2, Project title and Additional Project Title, To Accompany Invitation No., DO FILE NO. XX-XX,XXX, XXXXX.dgn. Edit the text YYYY to correspond the fiscal year the project is to be advertised.

4.5.3 *Index File*. Based on the selected ANSI size of border the same size index is selected for the project. The Administrator places a copy of the standard index as a guide. The index file serves reference file guide for developing the index sheet file. The index file is shown in figure 4-8. Revise the index name to correspond with the project naming convention that follows the CADD Standards.

The index file drawing template is shown below on figure 4-8.



XXXXX
XXXXX
PLANS
FOR CONSTRUCTION OF
XXXXX
AND
XXXXX

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
YYYY

INDEX TO DRAWINGS

DWG NO	TITLE
GENERAL	
G 101	INDEX TO DRAWINGS
G 102	NEXT DRAWING
NEXT SECTION	
X NNNN	DRAWING NAME

DWG NO	TITLE
NEXT SECTION	
X NNNN	DRAWING NAME

DWG NO	TITLE
NEXT SECTION	
X NNNN	DRAWING NAME

Figure 4-8

4.5.4 *Develop in a New Document*. Go to ProjectWise to develop new documentation for the project. Initiate ProjectWise by clicking on the windows desktop icon shown on figure 4-9 below.

Figure 4-9

The ProjectWise explorer opens up as shown on figure 4-10 below. Select *Jacksonville* data source with a left mouse click on the plus sign to open the data list of projects.

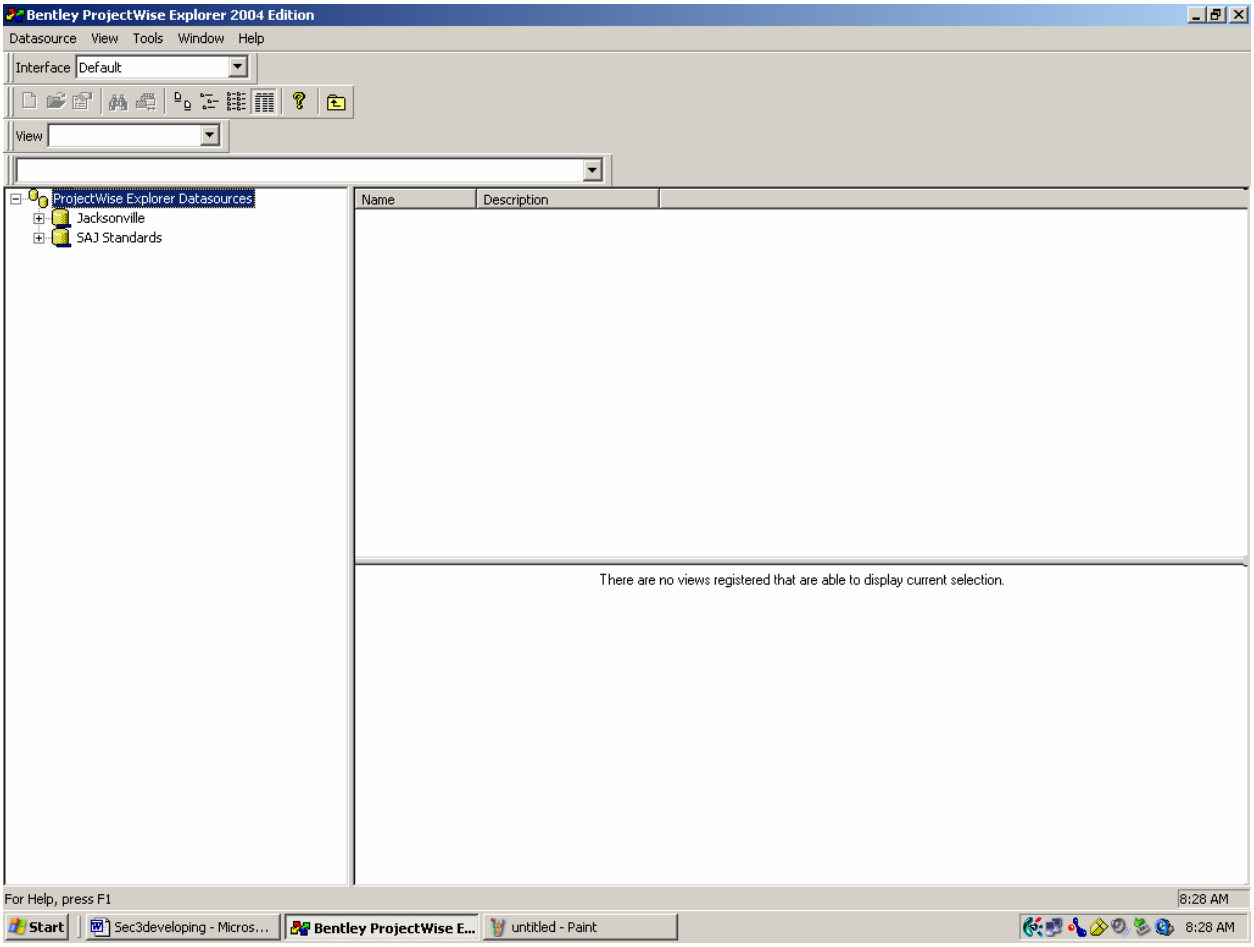


Figure 4-10

Select and highlight the project, by single clicking the project listed in the directory. In the right window pane click, and drag the mouse from new and click where it reads document as shown on figure 4-11.

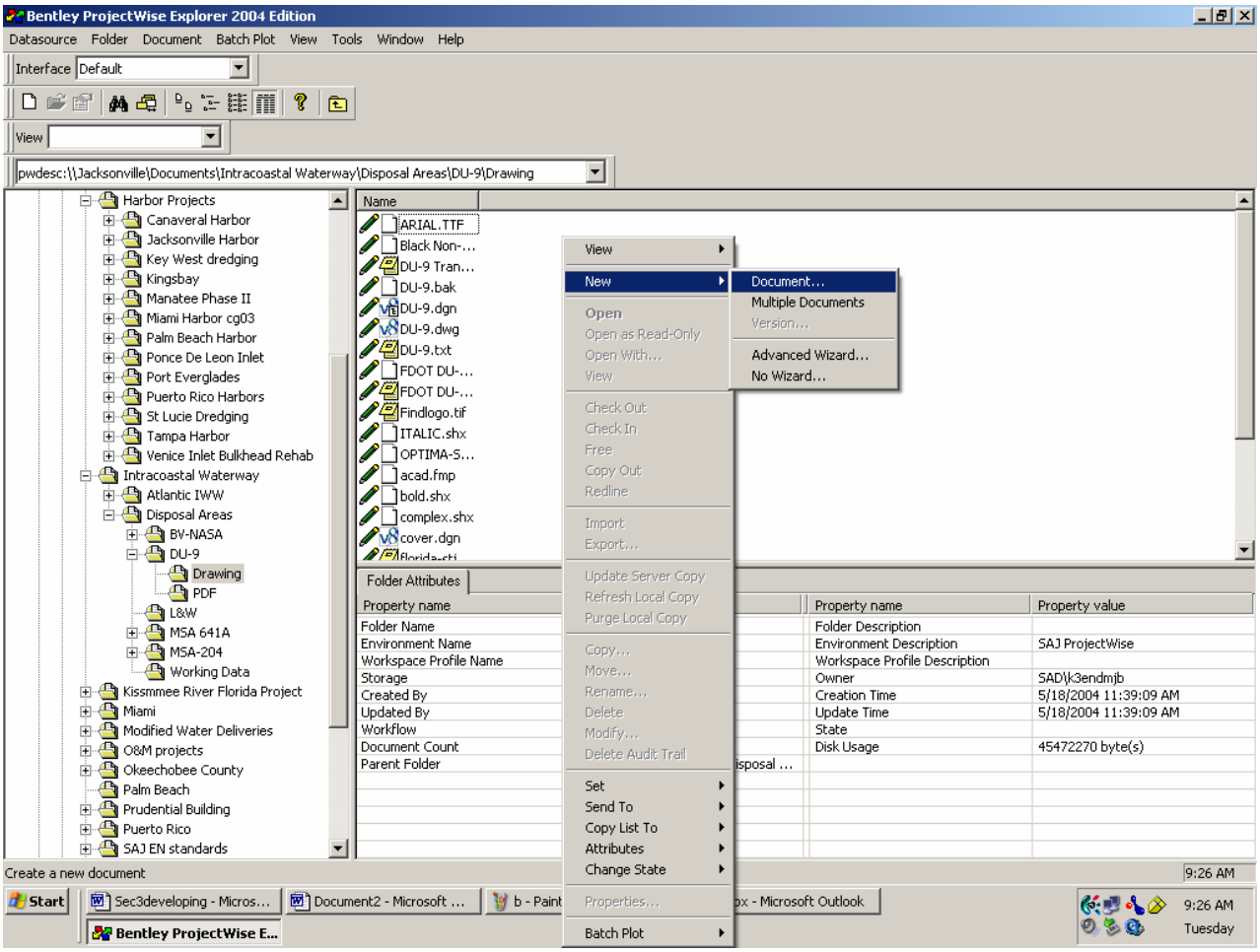


Figure 4-11

Next place a single mouse click on the advanced wizard and click the ok button as shown in figure 4-12.

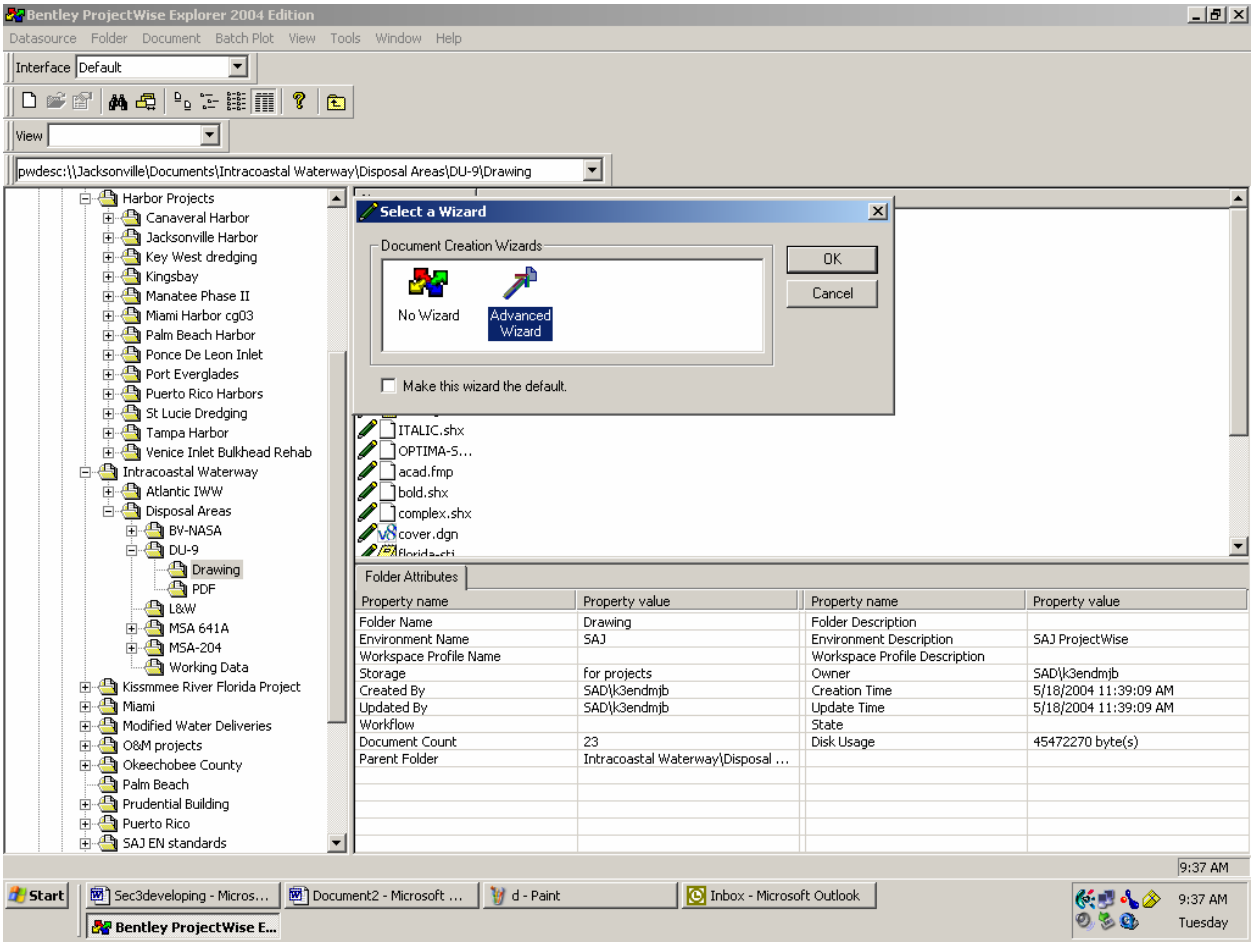


Figure 4-12

The advanced document creation wizard appears as shown in figure 4-13. Proceed by clicking the next button.

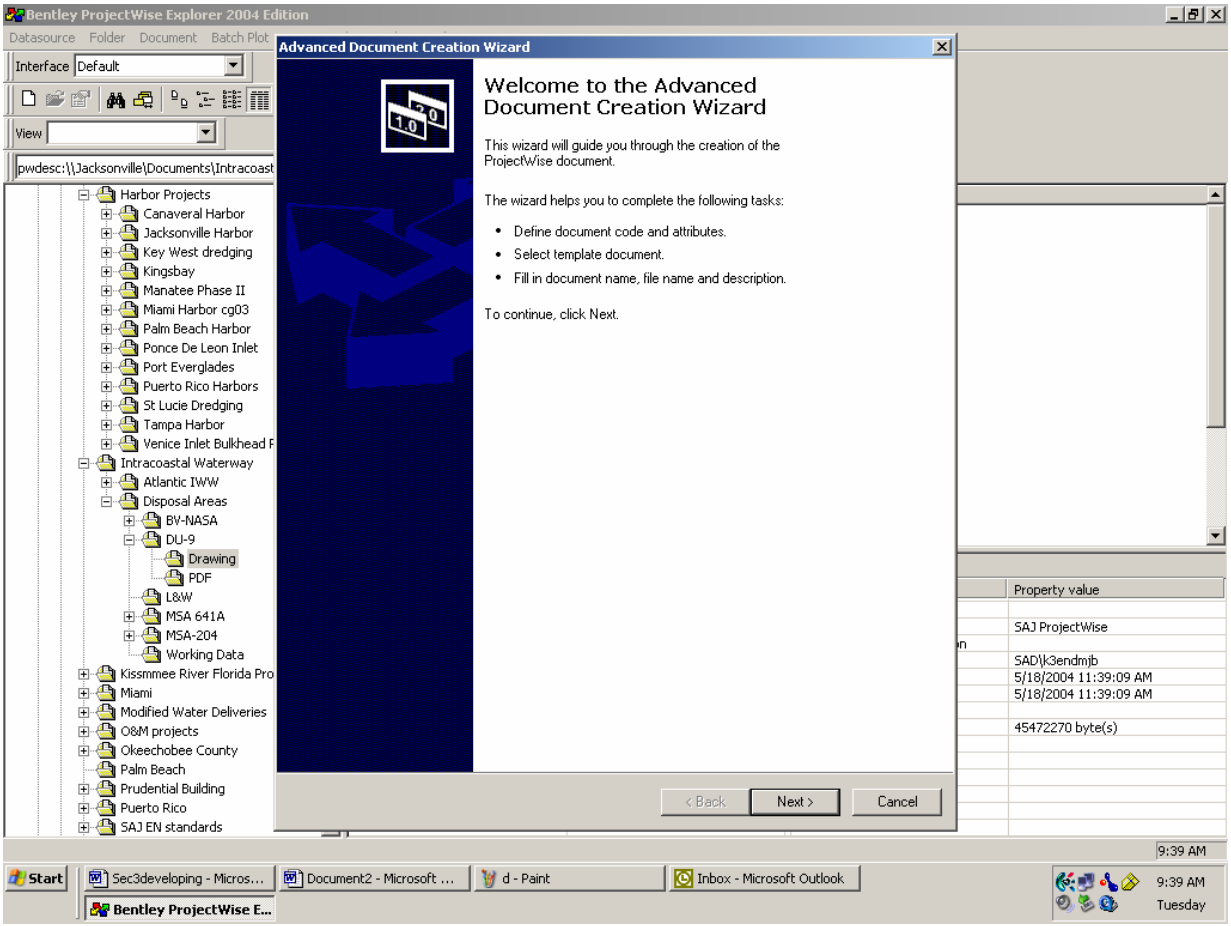


Figure 4-13

Select the project folder where the created file is to be placed, see example shown on figure 4-14.

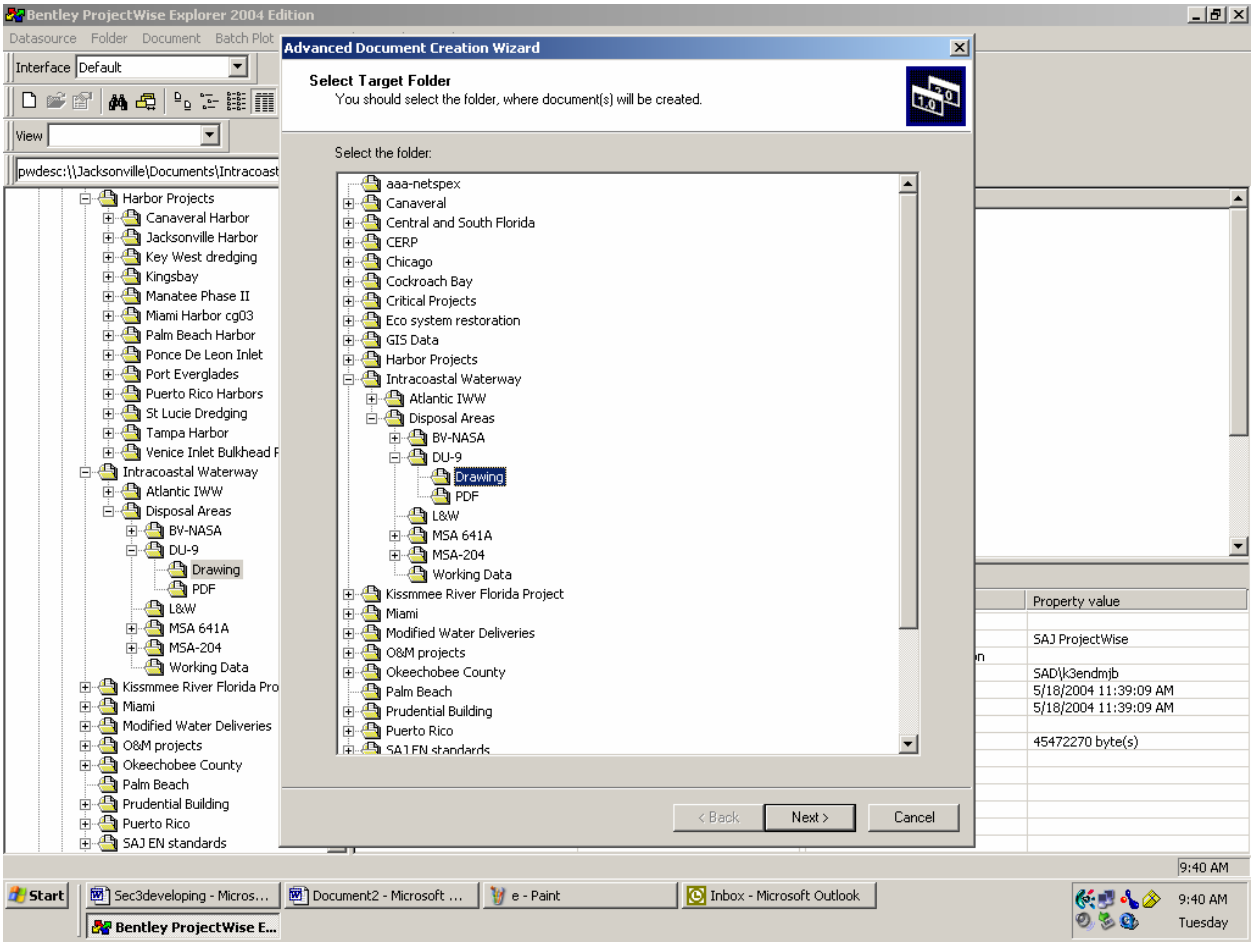


Figure 4-14

Select use ProjectWise document as a template shown on figure 4-15. Click the select button to browse to the template or seed file to be used.

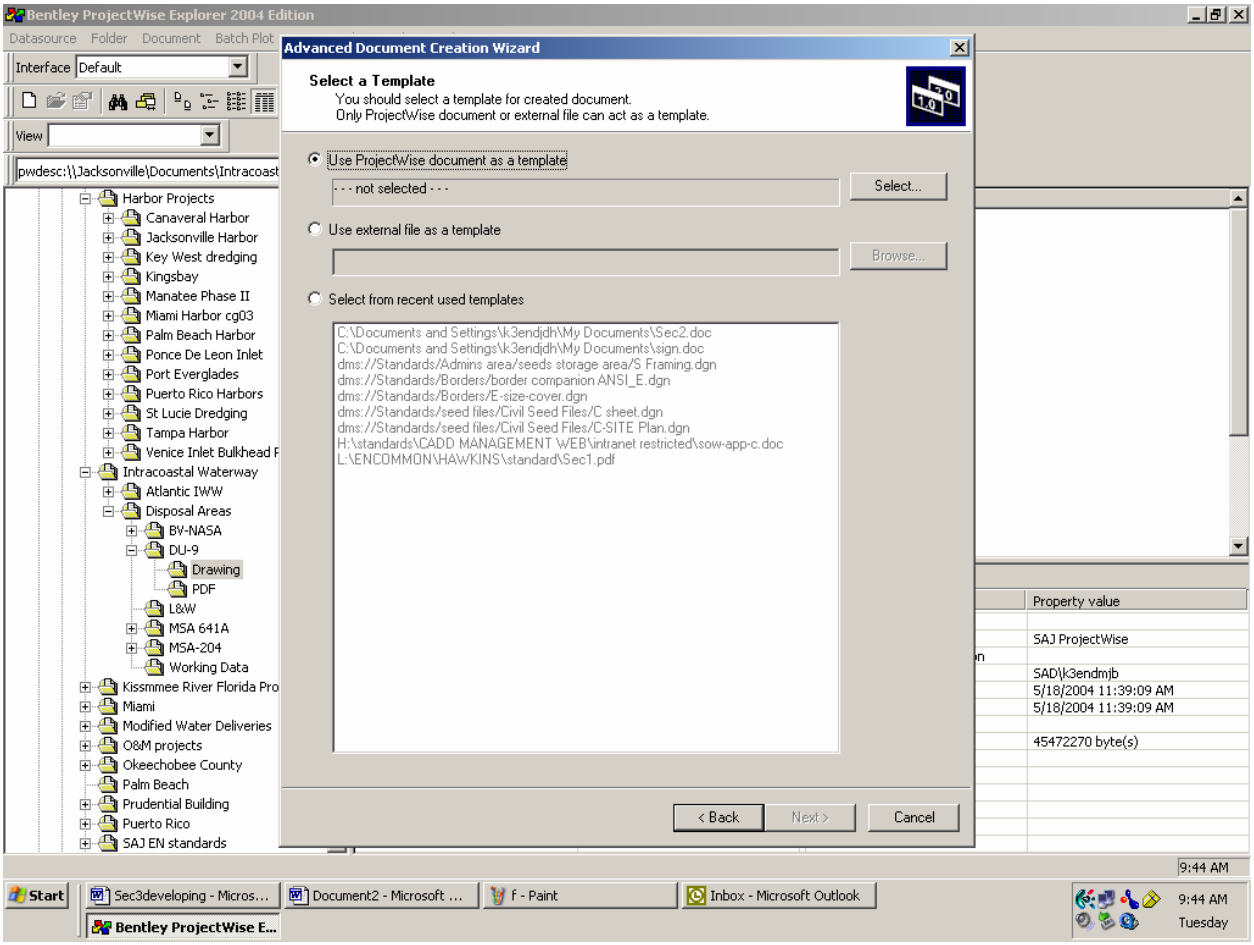


Figure 4-15

The select template document then appears; change the folder to SAJ EN Standards as shown on figure 4-16. Double click on the seed files folder under the list of documents.

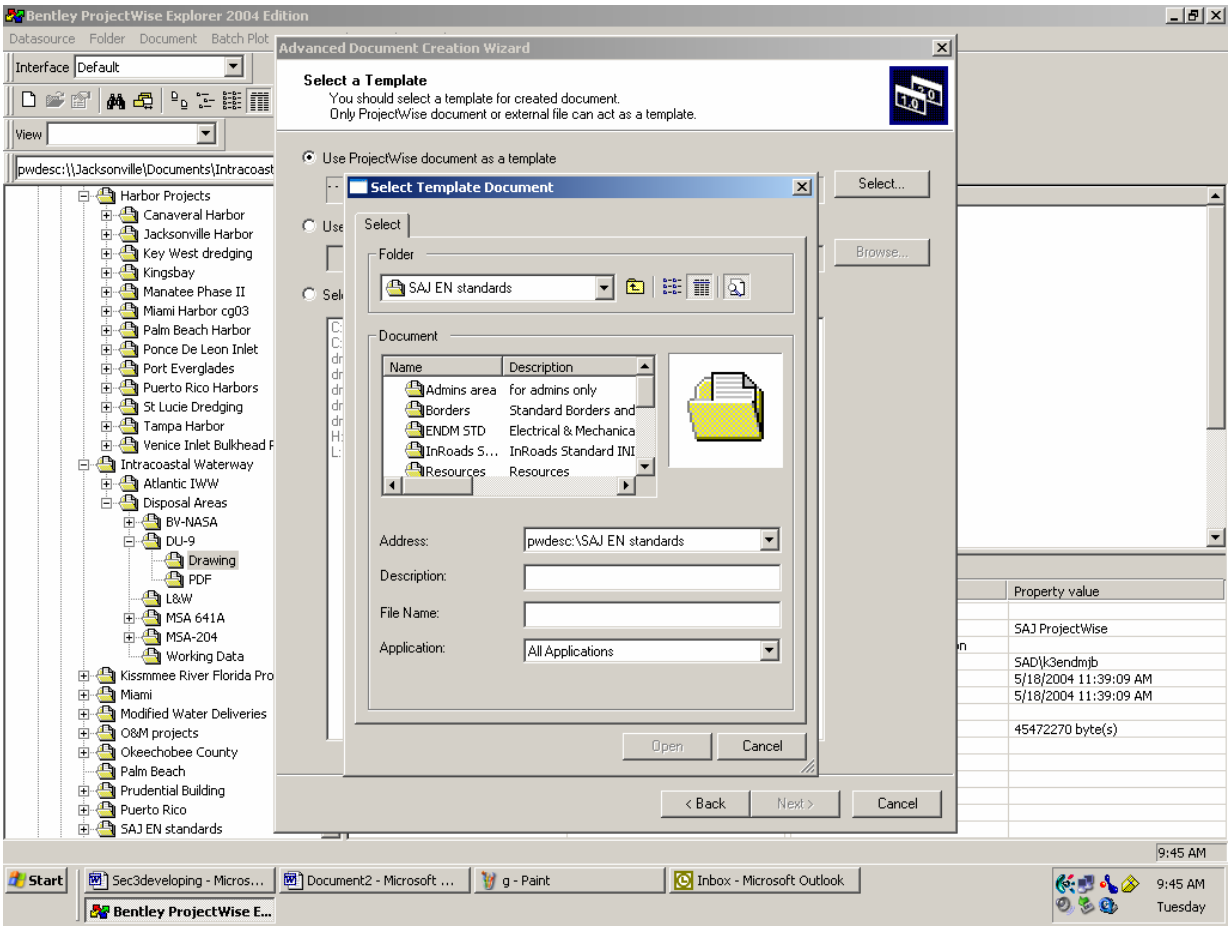


Figure 4-16

Double click in the document area the folder AEC seed files. After clicking, the folder the folder area under select then changes to AEC seed files as shown on figure 4-17.

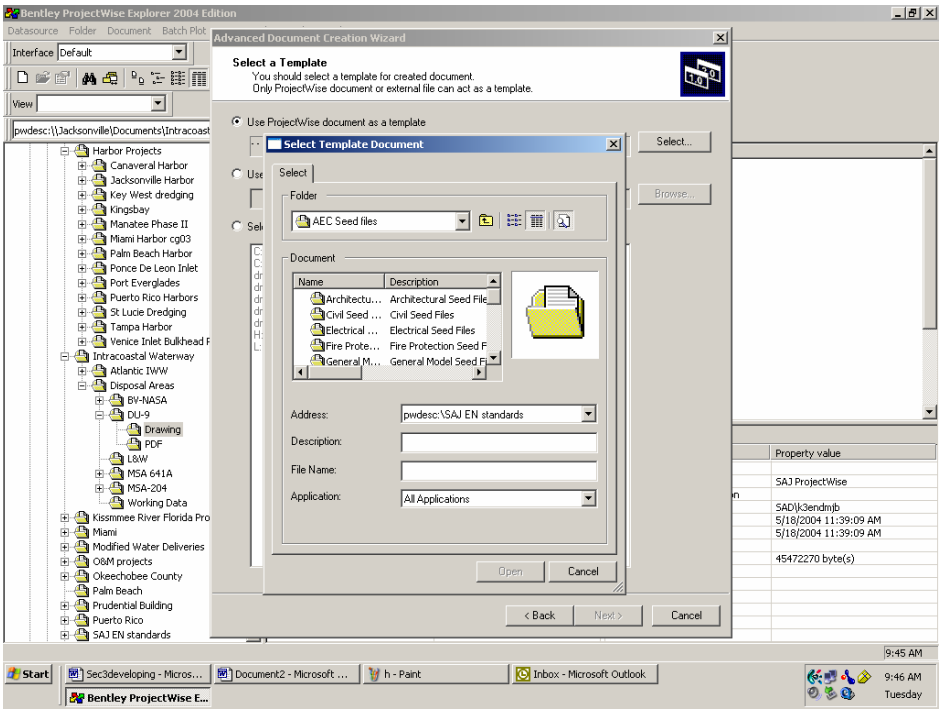


Figure 4-17

Double click on (civil) seed listed under the document area shown on figure 4-18.

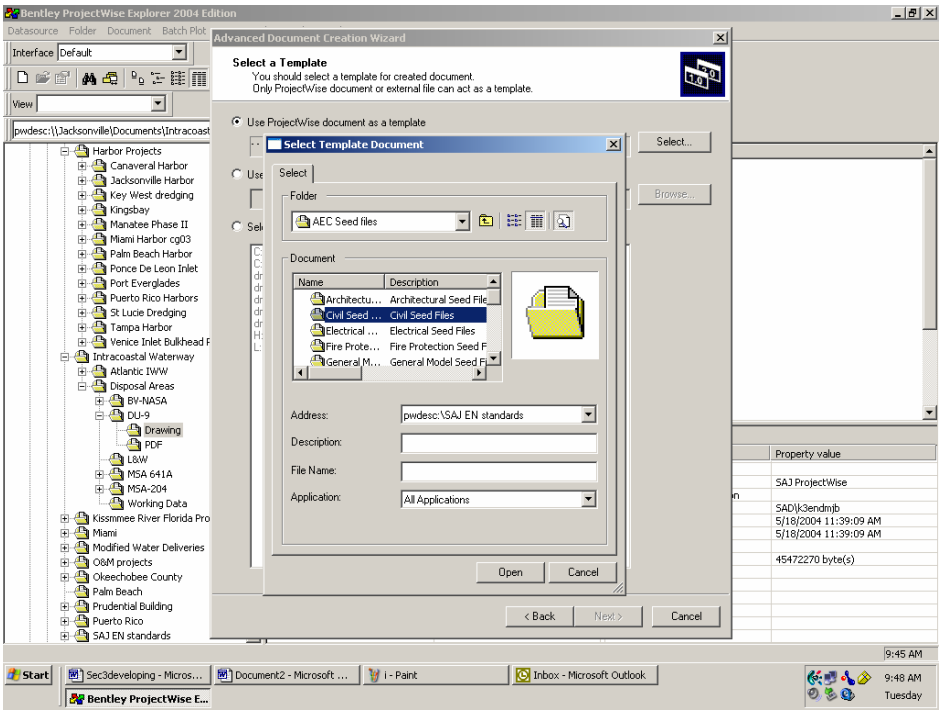


Figure 4-18

After the (civil) seed file is clicked opened, all the civil files are then listed under the document section as shown in figure 4-19.

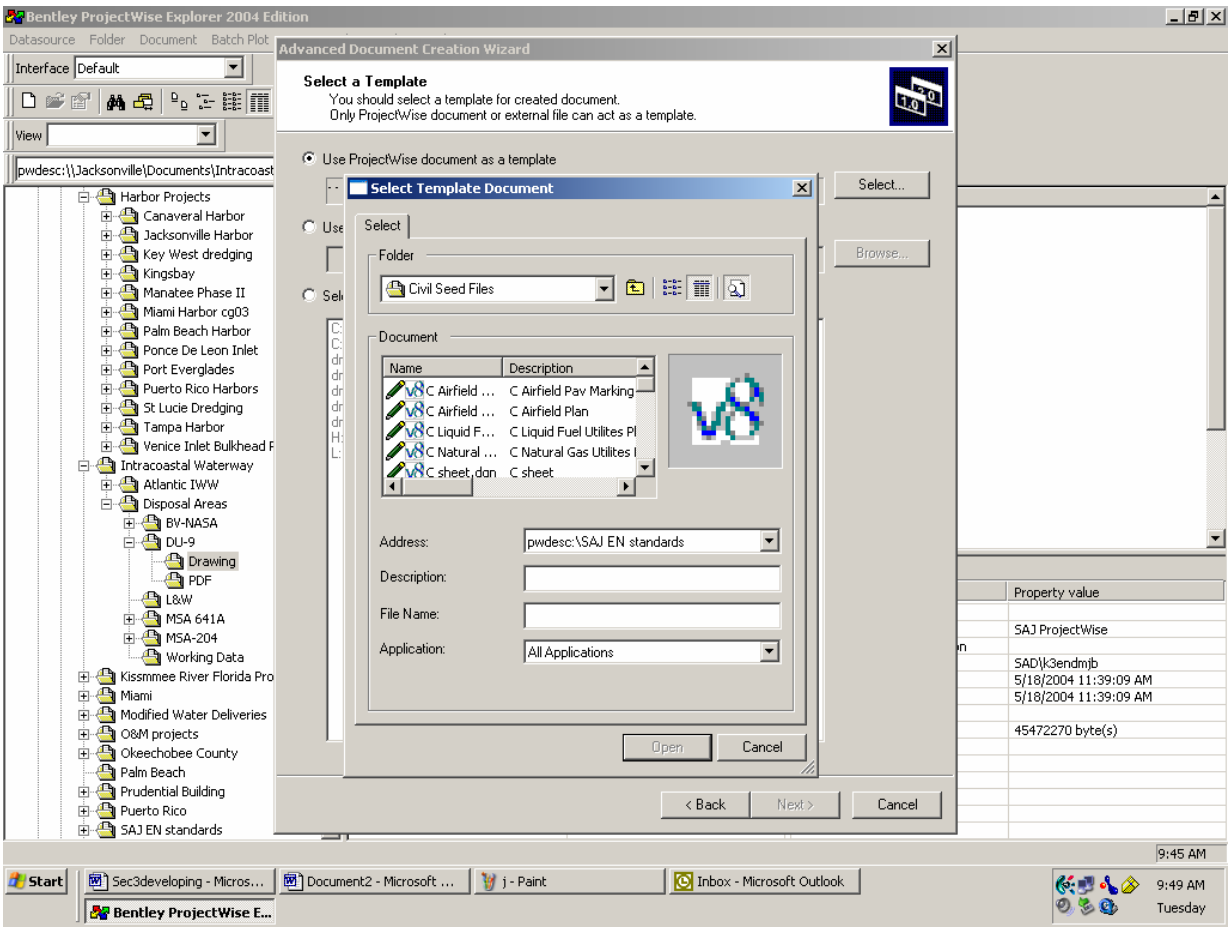


Figure 4-19

4.5.4.2 Creating New Model File Document. In order to create a new file model, the previous procedures are followed first through the initiation to develop a new document.

Click the model seed file c-xection in the document area as shown in figure 4-20. Proceed by clicking the "Open button.

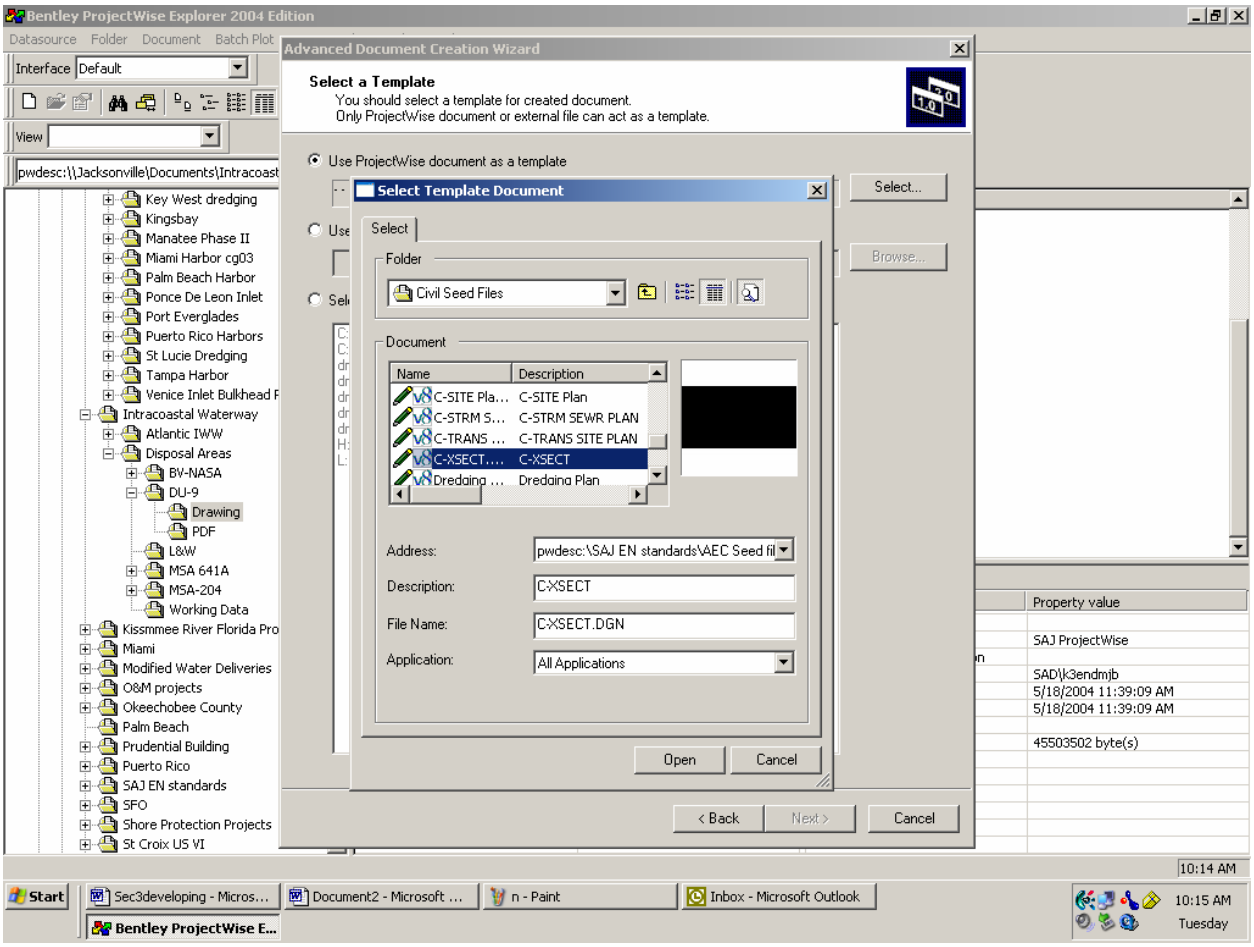


Figure 4-20

The advanced document creation wizard then appears as shown on figure 4-21. Click the select next button to proceed.

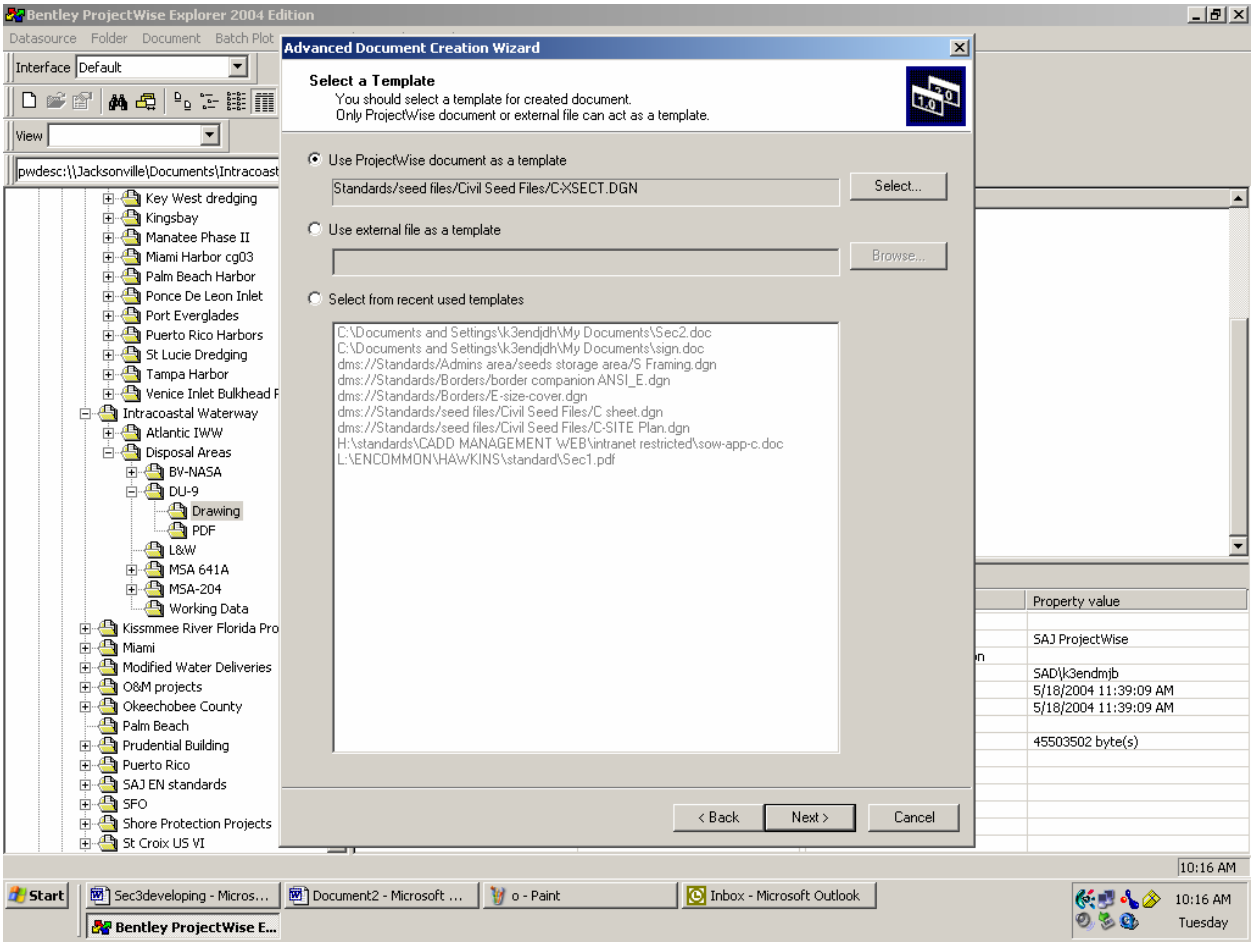


Figure 4-21

The advance documentation wizard then shows the current document properties of the file as shown below on figure 4-22.

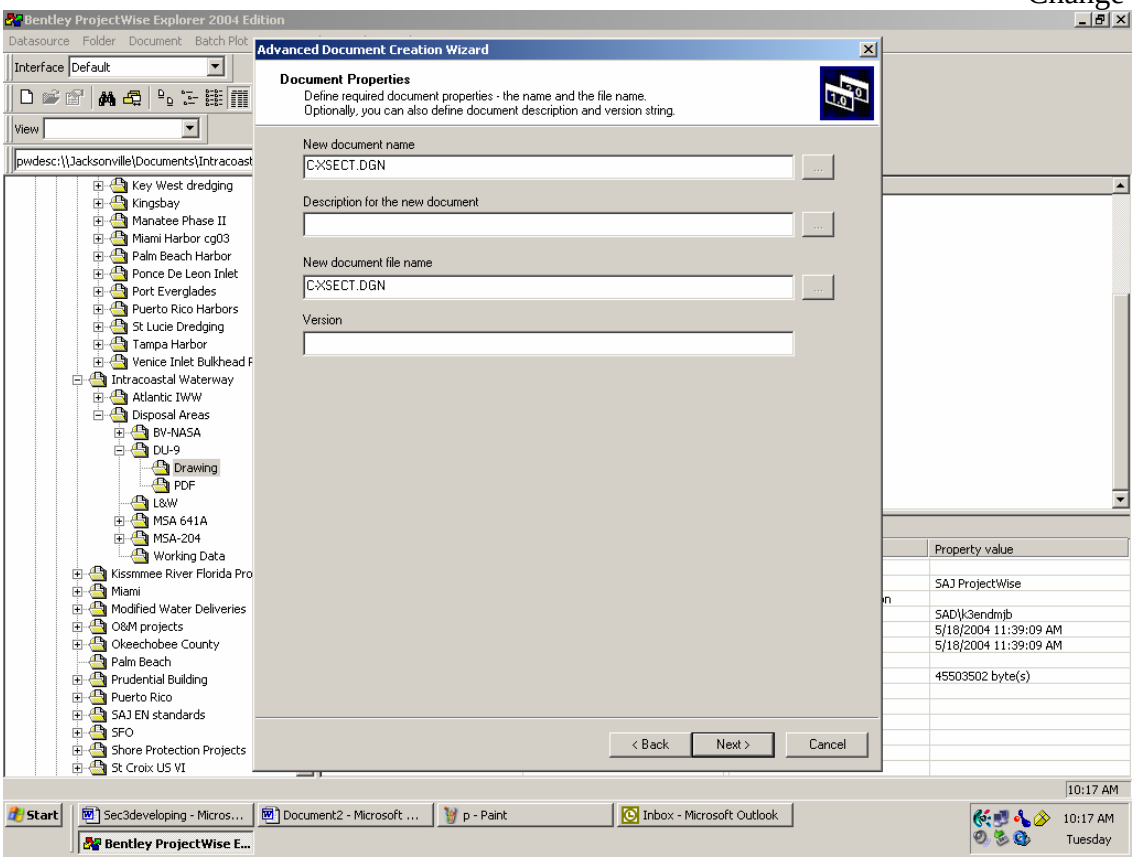


Figure 4-22

In the document properties add the new document name, provide a description that conveys what the sheet file is about, and input a new document file name according to the project and the CADD Standards naming convention as shown in the example 4-23. Refer to 2-.2.1 in the CADD Standards Guide model file naming convention to set up the model file name.

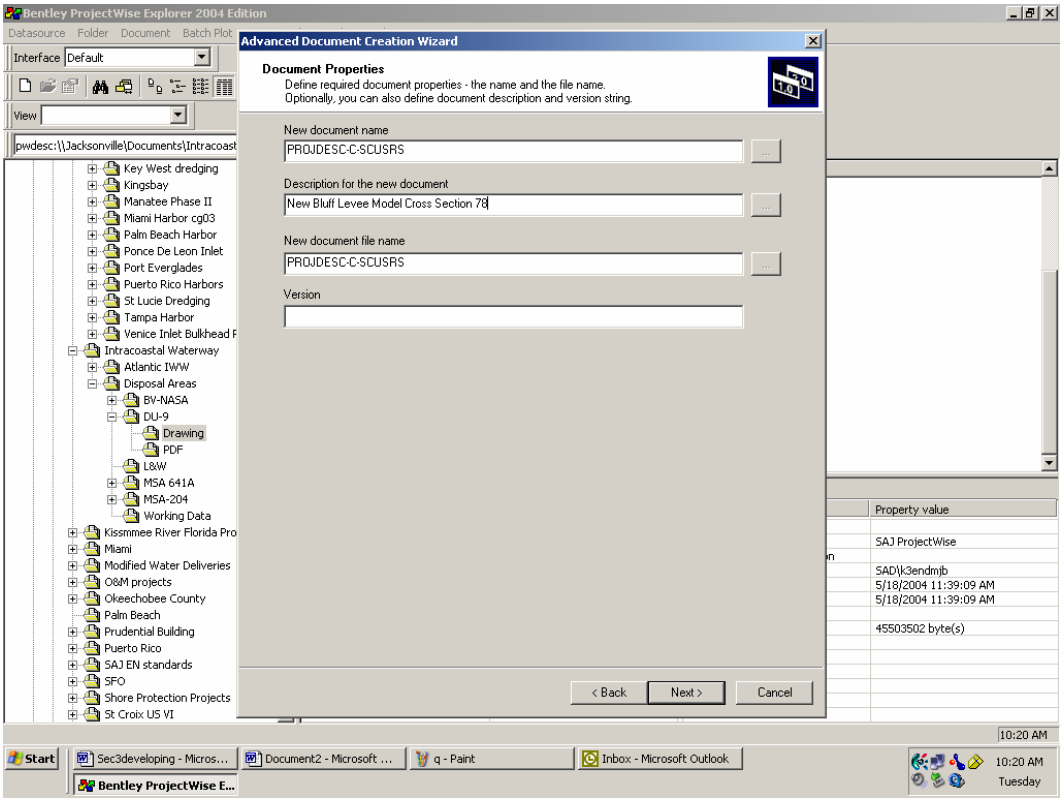


Figure 4-23

After 'Next' is clicked, 'Create a Document' appears as shown in figure 4-24 below. If the listing is correct, proceed by clicking the next button.

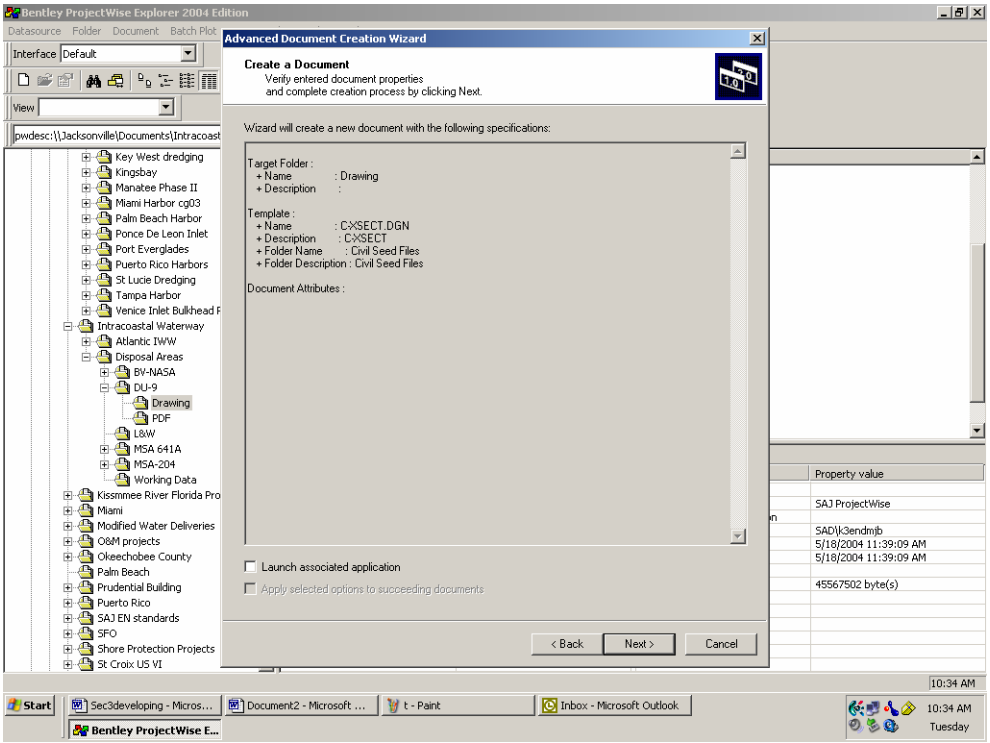


Figure 4-24

After "Next is clicked, advance document create wizard appears to show the document has been successfully completed as shown on figure 4-25. After the finish button is clicked the drawing is placed within the project directory and the process is complete.

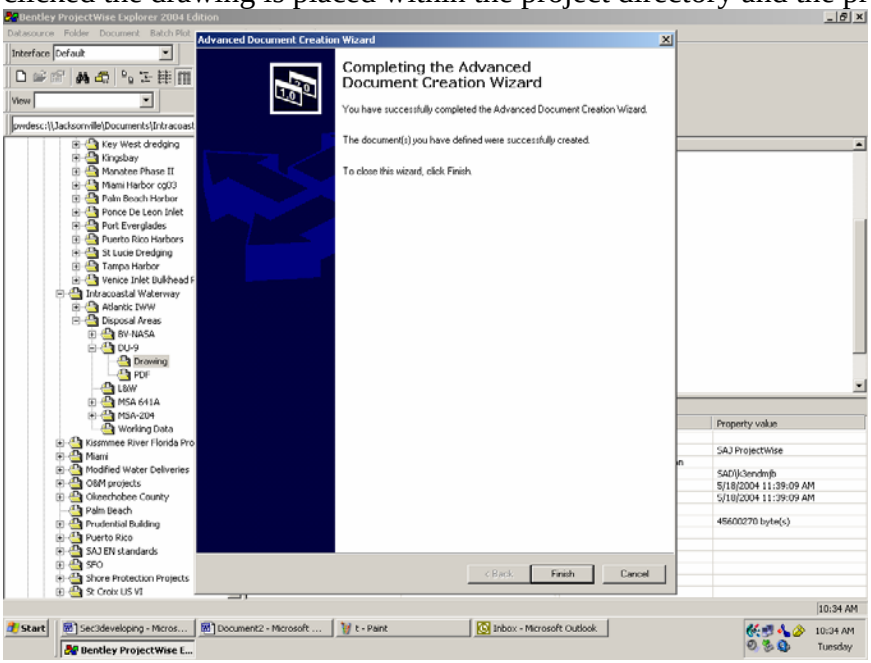


Figure 4-25

4.5.4.2 Creating New Sheet File Document. In order to create a new sheet file, first the previous procedures are followed through the initiation to develop a new document. Then click the model seed file Civil Sheet in the document area as shown in figure 4-26.

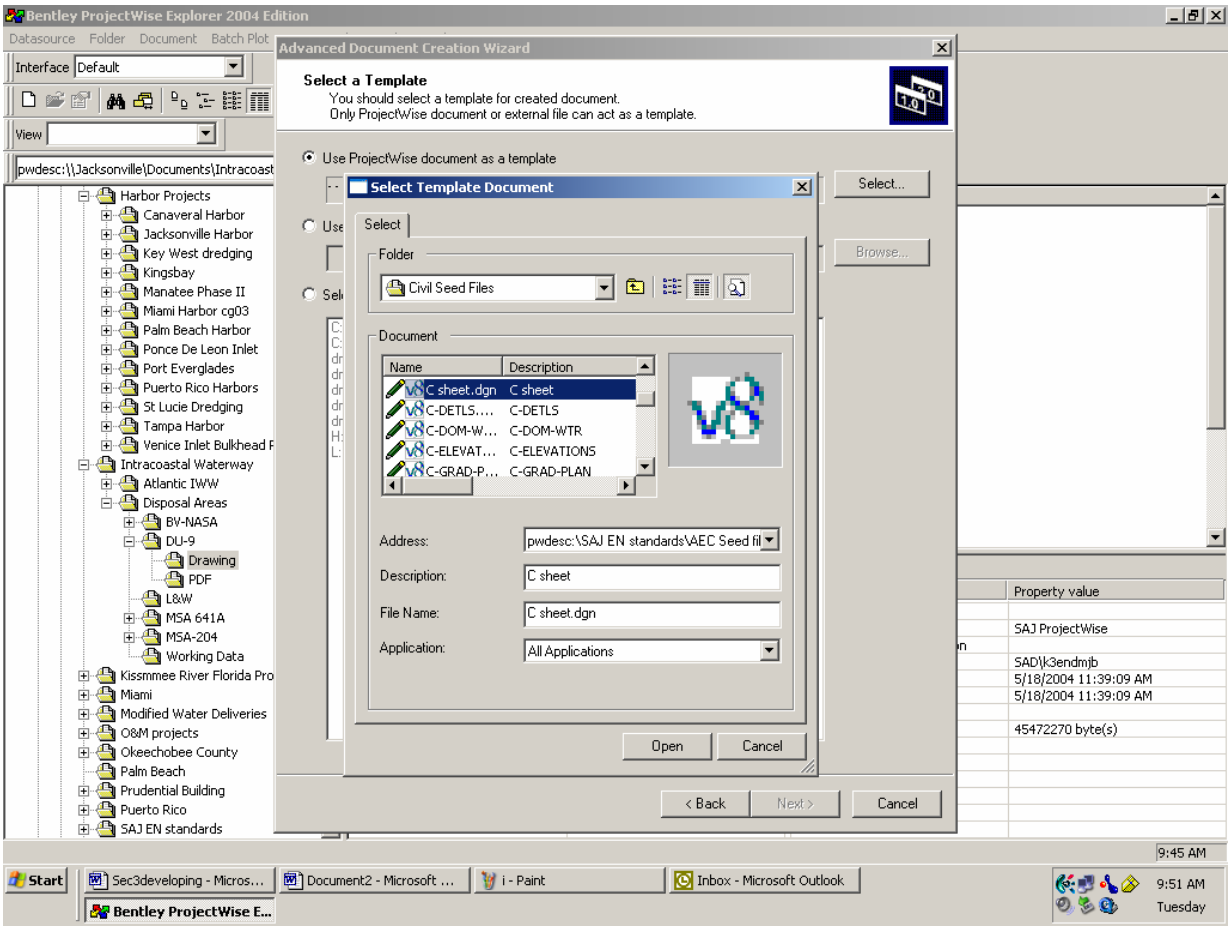


Figure 4-26

The advanced document creation wizard then appears as shown on figure 4-27. Click the 'Select' button of the use ProjectWise document as a template.

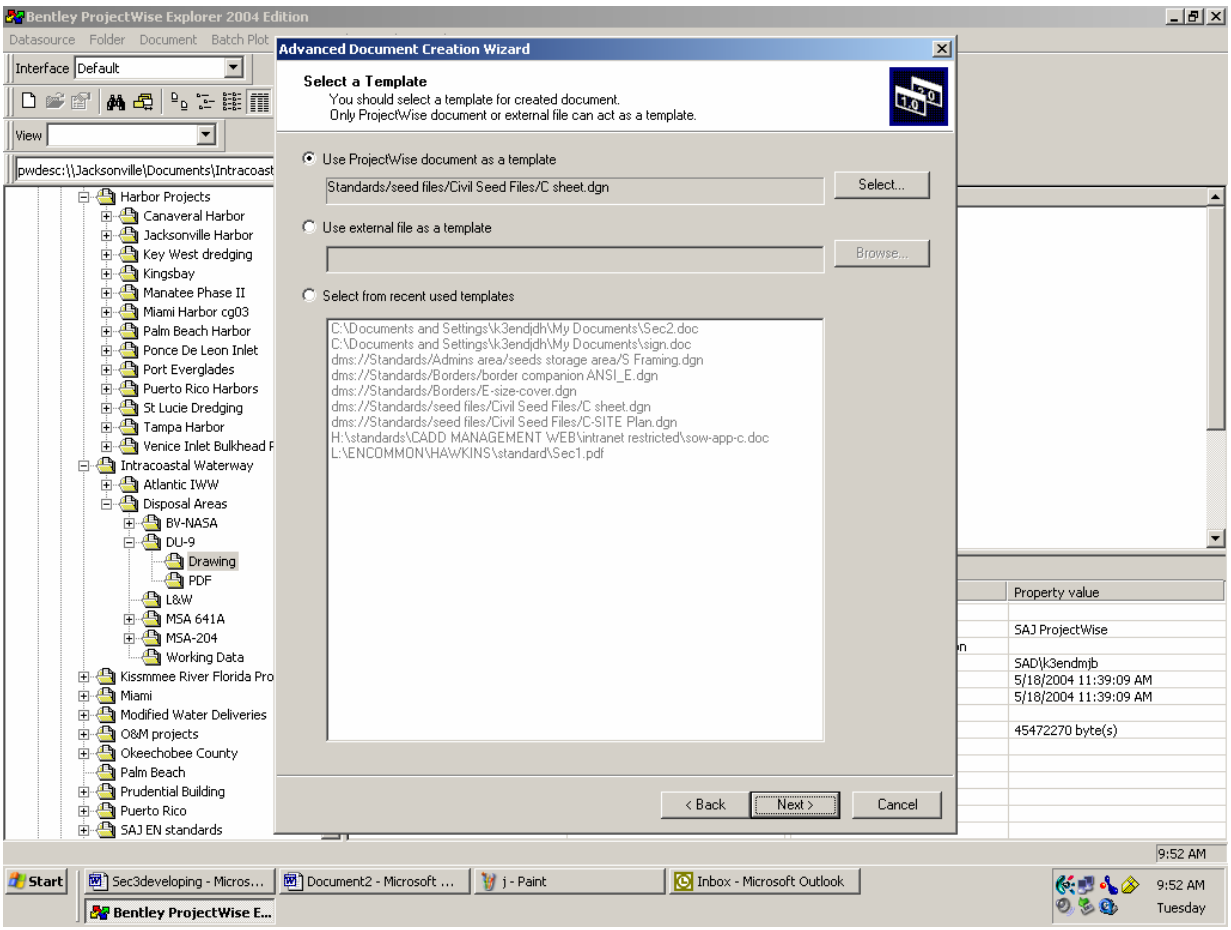


Figure 4-27

The advance documentation wizard shows the current document properties of the file as shown below on figure 4-28.

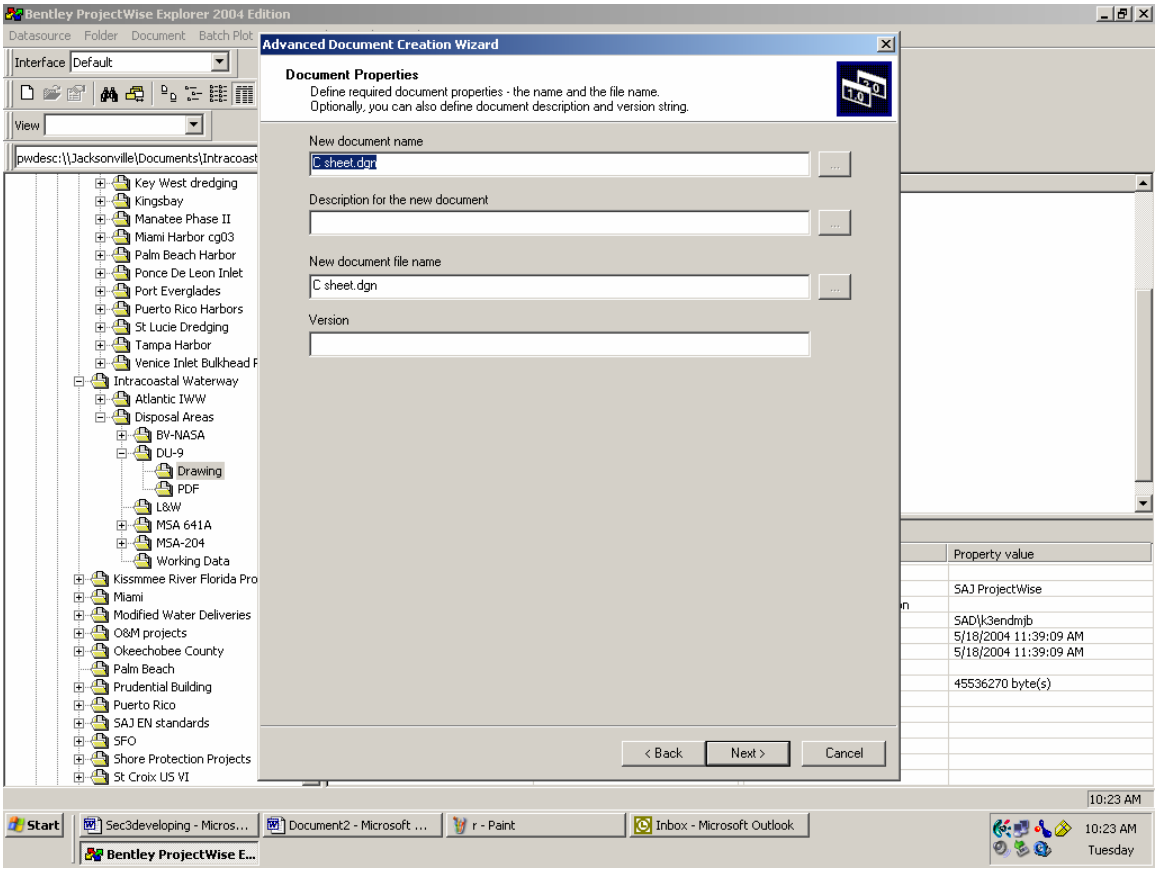


Figure 4-28

In the document properties add the new document name, provide a description that conveys what the model is about, and input a new document name according to the project and the CADD Standards Guide naming convention as shown in the example 4-29 below. Refer to section 2.2.2 sheet file naming convention in the CADD Standard Guide for procedure to set the sheet file name.

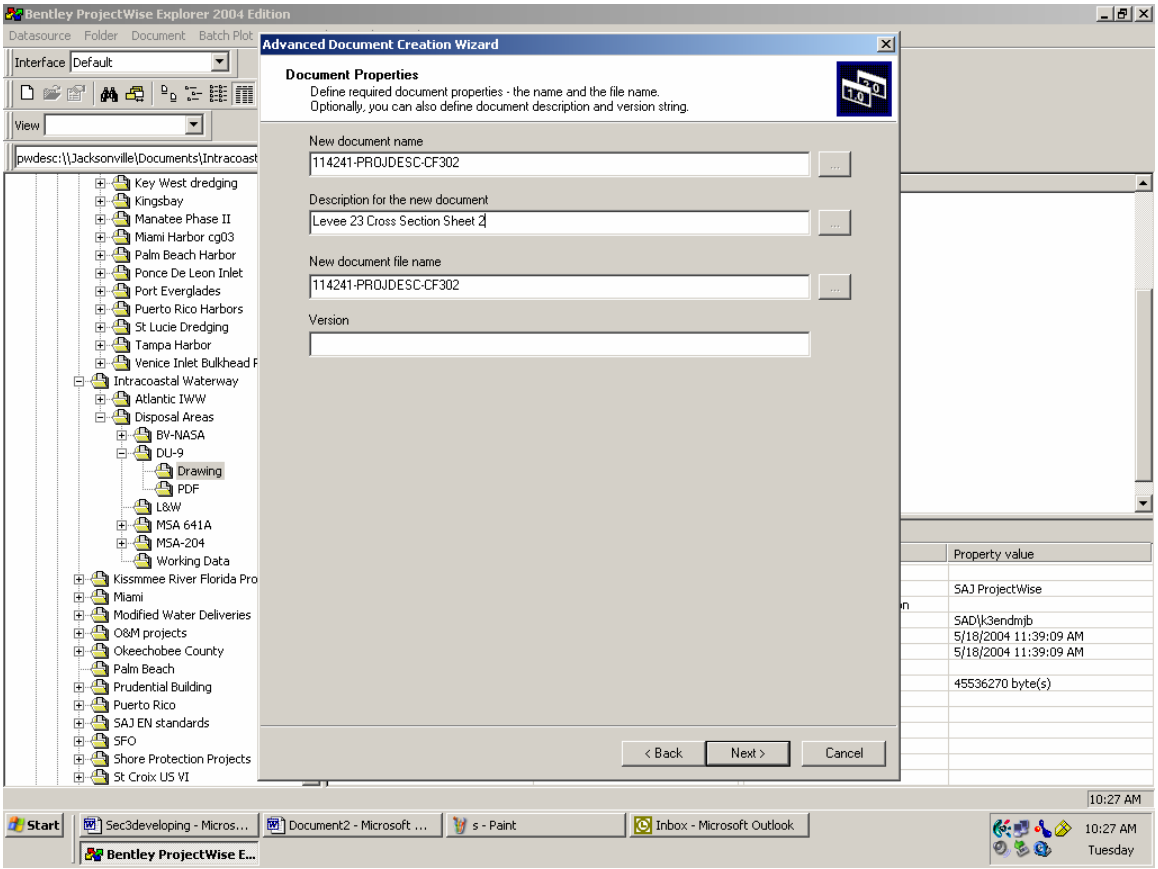


Figure 4-29

After 'Next' is clicked, the 'Create a Document' appears as shown in figure 4-30 below. If the listing is correct, proceed by clicking the 'Next' button.

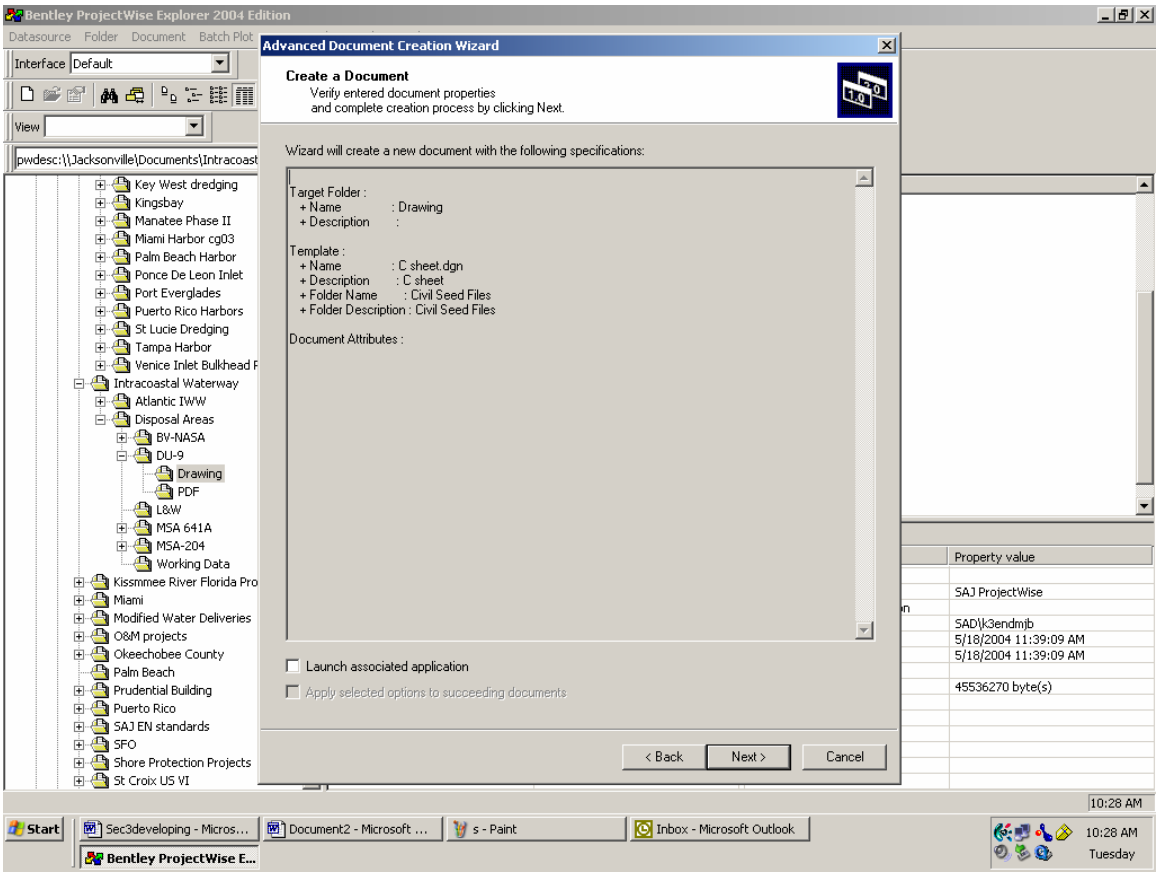


Figure 4-30

After 'Next' is clicked, the advance document create wizard appears to show the document has been successfully completed as shown on figure 4-31. After the finish button is clicked, the drawing is placed within the project directory and the process is complete.

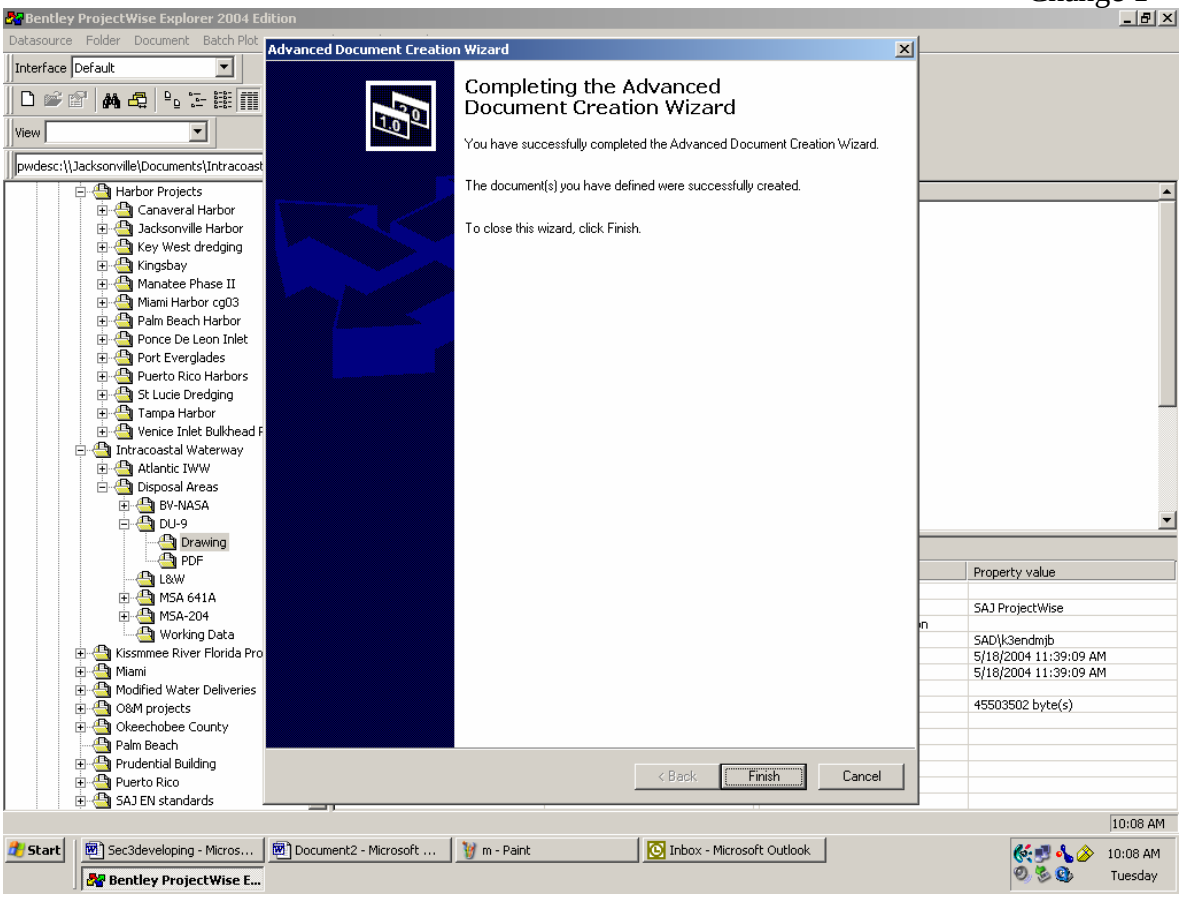


Figure 4-31

4.6 **Drawing Initiation**.

4.6.1 To begin drawing initiation, *Click on the Netspex designer icon* shown on figure 4-32 to start drawing in Microstation V8.

Figure 4-32

4.6.2 Once the Netspex designer is initialized, the Microstation splash screen appears and then afterwards the ProjectWise dialogue appears as shown in figure 4-33 below. Set the ProjectWise dialogue to the data source and set the other boxes according to the

user's name and password. Select in ProjectWise the project folder as shown in figure 4-33 below and click the drawing file. Proceed by clicking the 'Open' button and the file then opens in Microstation.

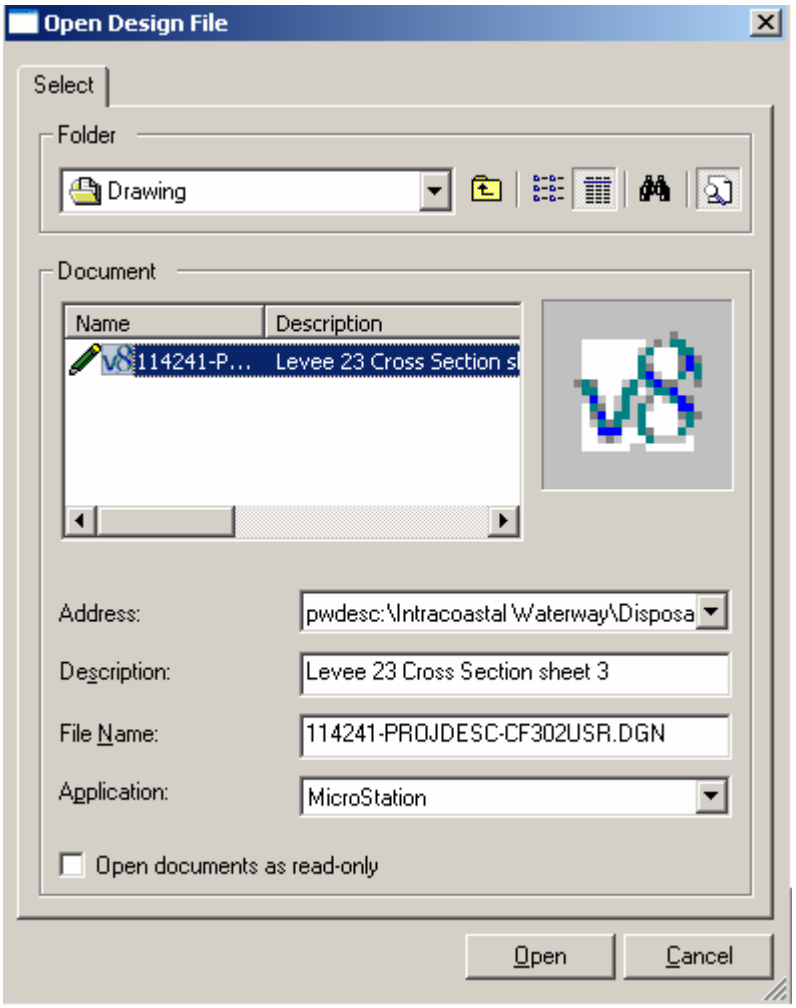


Figure 4-33

The Netspex branding wizard then appears. Select the discipline as civil, drawing type and scale 1=20', see figure 4-33. Within this model file there is only one type of model so keep the save branding to file checked.

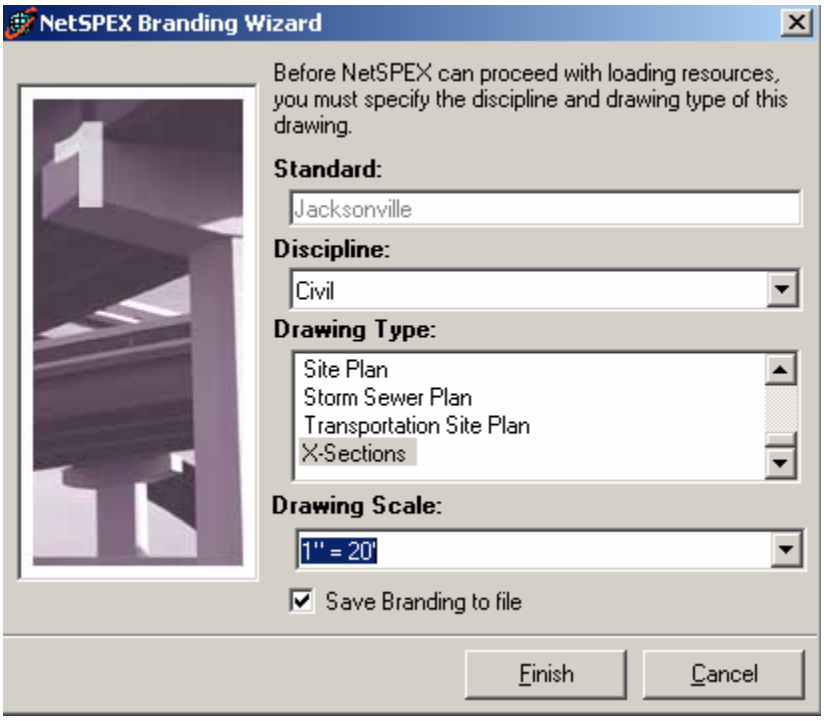


Figure 4-34

After the clicking the finish button of the Netspex Banding Wizard shown in figure 4-34, the Netspex Designer box appears.

4.7 **Drawing File Elements**. Use the model file to develop the drawing file elements. All design graphics pertain to the specific model type.

4.8 **Scale Relationship**. The plot scale of the sheet file and scale of the border file is set by the dominant model file used.

4.9 **Placement of Elevations and 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.

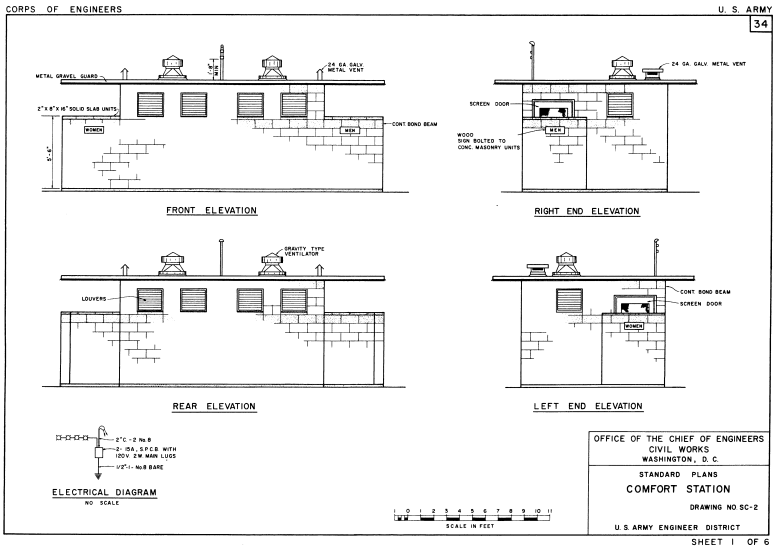
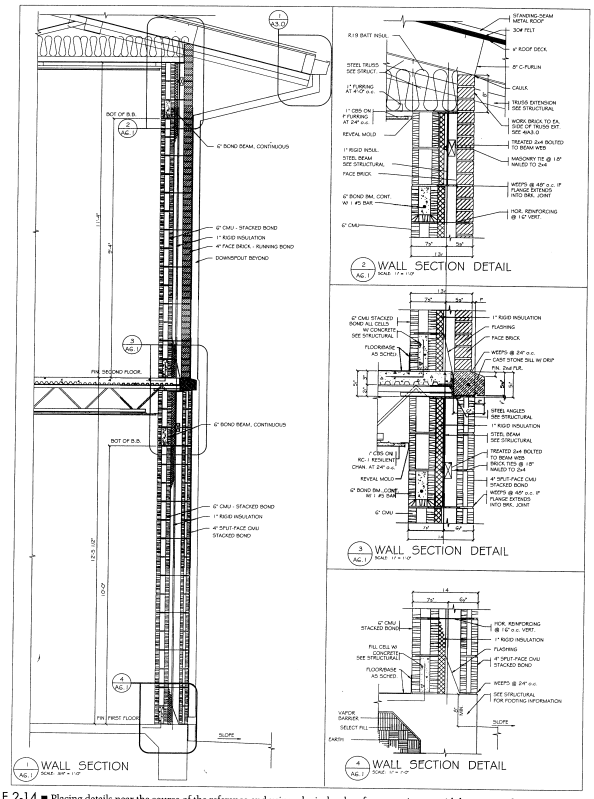


Figure 4-35

4.10 **Layout of Cut Sections**. Cut sections from the bottom of the sheet to the top of the sheet.



E 2-14 ■ Placing details near the source of the reference and using a logical order of presentation can aid the print reader. *Courtesy G. William V.I.A., Archer & Archer PA.*

Figure 4-36

4.11 **Detail Layout**. Set the details in a sequential flowing logical order, see example figure 4-37. If the detail contains a plan view, place the plan view in the top-left corner of the sheet file. When the details are laid out set all the views and sections in proper orientation to each other.

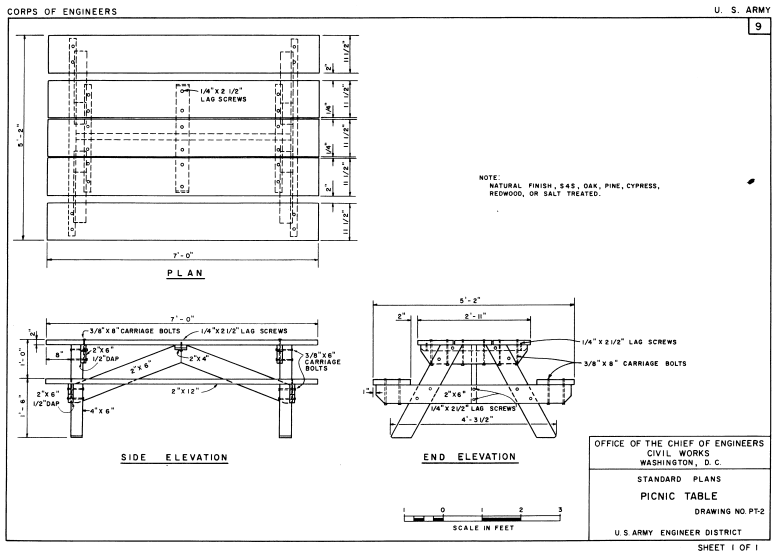


Figure 4-37

4.12 **Text and Scales**. Place text, scales and general notes on the sheet file, by copying from the border companion file, the general note placeholder, and the scale relating to the drawing.

4.13 **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.

4.14 **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".

4.15 **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 reference border to the dominant scale to be used on the drawing.

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

4.16 **Valve House Example**. *A Valve House sheet file contains a series of drawings.* The sheet file is created by choosing the seed file and saving as a new drawing.

The structural drawing r_valuvehouse.dgn model file is created and attached as a reference file, see figure 4-38.

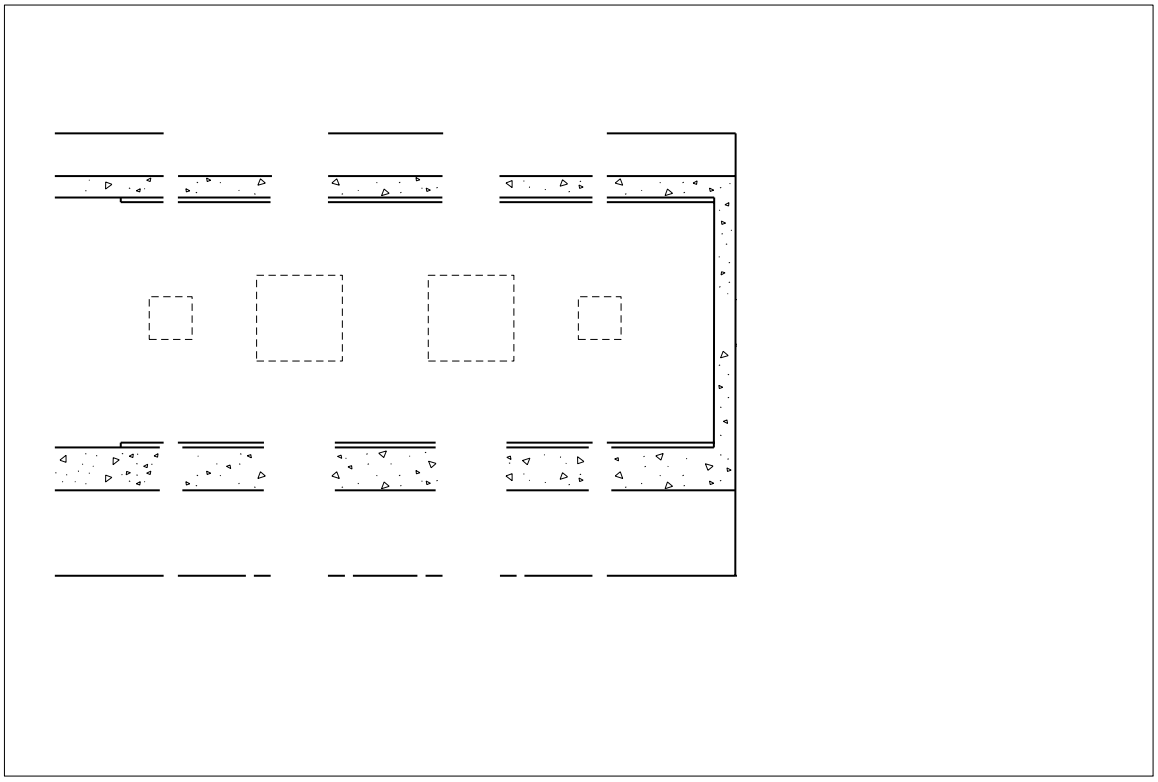


Figure 4-38

For the Valve House a Mechanical model file drawing r_valuvehouse.dgn is created and then referenced to the sheet file drawing shown as figure 4-39 where both the model structural and mechanical files are attached to the sheet file.

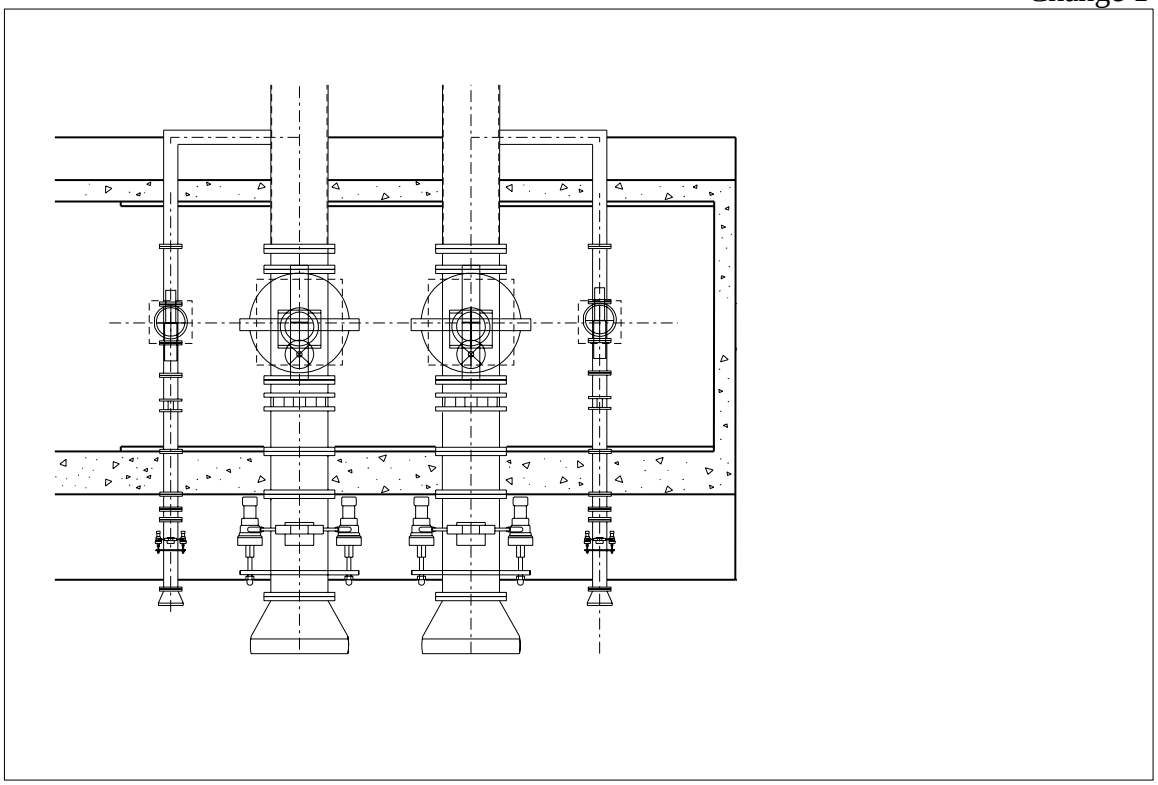


Figure 4-39

The border companion file is attached to the sheet drawing file using saved view.
For a 3/8”=1’-0” scale set the master reference scale to the 1/(3/8)=2.6667, see drawing figure 4-40.

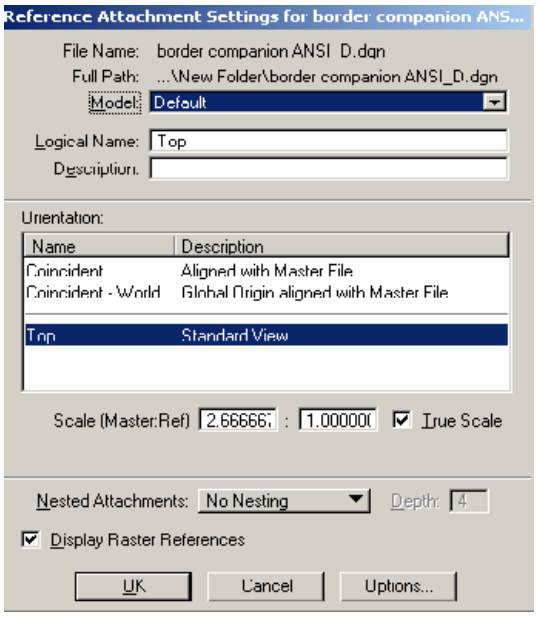


Figure 4-40

The border file is attached to the sheet file as a reference file use ‘Save View’ or ‘Top Standard View’ to set the orientation. Set the scale to the sheet file plot scale.

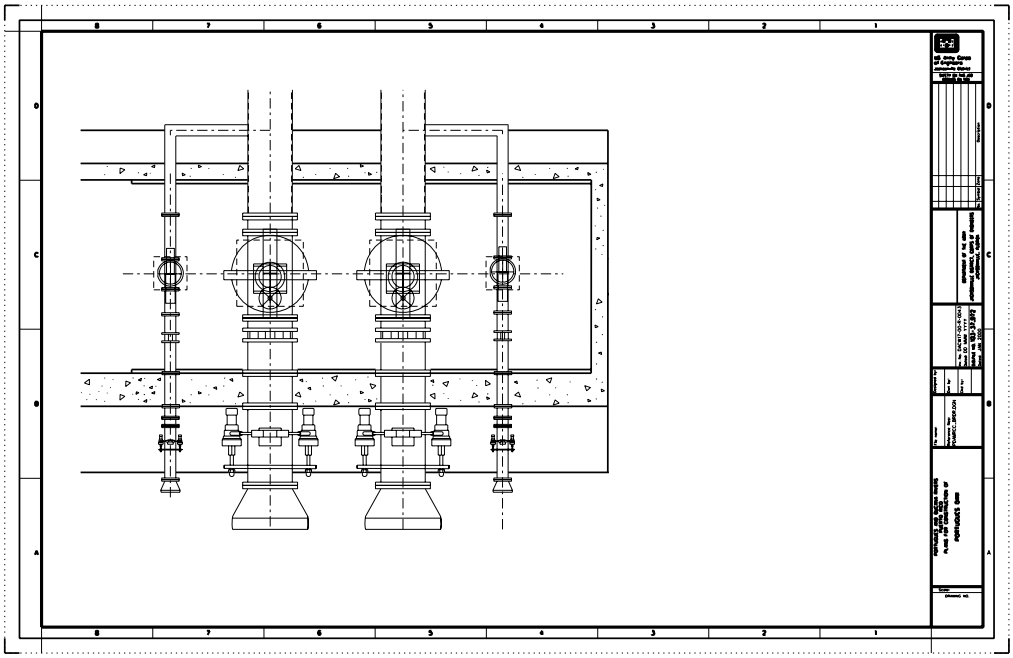


Figure 4-41

Using ‘Saved View’ reference the border to the required scale around the M-102 mechanical valve design. Using the border companion, copy the attached referenced elements graphic scales to the sheet file.

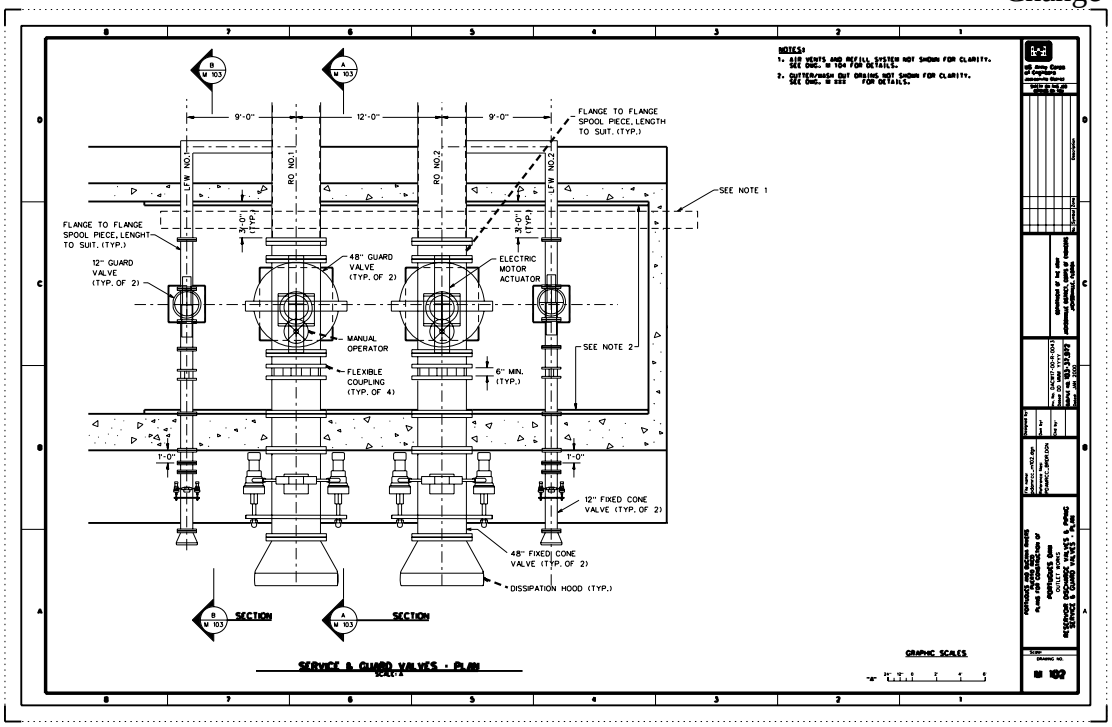


Figure 4-42

4.17 **Site Plan.** 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.

4.18 **Orientation.**

4.18.1 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.

3.18.2 Projects are laid out horizontally on a sheet.

4.18.3 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.

4.18.4 Riverbank orientation is always determined as being right bank or left bank by facing in direction of the water flow (downstream) see figure 4-43.

4.18.5 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 4-44.

4.18.6 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.

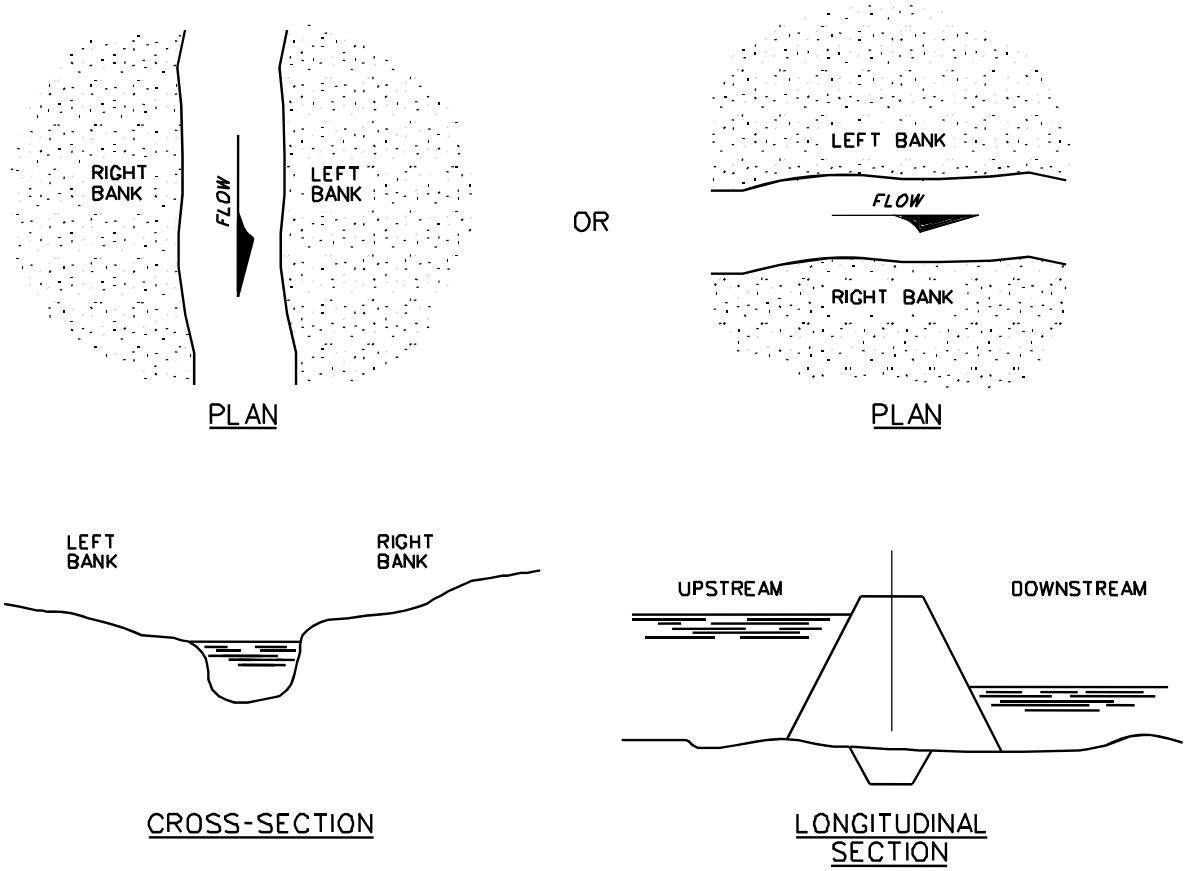


Figure 4-43

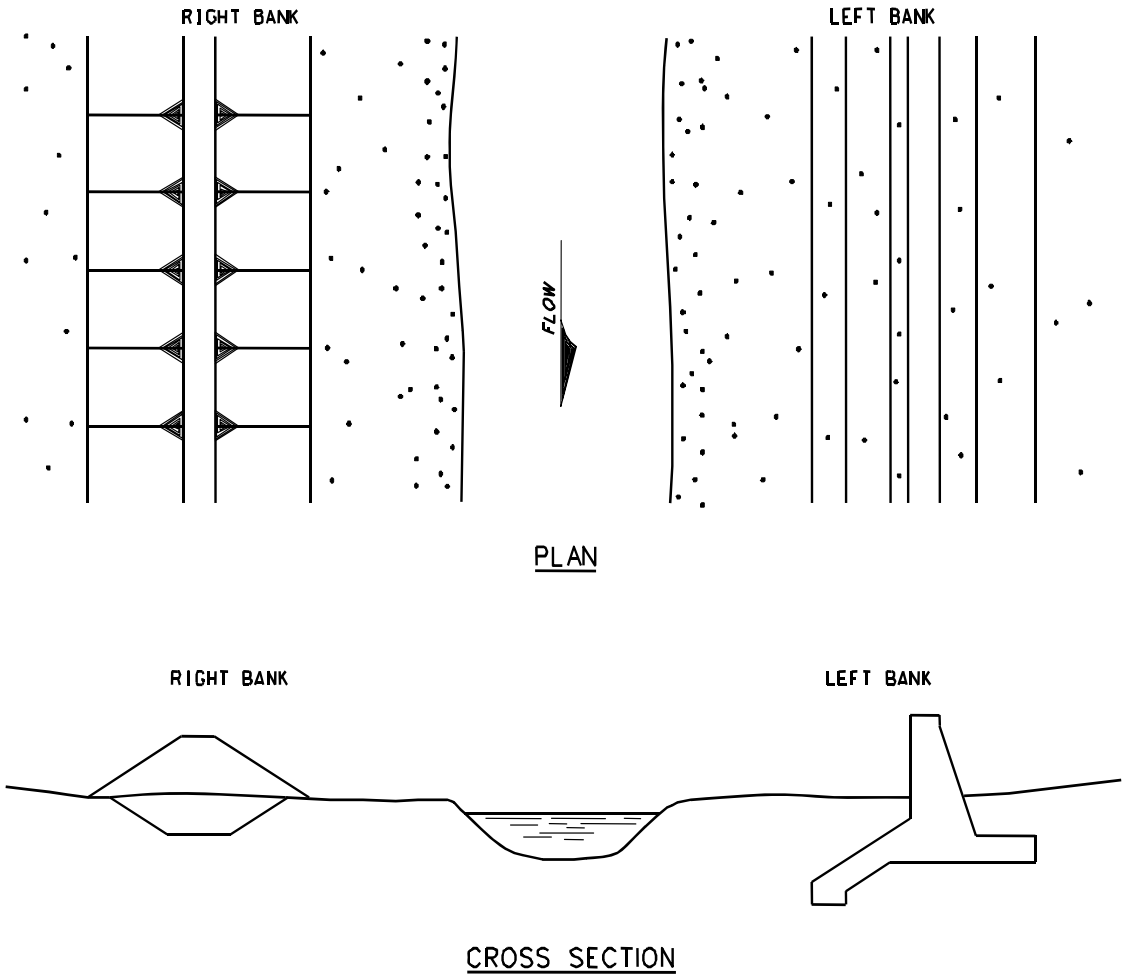
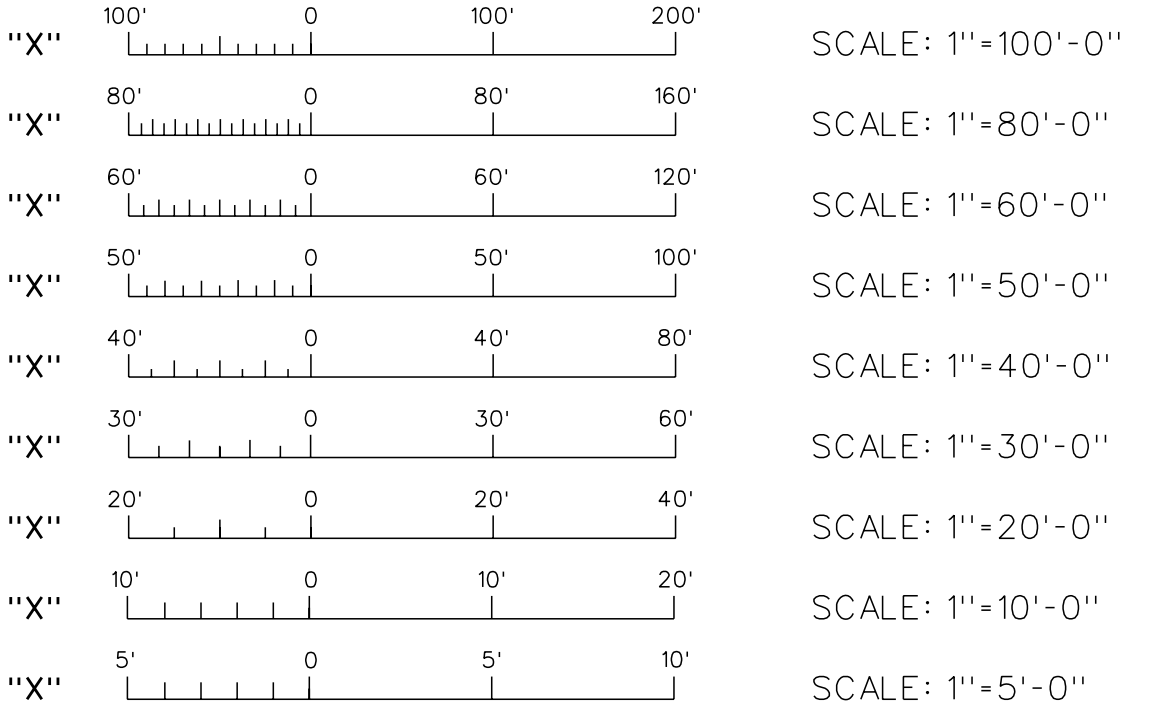


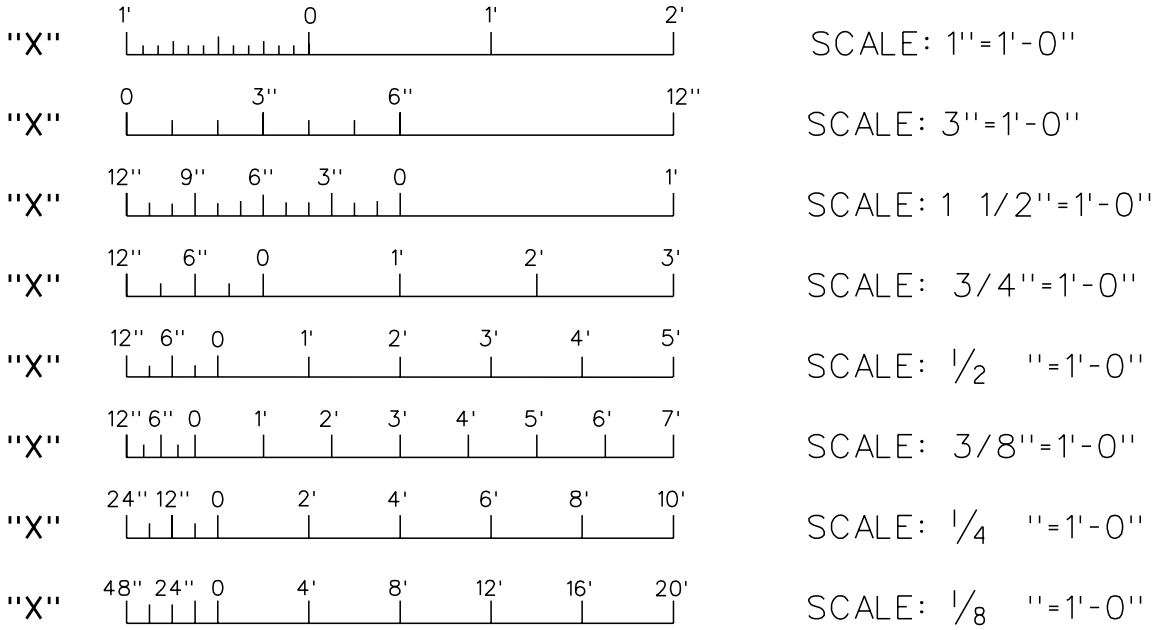
Figure 4-44

4.19 **Scales**. Use scales that are industry standard for architect and engineering scales, and avoid using unusual scales, see figure 4-45. 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



ARCHITECTURAL GRAPHIC SCALES



NOTES:

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

Figure 4-45

4.20 **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.

4.20.1 Segmental drawings shall include appropriate key plans and match lines.

4.20.2 The key plan shall be placed in a convenient location and shall indicate the represented plan area shown on the drawing by crosshatching.

4.21 **Utilization of Record Drawings Within the Contract Set.**

4.21.1 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.”

4.21.2 When ‘As-Built Drawings’ are used within the set, the index drawing shall have the note included

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

4.21.3 When reference to ‘As-Built Drawings’ from previous contracts are deemed necessary for information only purposes, but have been destroyed or are missing, a developed current condition drawing may be prepared as a substitute. Any drawing created, as a developed current condition drawing will be marked with the statement

> “DEVELOPED CURRENT CONDITION SHOWN FOR INFORMATION ONLY, CONDITIONS, ARRANGEMENTS, AND APPLICATION HAVE NOT BEEN VERIFIED."

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

4.22 **Redline Procedures.**

4.22.1 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.

4.22.2 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.

4.23 **Drawing Revision** (see figure 4-46)**.**

4.33.1 During the contract advertisement period revisions are amendments, after award of a contract revisions are modifications.

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

4.23.2.1 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.

4.23.2.2 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.

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

4.23.2.4 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.

4.23.2.5 A short description shall be placed in the Revision Block. When amendment changes are to be furnished to bidders through 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

4.23.2.6 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”

4.23.2.7 Filenames of modified or amended drawings will remain unchanged.

4.23.2.8 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.

4.23.2.9 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.

4.23.2.10 When a drawing has received extensive revisions a single revision symbol shall be placed within the title block border, just below the sheet 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

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 4-46

4.24 **Arrangement of Contract Plans.** Contract plan discipline designator drawing index sequence required by the National CAD Standard and A/E/C CADD Standard to be used for construction drawings.

4.25 **Plan Set Requirements**. All plan sets shall include as a minimum, Jacksonville District Corp of Engineers cover sheet, abbreviations, and a key plan.

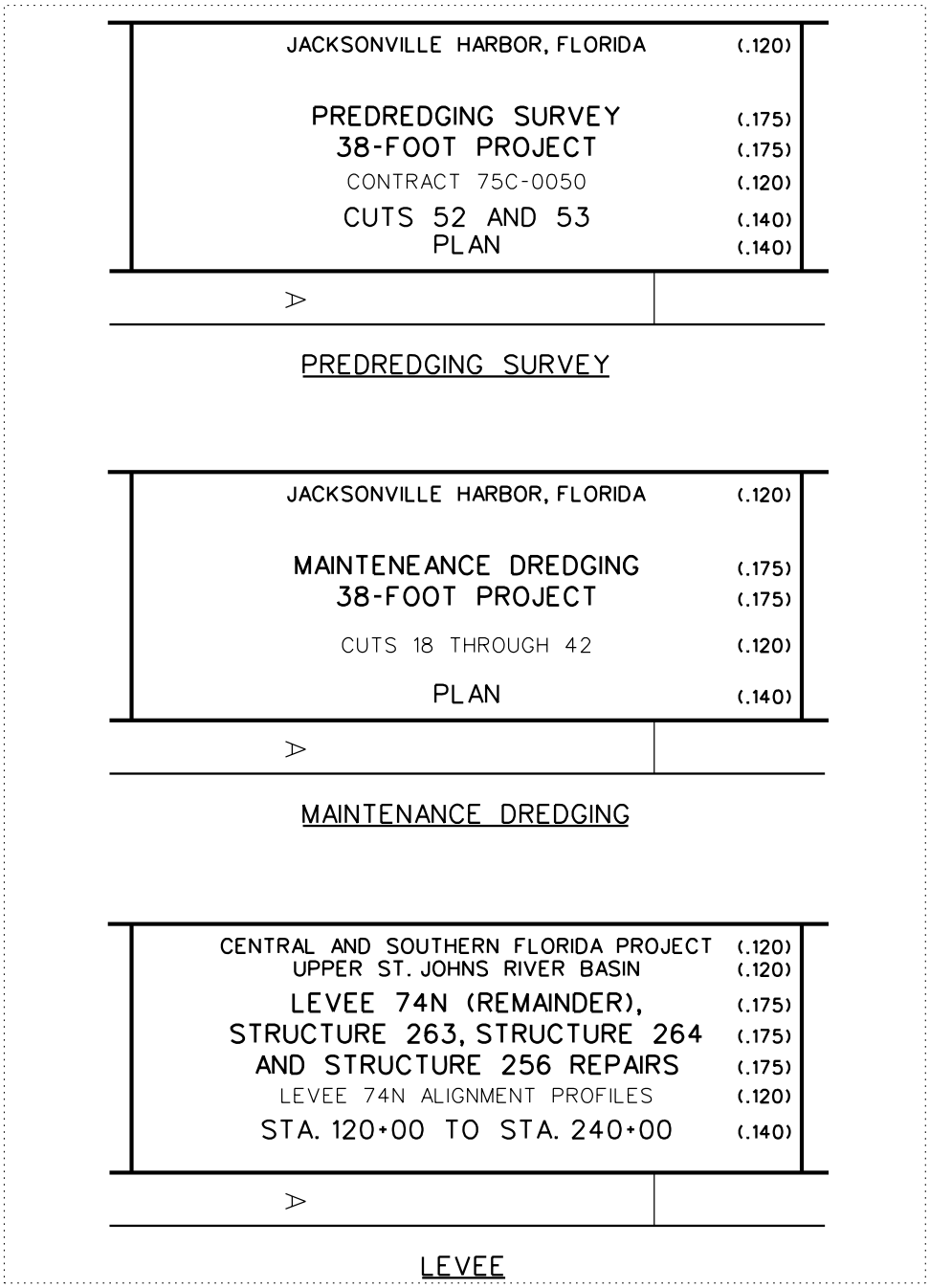


Figure 4-47

CENTRAL AND SOUTHERN FLORIDA PROJECT (.120)
UPPER ST JOHNS RIVER BASIN (.120)

STRUCTURE 96B AND TIEBACK LEVEE (.175)

MECHANICAL (.120)

GATE HOIST (.140)
DETAILS NO. 1 (.140)

A

STRUCTURE

CALOOSAHATCHEE RIVER AND LAKE (.120)
OKEECHOBEE DRAINAGE AREAS, FLORIDA (.120)

LOCK NO. 1-ST. LUCIE CANAL (.175)

ARCHITECTURAL (.120)

MACHINERY HOUSES (.140)
PLANS, ELEVATIONS AND DETAILS (.140)

A

LOCK AND DAM

CENTRAL AND SOUTHERN FLORIDA PROJECT (.120)
FOR FLOOD CONTROL AND OTHER PURPOSES (.120)
LEVEE 29 BORROW CANAL ENLARGEMENT (.120)
STRUCTURES 333, 334, AND 336 (.120)

STRUCTURE 333 (.175)

ELECTRICAL (.120)

CONTROL WIRING DIAGRAM (.140)

A

CENTRAL AND SOUTH FLORIDA

Figure 4-48

Section 5

Preparation of CADD Contract Drawings for Publication

5.1 **Preparation of CADD Drawings Prior to Publication.** Prior to releasing contract plans CADD 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.

5.2 **Create Archive Copy**. Create an archive copy of the 100% designed contract plans prior to reviewing and preparing files for drawing publication to serve as a backup resource.

5.3 **Select File for Review and Cleanup**. *Open* the selected file for reviewing and cleanup in Microstation.

5.3.1 *Activate Reference Manager.*

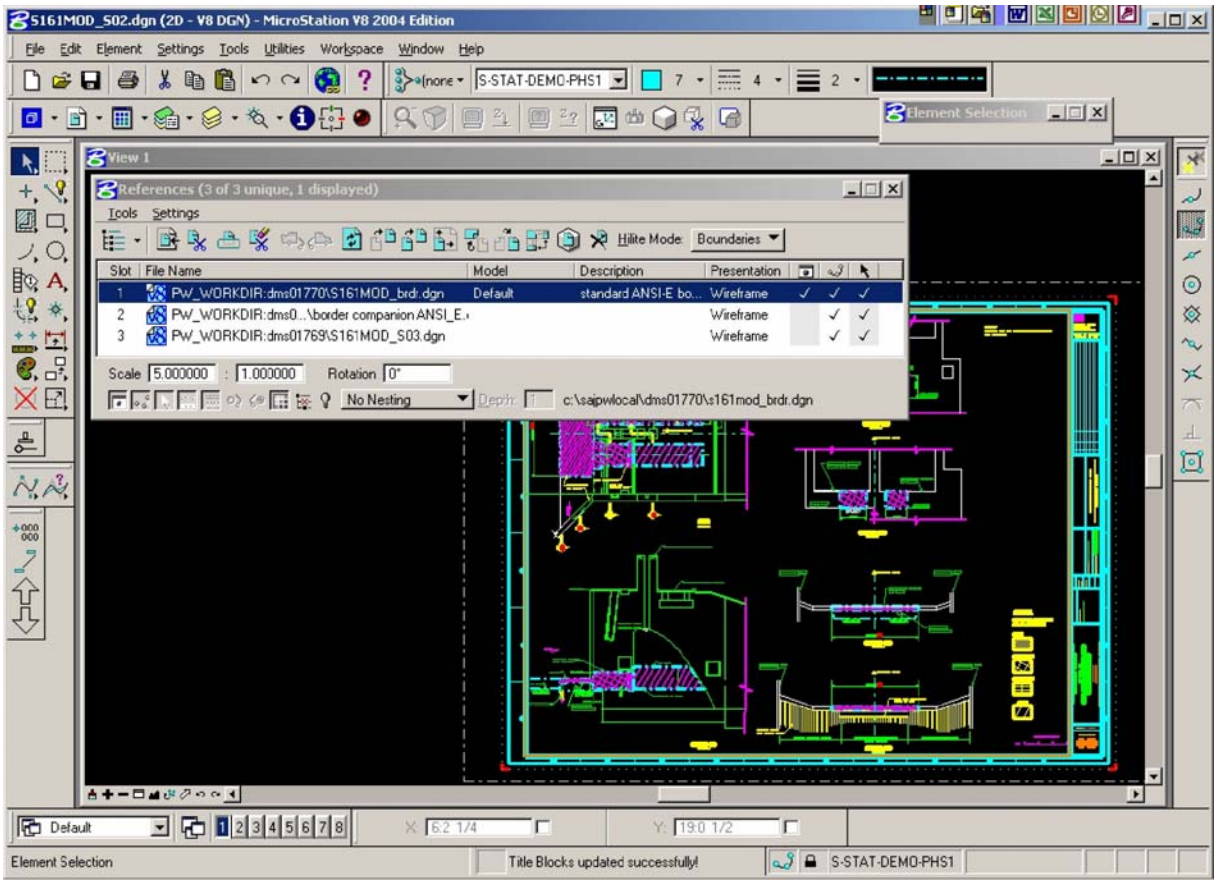


Figure 5-1
Reference File Example

5.3.1.2 Verify reference paths prior to detaching the reference file.

CAUTION
Be aware some margin graphics might be used as referenced details, or for sections. Prior to removing any margin graphics verify if they are being used or just left over from the design.

5.3.1.3. For every reference file that has display turned *OFF*, *detach* the reference file.

5.3.1.4 Delete any attached border companion file.

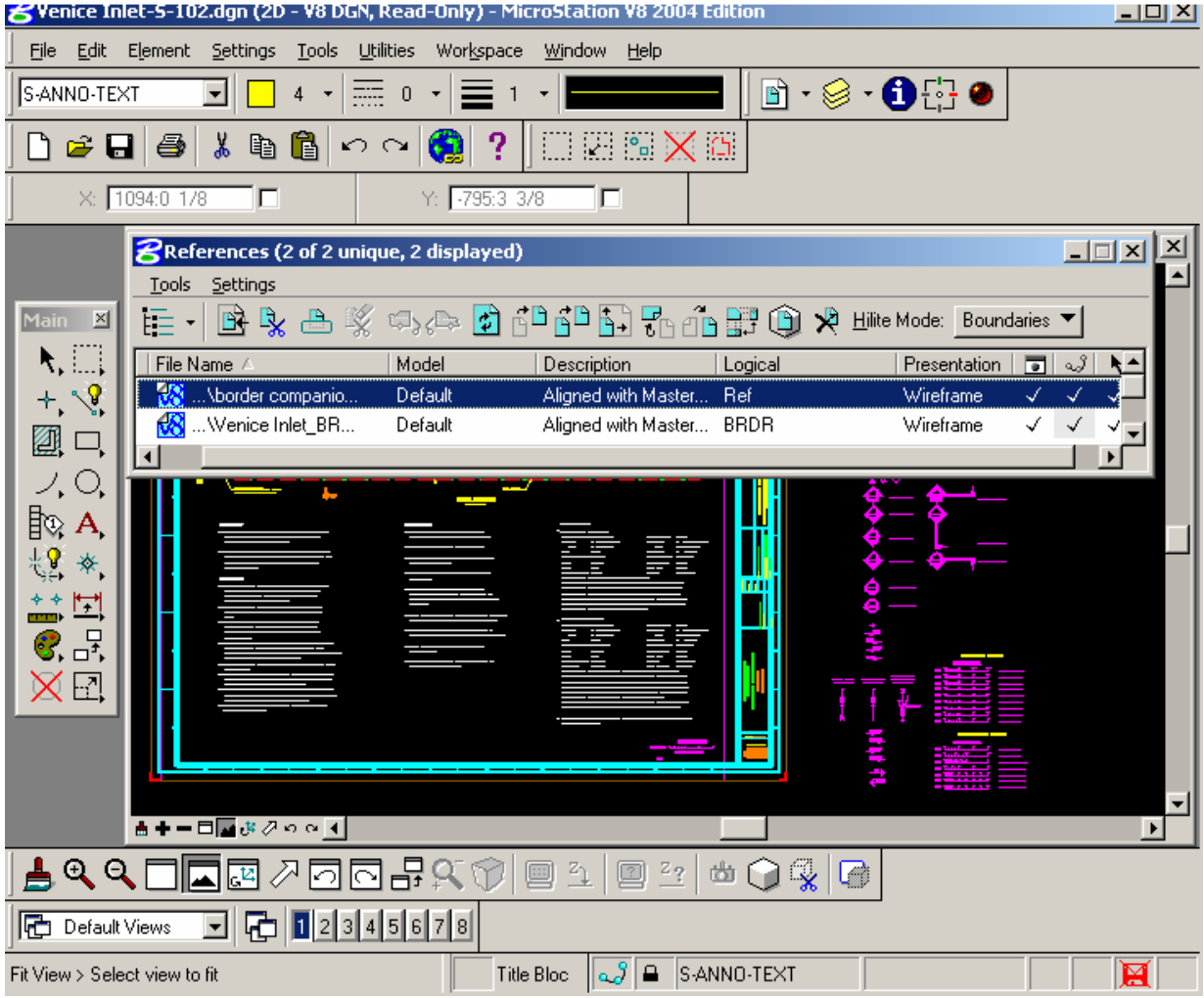


Figure 5-2
Companion File Attachment

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

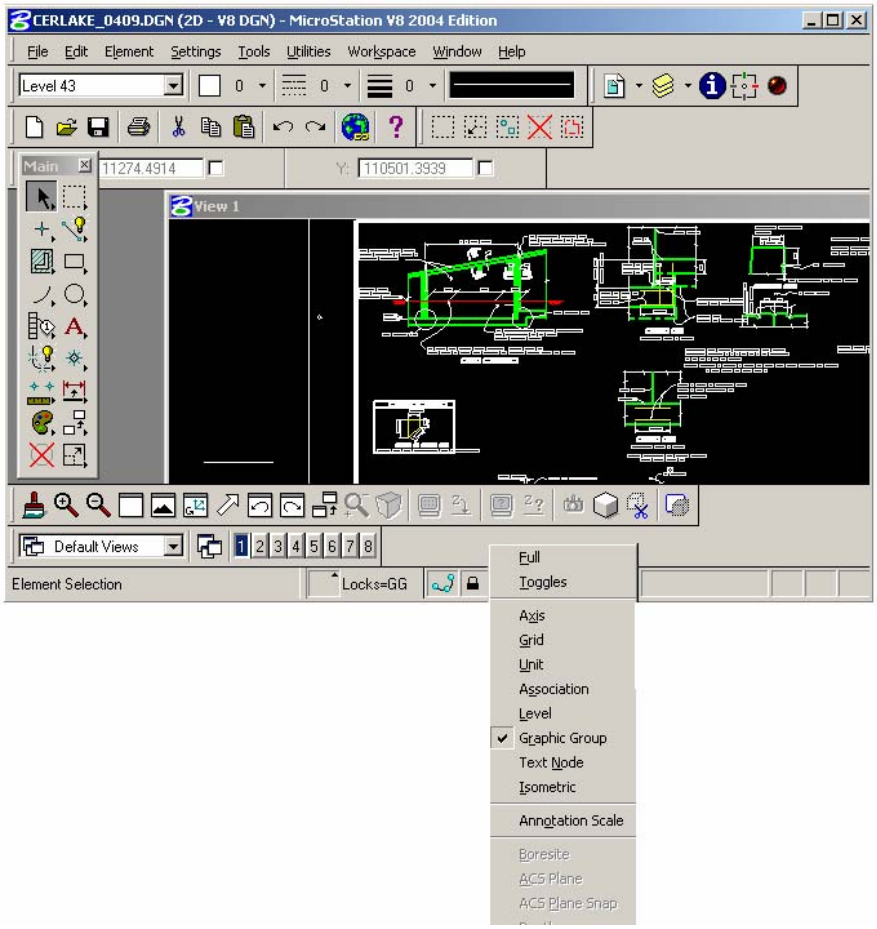


Figure 5-3
Graphic Group Lock

5.3.1.6 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 outside the border. Replace the sheet file graphics circular reference with the created model file.

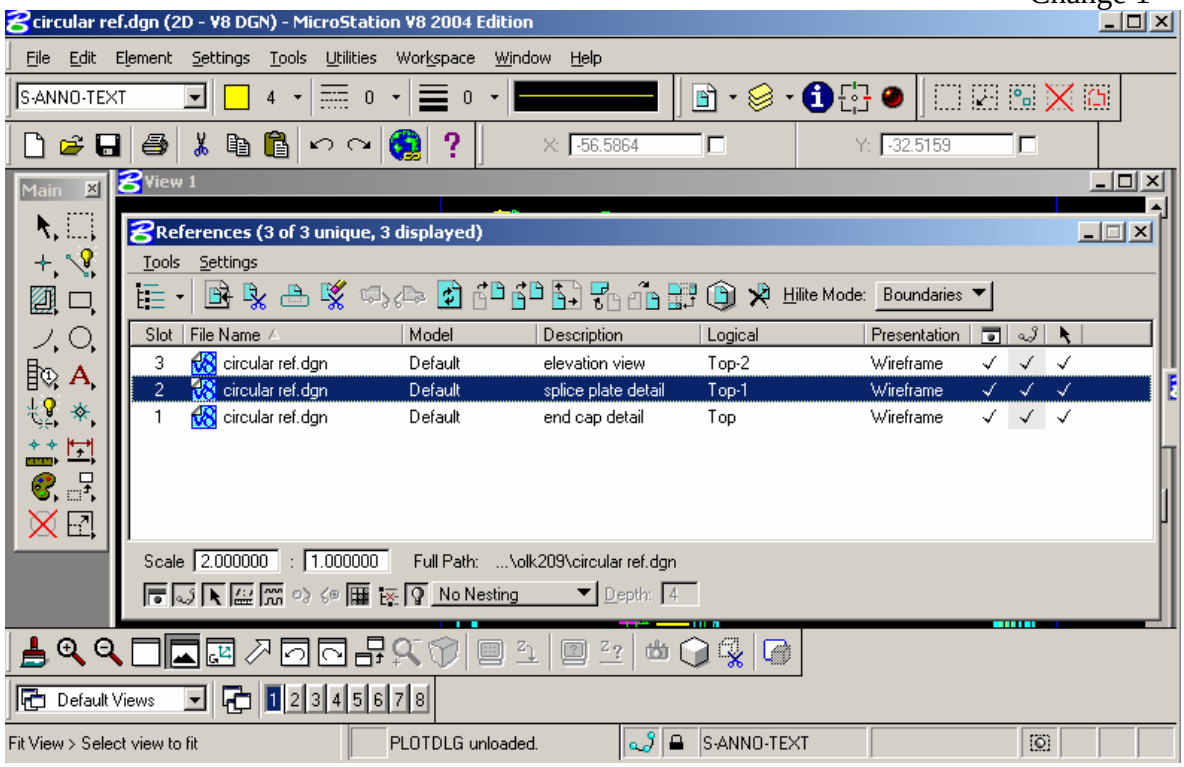


Figure 5-4
Circular Reference File of File No. 1

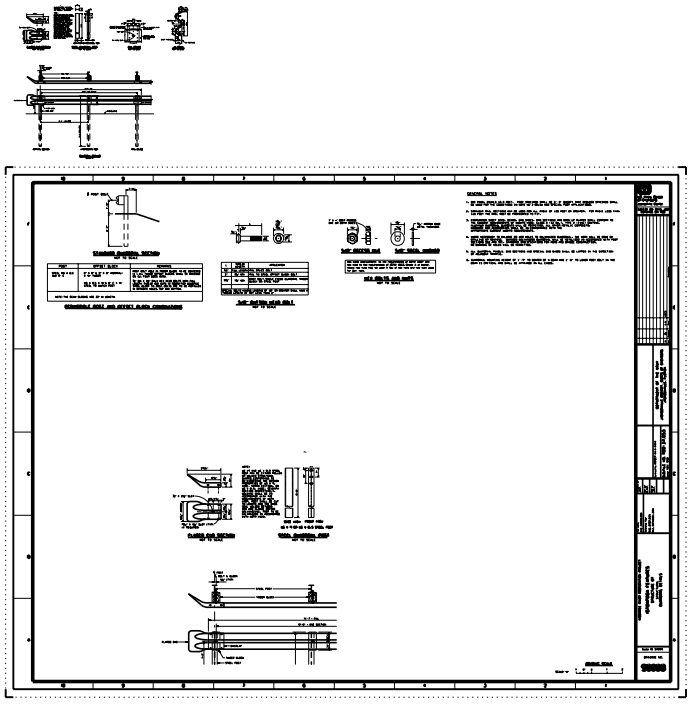


Figure 5-5
Circular Reference of File No. 2

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

5.3.2 *Delete Graphics Outside the Border*. Delete all working/construction graphics outside the margin area of the border.

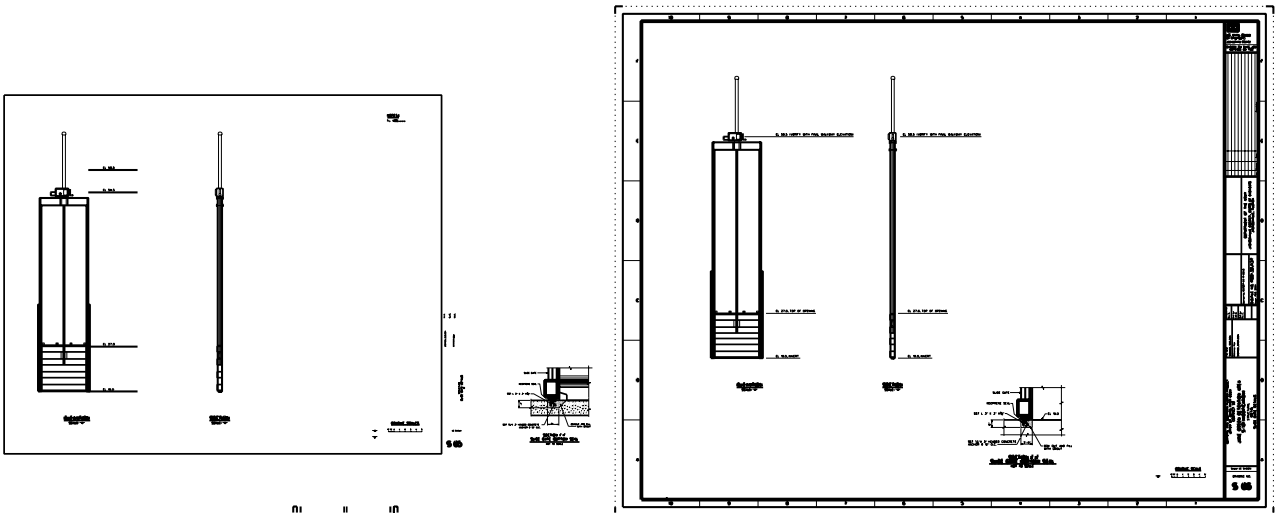


Figure 5-6
Margin Graphics - Graphics Outside Border

5.3.3 *Activate Raster Manager*.

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

5.3.3.2 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 CADD Standard levels, used or unused.

5.3.4 *Open Level Manager*.

5.3.4.1 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.

5.3.4.2 Check the sheet file to see if it contains unused non-standard levels. Delete any non-standard levels you find in the sheet file.
5.3.4.4 Check the font used for all of these text elements. Change these text items to Bentley font 3, Engineering if needed.

a. general notes.
b. schedules.
c. tables.
d. legends.

5.3.3.1 Check the font used for dimensions, subtitles, titles, symbols, callouts, etc. Change these text elements to font 1, Working if needed.

5.4 **Open Cell Library Manager.**

5.4.1 *Detach the cell library.*

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

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

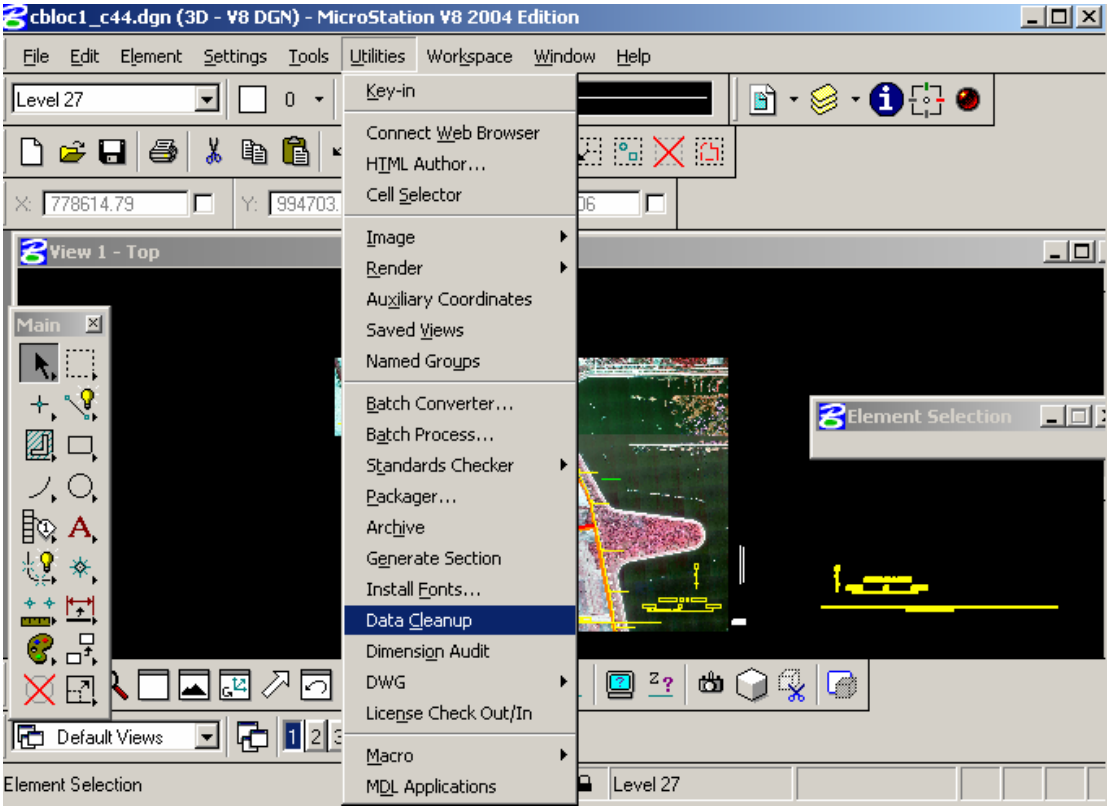


Figure 5-7
Delete Duplicate Element No. 1

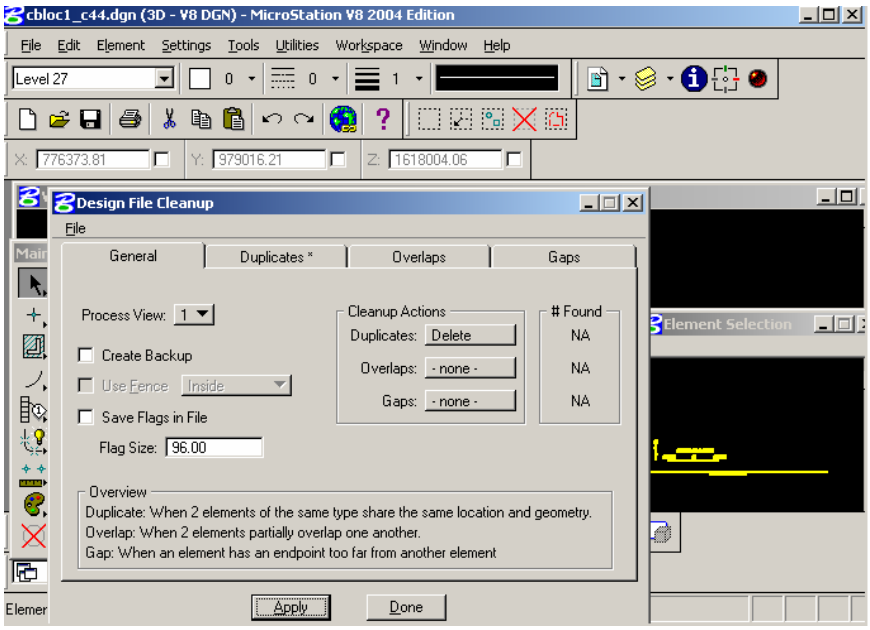


Figure 5-8
Delete Duplicate Element No. 2

5.6 Open the file menu and Save Settings.

5.6.1 *Compress the file.*

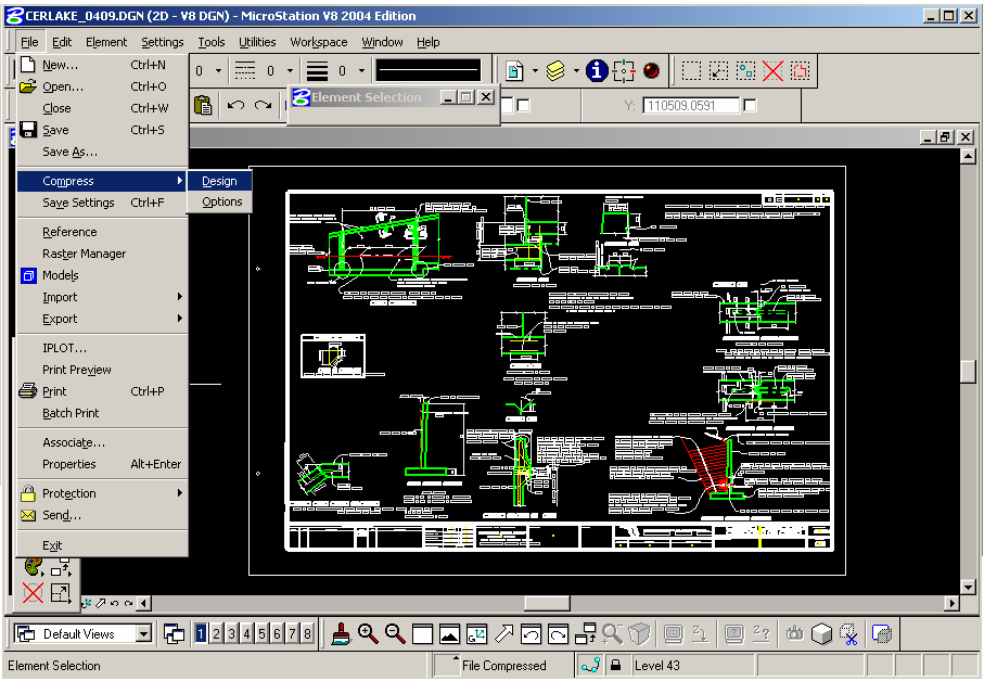


Figure 5-9
File Compression

Section 5

Preparation of CADD Contract Drawings for Publication

5.1 **Preparation of CADD Drawings Prior to Publication.** Prior to releasing contract plans CADD 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.

5.2 **Create Archive Copy**. Create an archive copy of the 100% designed contract plans prior to reviewing and preparing files for drawing publication to serve as a backup resource.

5.3 **Select File for Review and Cleanup**. *Open* the selected file for reviewing and cleanup in Microstation.

5.3.1 *Activate Reference Manager.*

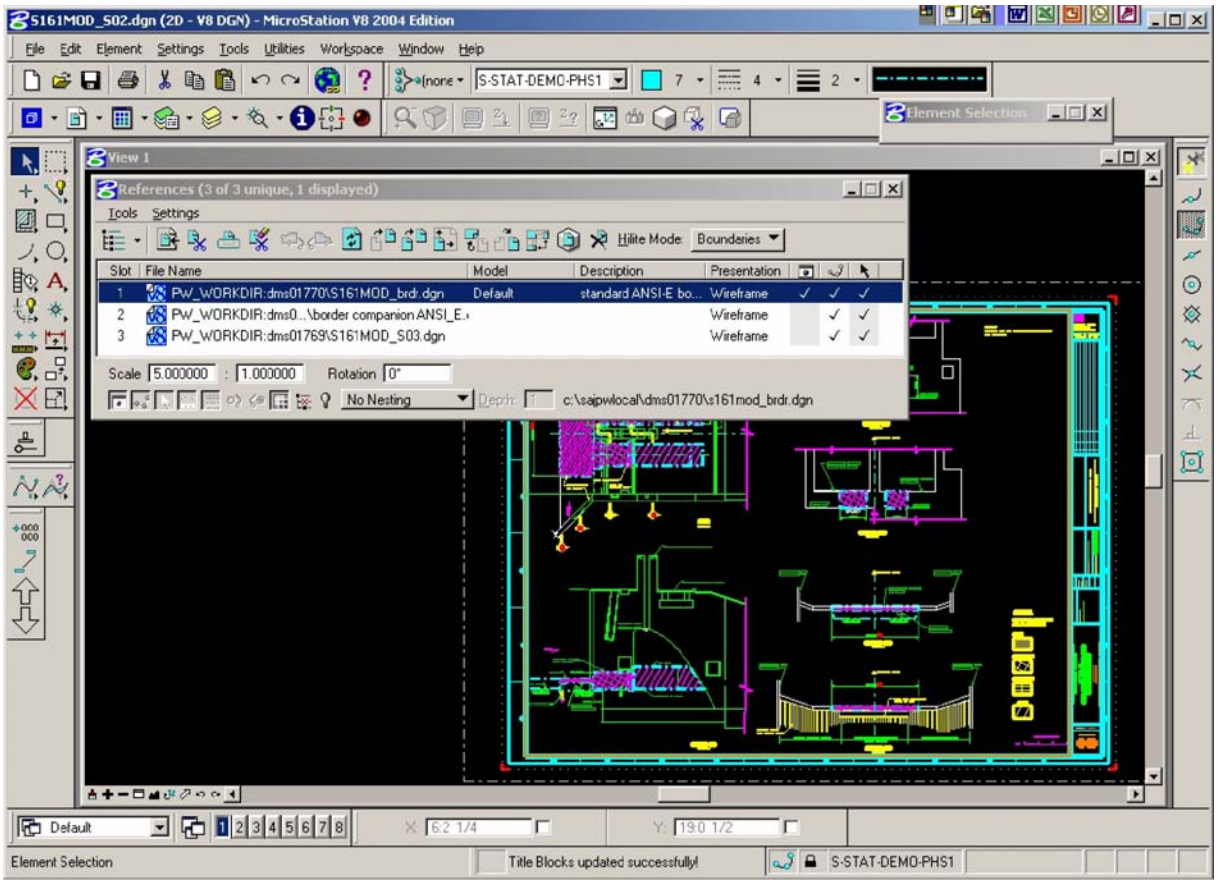


Figure 5-1
Reference File Example

5.3.1.2 Verify reference paths prior to detaching the reference file.

CAUTION
Be aware some margin graphics might be used as referenced details, or for sections. Prior to removing any margin graphics verify if they are being used or just left over from the design.

5.3.1.3. For every reference file that has display turned *OFF*, *detach* the reference file.

5.3.1.4 Delete any attached border companion file.

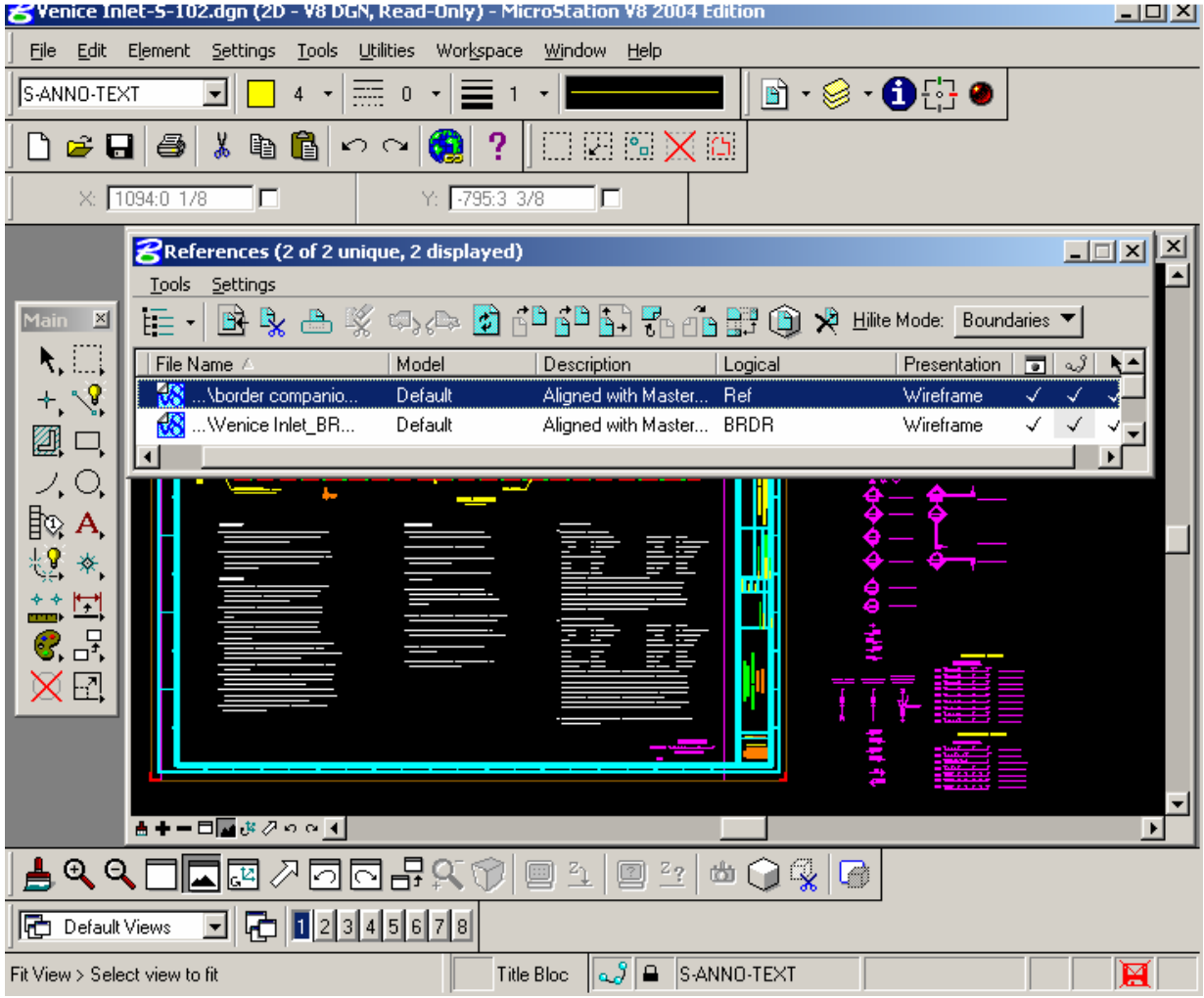


Figure 5-2
Companion File Attachment

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

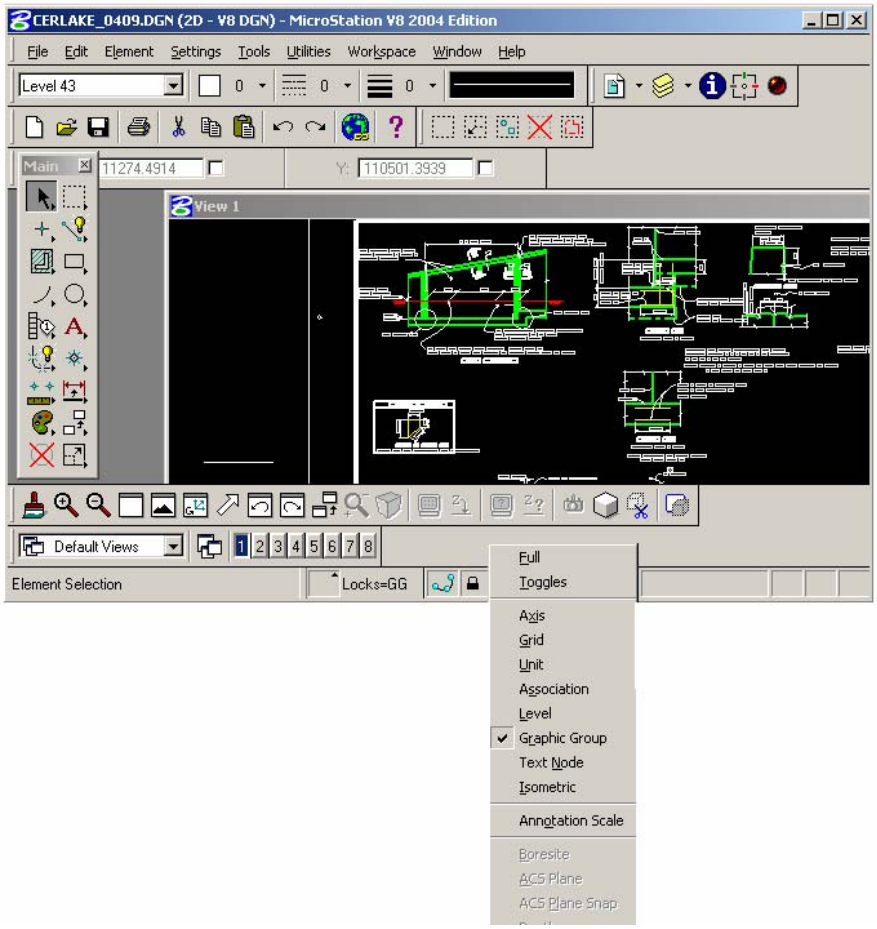


Figure 5-3
Graphic Group Lock

5.3.1.6 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 outside the border. Replace the sheet file graphics circular reference with the created model file.

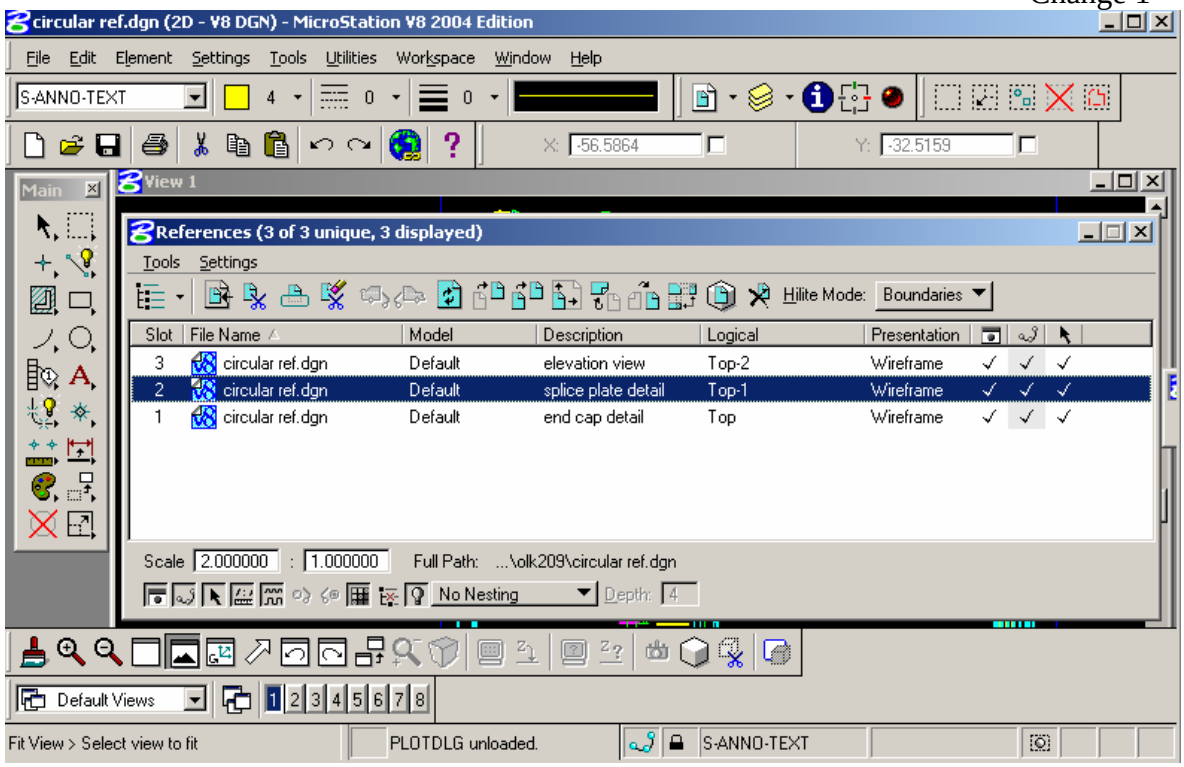


Figure 5-4
Circular Reference File of File No. 1

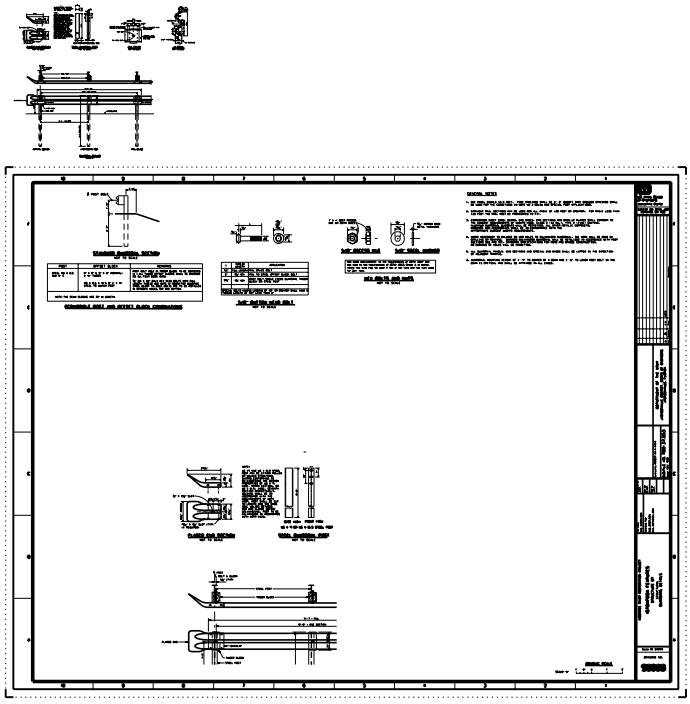


Figure 5-5
Circular Reference of File No. 2

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

5.3.2 *Delete Graphics Outside the Border*. Delete all working/construction graphics outside the margin area of the border.

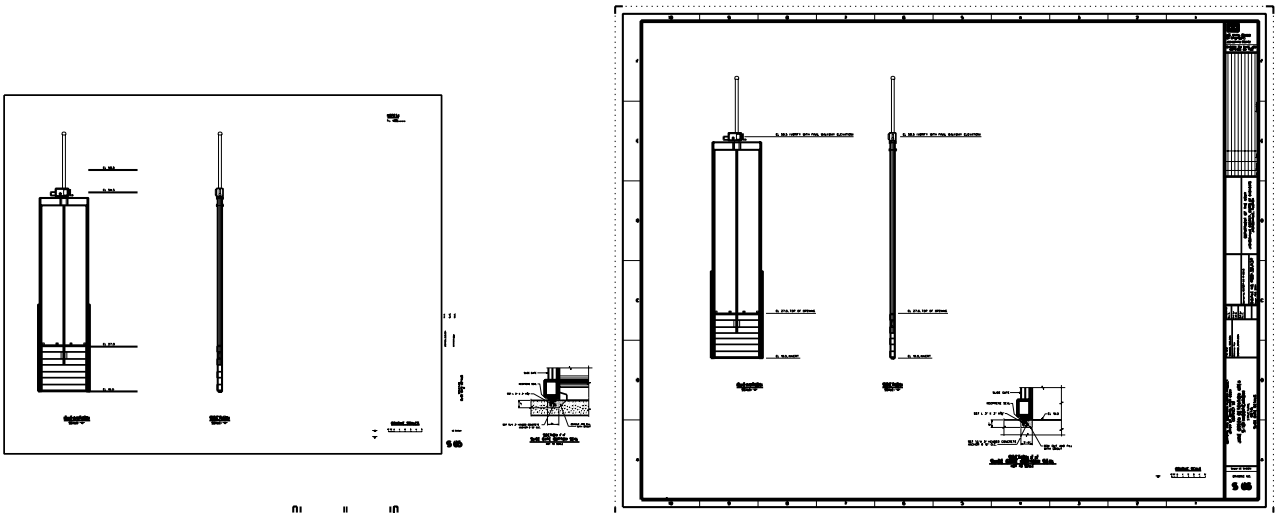


Figure 5-6
Margin Graphics - Graphics Outside Border

5.3.3 *Activate Raster Manager*.

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

5.3.3.2 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 CADD Standard levels, used or unused.

5.3.4 *Open Level Manager*.

5.3.4.1 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.

5.3.4.2 Check the sheet file to see if it contains unused non-standard levels. Delete any non-standard levels you find in the sheet file.
5.3.4.4 Check the font used for all of these text elements. Change these text items to Bentley font 3, Engineering if needed.

a. general notes.
b. schedules.
c. tables.
d. legends.

5.3.3.1 Check the font used for dimensions, subtitles, titles, symbols, callouts, etc. Change these text elements to font 1, Working if needed.

5.4 **Open Cell Library Manager.**

5.4.1 *Detach the cell library.*

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

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

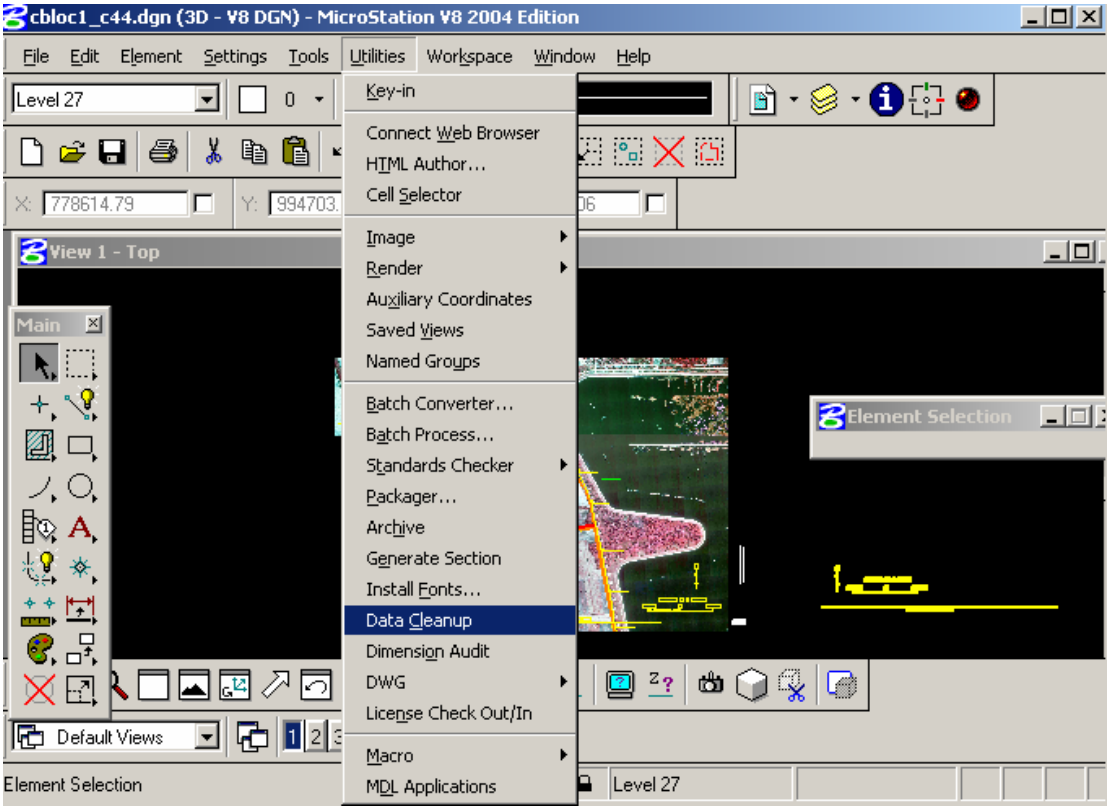


Figure 5-7
Delete Duplicate Element No. 1

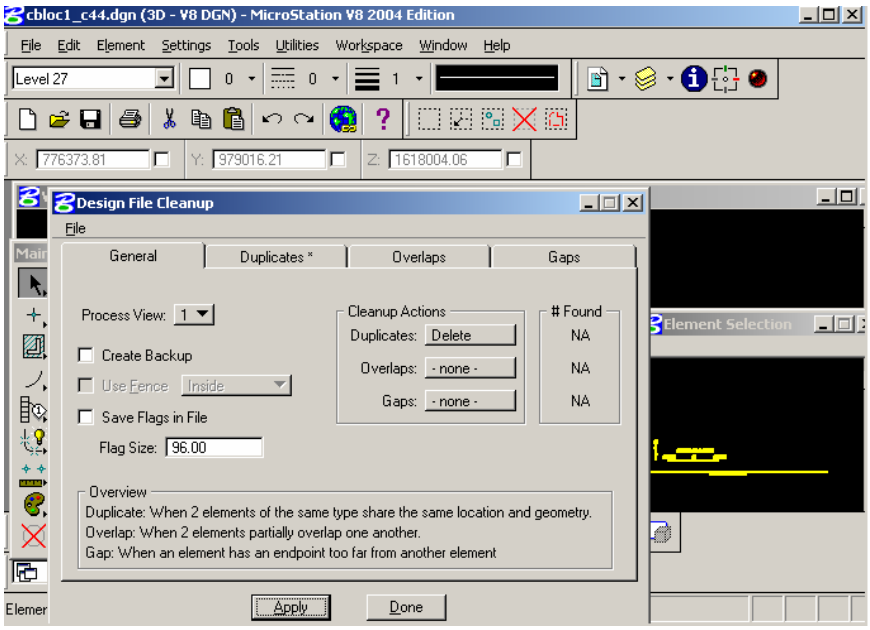


Figure 5-8
Delete Duplicate Element No. 2

5.6 Open the file menu and Save Settings.

5.6.1 *Compress the file.*

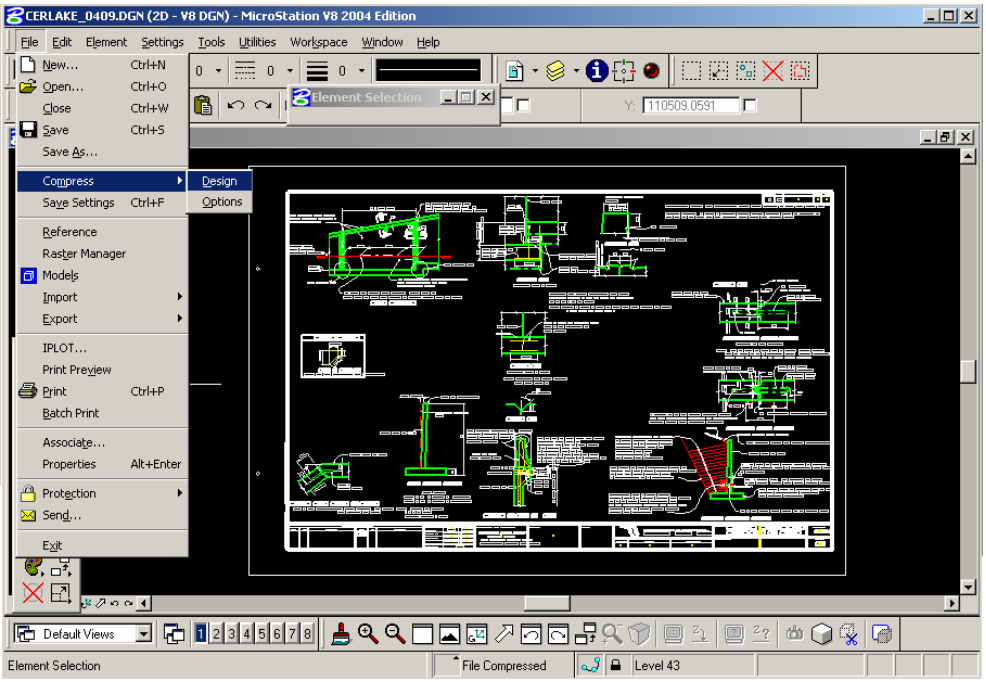


Figure 5-9
File Compression

Section 6

Graphic Concepts

6.1 **Line Work Delineation.** Proper line work graphic delineation is essential to prepare contract drawings. The Jacksonville District and all agencies under contract to the Jacksonville District are required conform to the A/E/C CADD Standard ERDC/ITL TR-01-06, chapter 3 "Graphic Concepts" http://www.saj.usace.army.mil/cadd/end/caddmanagementandsupport.htm. The line types specified by the A/E/C CADD Standard ERDC/ITL TR-01-06 are included in the tsaec.rsc file for Microstation users and tsaec.lin for AutoCAD users. All line work elements in the drawing are created on the specified level using a line weight, line style, and color according to appendix F of this document.

6.2 **Line Types/Styles.**

6.2.1 *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.

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

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

6.2.4 *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.

6.2.5 *Hidden Lines*. Hidden Lines is a line style 2 with a line weight of 2. The hidden line is used to depict features that are not visible in the drawing view.

6.2.6 *Patterning*. Cross-hatching, patterning, pouche lines are line style 0 with a line weight of 0.

6.2.7 *Cutting Plane*. Cutting plane line is a phantom 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.

6.2.8 *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.

6.2.9 *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.

6.2.10 *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.

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

6.4 **Text Styles/Fonts.** The text styles/Fonts are required to conform to the AEC CADD requirements of table 3-5 and as set forth in Chapter 3, Graphic Concepts of the AEC CADD Standard.

6.5 **Dimensions and Leaders**.

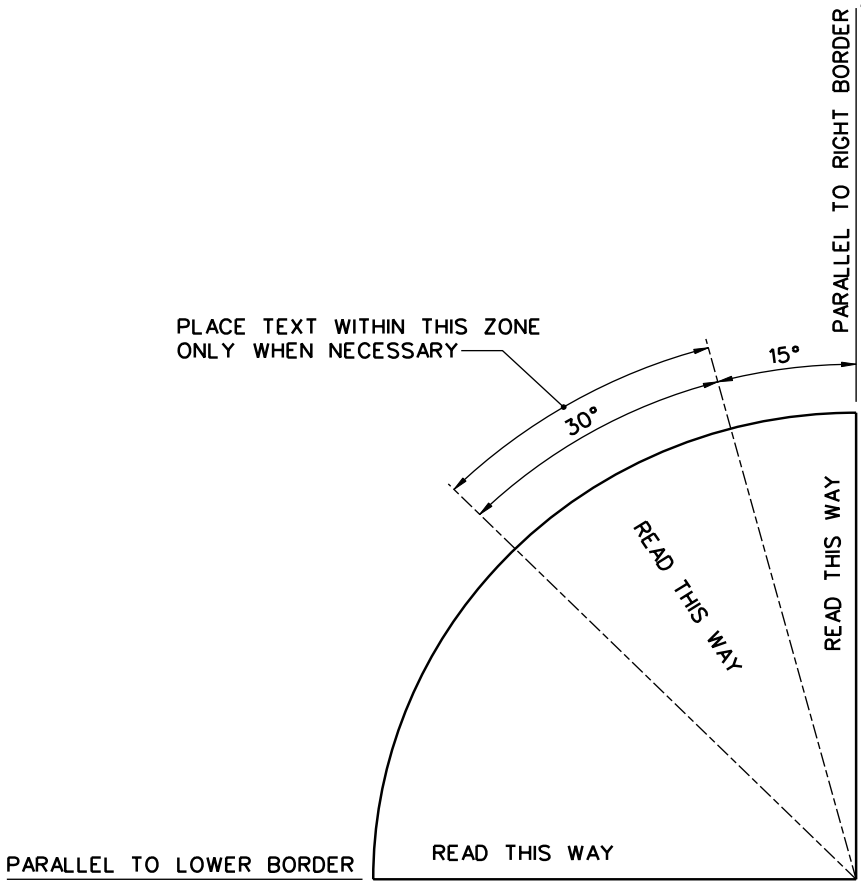
6.5.1 *Dimension Lines*. In Architectural and Civil Works drafting the dimension line shall be a continuous, solid, line weight 0.25 mm line placed between the extension lines with filled arrow terminators at both ends. The dimension line nearest the outer most object line should be 3/8” to 1/2” from 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.

6.5.2 *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.

6.5.3 *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.

6.5.4 *Dimension Line Terminators*. There are two allowable terminators used with dimension lines. The primary terminator is a closed filled arrowhead. As an alternative a

solid dot may be used where space does not allow use of an arrowhead. All arrowheads shall have a length equal to 1.5 times the text size and a width of 1/2 (0.5) the text size. Solid dot terminators shall have a diameter equal to 1/2 (0.5) of the text size.

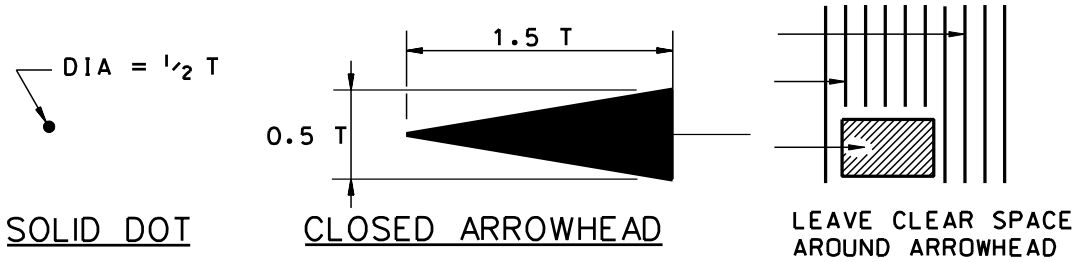


NOTE:

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

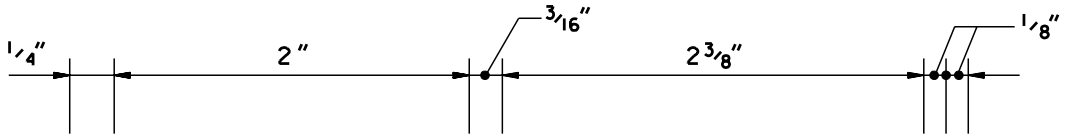
2. REQUIRING THE READER TO TURN THE DRAWING TO READ DIMENSIONS AND LOCAL NOTES SHOULD BE AVOIDED IF POSSIBLE.

Figure 6-1

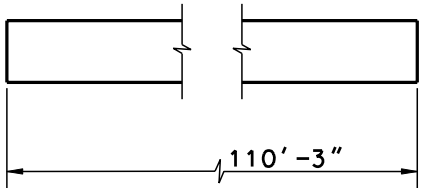


TERMINATORS

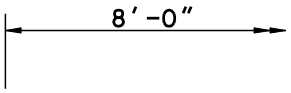
NOTE: "T" EQUALS TEXT SIZE



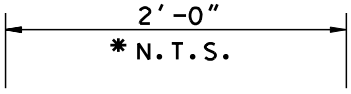
STANDARD DIMENSIONING



BROKEN DIMENSION LINE



FOR CONTINUATION

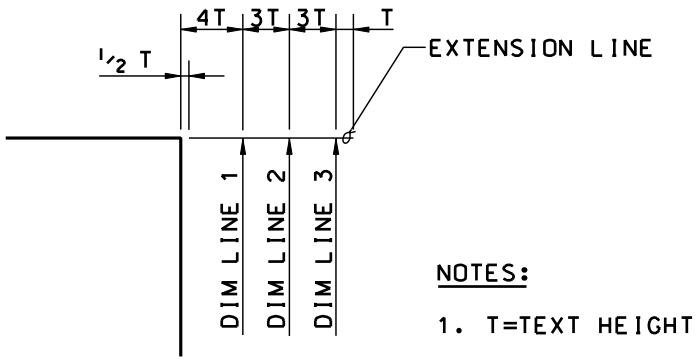


* NOT TO SCALE
USE WHEN REQUIRED

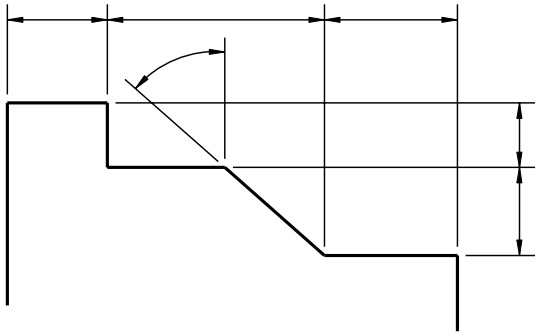
DIMENSIONING IN CROWDED AREAS

DIMENSIONS

Figure 6-2

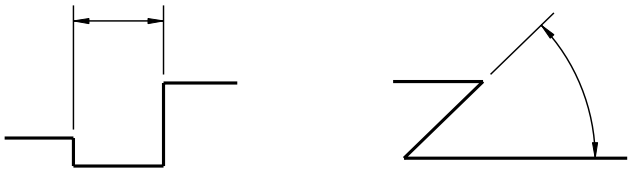


DIMENSION AND EXTENSION LINE SPACING



NOTES:

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



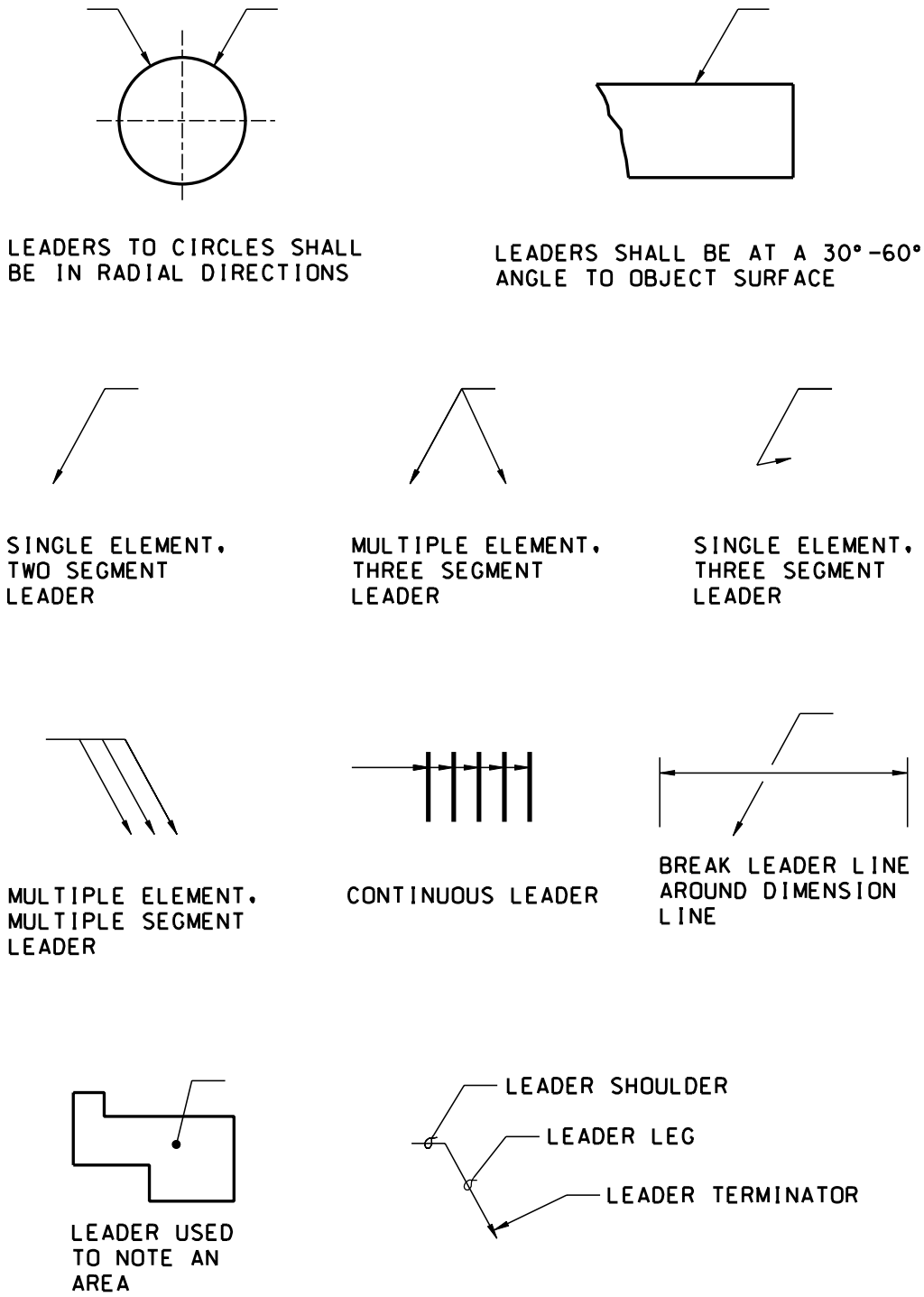
USE OF EXTENSION LINES

Figure 6-3

6.5.5 *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.

6.5.6 *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 CONVENTION

Figure 6-4

6.5.7 *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.

6.5.8 *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.

6.5.9 *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.

6.5.10 *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.

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

6.5.10.2 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.

6.5.11 *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.

6.5.12 *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 Ø 54.

6.6 **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.

6.6.1 *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 nonmandatory provisions.

6.6.2 *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.

6.6.3 *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.

6.6.4 *General Notes*.

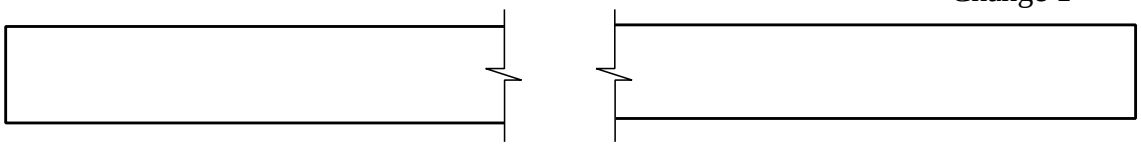
6.6.4.1 General notes shall be numbered consecutively as a single list starting with 1. Note numbers of deleted notes shall not be reused after plans and specifications have been issued for solicitation and have inserted in place of the deleted note "not used".

6.6.4.2 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.

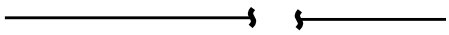
6.6.4.3 Notes shall not include contractual requirements, such as statements of costs; time and place of delivery; methods of payment; and requirements for submission, approval, or distribution of data or reports.

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

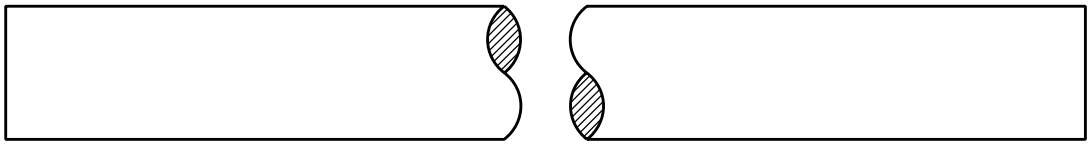
a. All general notes shall be numbered.
b. Standard punctuation and grammar rules apply.
c. For multi line notes the second and successive lines shall be indented to show they belong to the same note.



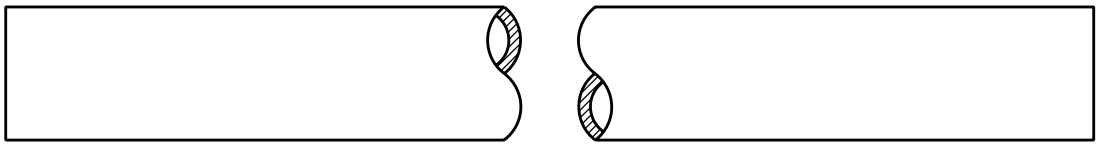
LONG BREAK LINE



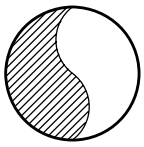
SHORT BREAK LINE



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.

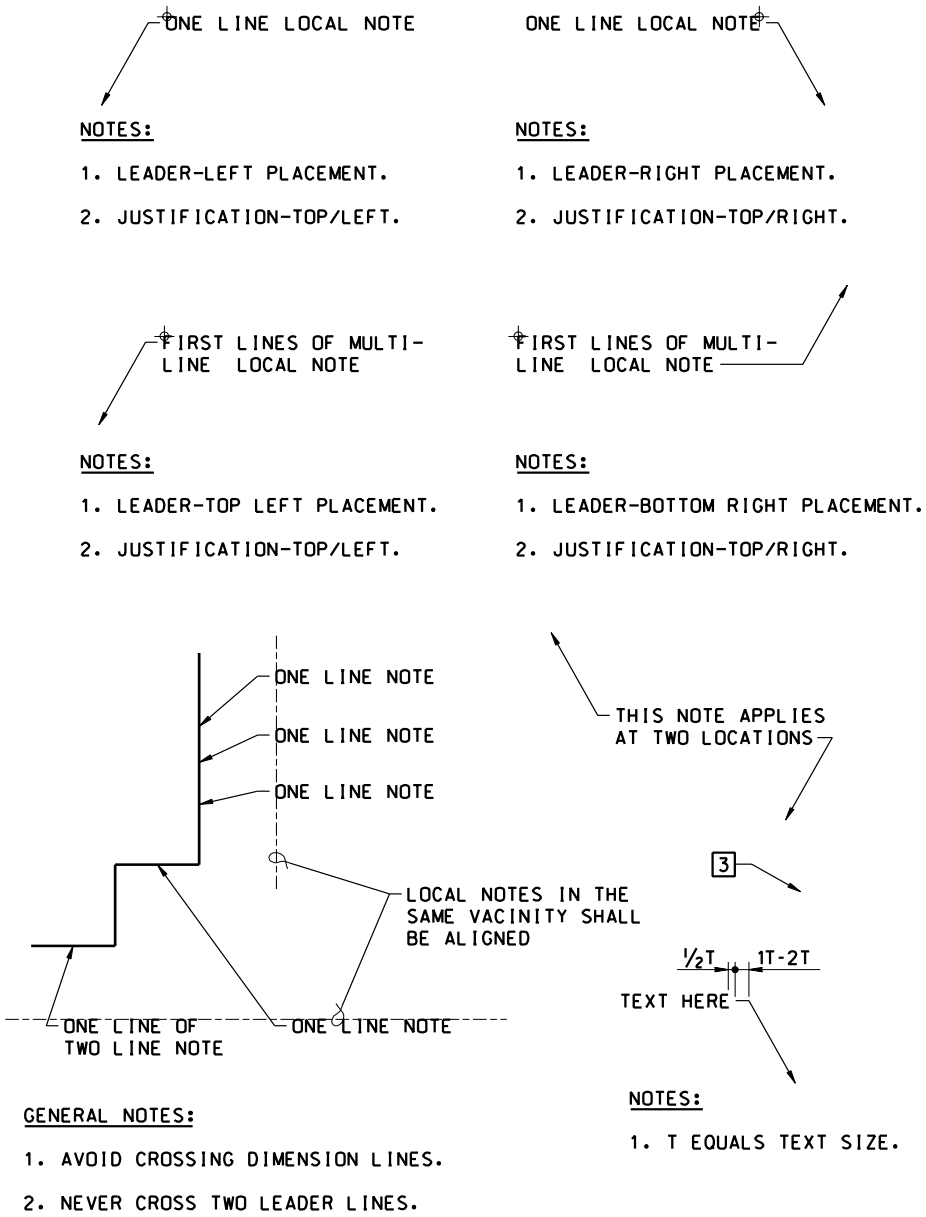
Figure 6-5

6.6.5 **Local Notes**.

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

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

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



LEADER LINE CONVENTION

Figure 6-6

6.7 **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 5 in 2 or about 68 deg. Uppercase letters shall be used for all lettering on drawings unless the subject matters requires otherwise.

6.8 **Text Height**.

Text Feature	A&B [1]		D, E, & F [1]	
Size	Size	Weight	Size	Weight
General Notes	0.080"/#80	0.25mm	0.125"/#125	0.25mm
Text & Local Notes	0.080"/#80	0.25mm	0.125"/#125	0.25mm
Dimensions	0.080"/#80	0.25mm	0.125"/#125	0.25mm
Symbology Data Fields	0.080"/#80	0.25mm	0.125"/#125	0.25mm
Headings	0.100/#100	0.25mm	0.140/#140	0.25mm
Subtitles	0.125"/#125	0.35mm	0.175"/#175	0.35mm
Titles	0.175"/#175	0.50mm	0.200"/#200	0.50mm
Status Markings	0.125"/#125	0.35mm	0.175"/#175	0.35mm

[1] Drawing Size Identification

Table 6-1

6.9 **Feature Designations**.

6.9.1 *Planimetric*.

Bench Mark Designations
Cemeteries
Dimensions
Highway Symbol Numbers
Island Names
Legends
Match Lines
Navigation Aids
Property Corners
Public Unities
Scales
Street Titles
Township & Range
Building Names
County Names
Grid Designations
Highway, Road & Trail Names
Plateaus
Limits of Construction
Monuments
Notes
Proposed Works
Railroad Names
State Names
Town Names
Triangulation Stations

6.9.2 Hydrographic and Topographic.

Bays	*Bridges*
Causeways	*CANALS*
Coves	*Creeks*
Centerline Designations	*Channel Names*
Contour Numbers	*Cut Designations*
Dams	*Ground Elevations*
Inlets	*Jetty*
Lakes	*Levees*
Marshes	*Oceans*
Sounds	*Station & Ranges*
Structure Numbers	*Swamps*
Water Soundings	*River Names*
River Miles	*Project Depths*
Reservoirs	*Right-of-Way Designations*

6.10 **Examples of Symbology Data Fields**:

SLOPE (with symbol)
GRAPHIC SCALES (underlined)
NOTES: (underlined)
LEGEND: (underlined)
SYMBOLS: (underlined)

6.11 **Schedule and Table Column Headings**:

Section and detail sub-titles:
Schedule and table titles
Detail grouping title:
SLIDE GATE (double underlined)

6.12 **Markings**. Special item, management, and processes markings, for example:

SUPERSEDED
DUPLICATE ORIGINAL
CRITICAL SAFETY ITEM
AS-BUILT
REFERENCE DRAWING

6.13 **Border Sheets**

6.13.1 Based on the project type, full-size drawings can be developed as ANSI size (D or E). The standard size border is an ANSI D (22”x34”) border file. If the project is, a large civil project or navigation project then use the ANSI E (34”x44”) border.

All drawings shall utilize the standard Corps of Engineers Jacksonville District title block. Half-sized drawings of the ANSI-D size sheet are to be printed on ANSI-B size sheet (11”x 17”) plotted at 50%. Half-sized drawings of the ANSI-E size sheet are to be printed on ANSI-C size sheet (17”x 22”) plotted at 50%.

6.13.2 The standard Corps of Engineers Jacksonville District title block has been populated with placeholders for project and drawing information. Placeholders in the title block file are to be edited as appropriate for a specific project and each drawing.

6.13.3 Standard configuration areas of the border have been pre-set and are not to be changed.

6.13.3.1 Border line work; level: G-ANNO-TTLB; color varies. The normal status of this level is ON.

6.13.3.2 Corps logo; level: G-ANNO-SYMB; color varies. The normal status of this level is ON.

6.13.3.3. Border/title block text; level: G-ANNO-TEXT-TTLB; color yellow. The normal status of this level is ON.

6.13.3.4 Plot shape; level: G-ANNO-NPLT; COLOR 134, LINE 0, WEIGHT 0. The normal status of this level is on.

6.13.3.5 Neat image frame; level: G-ANNO-TTLB-FRME; color yellow. The normal status of this level is ON.

6.13.4 The project data editable border placeholders require editing for each project. Project specific title block text; level: G-ANNO-TEXT-PROJ; color green (2). The normal status of this level is ON.

6.13.5 The drawing data editable border placeholders require editing for each drawing.

6.13.6 Drawing data title block text; level: G-ANNO-TEXT-DRWG; color orange (6). The normal status of this level is ON.

6.14 **Border Referencing Procedure for Microstation Users**.

6.14.1 Copy the standard border file and place it in the project specific directory-using file naming standards.

6.14.2 Edit green text in G-ANNO-TEXT-PROJ and save. This text is common on all drawings in the same project (i.e. project name).

6.14.3 Then, reference this edited border file to each project drawing file.

After the border is referenced, copy text on G-ANNO-TEXT-DRWG, color orange (6) that describes drawing specific information (i.e. dwg no., dwg name, etc). To do this, copy these text elements into the active project drawing file and turn off G-ANNO-TEXT-DRWG in the referenced border file using the level manager.

6.15 **Plotting for Microstation users**:

6.15.1 Microstation users shall use the printer driver file named AEC_FULLrtl.plt to plot in accordance with the A/E/C CADD Standard ERDC/ITL TR-01-6.

6.15.2 Fence the trim line shape and plot fence element using ANSI-D or ANSI-E for full size and ANSI-B or ANSI-C for half size sheets.

6.15.3 The shape found around the trim line location of the border drawings is to use for batch plotting processes.

6.15.4 Don't change element attributes because they are critical for successful plotting procedures.

6.16 **Symbology Convention**

6.16.1 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.

6.16.2 All symbology used to prepare contract drawings shall conform to the Tri-Service A/E/C CADD Standard; ERDC/ITL TR-01-6, Appendix D. Microstation users shall use the A/E/C CADD Standard ERDC/ITL TR-01-6 Symbols .dgn cell libraries. AutoCAD users shall use the A/E/C CADD Standard ERDC/ITL TR-01-6 Symbols .dwg files.

6.17 **Microstation Sheet File Element Size**

6.17.1 *Sheet Scale 1”=1’*
Text, Dimensions, and Notes: 0.125
Title: 0.2
Subtitle: 0.175
Section Callout (3/8”): 0.375, Dia.
Pay Item Mark (3/8”): 0.375, Square
Section/Elevation Bubble (5/8”): 0.625, Dia

6.17.2 *Sheet Scale 1”=5’*
Text, Dimensions, and Notes: 0.625
Title: 1.0
Subtitle: 0.875
Section Callout (3/8”): 1.875, Dia.
Pay item mark (3/8”): 1.875, Square
Section/Elevation Bubble (5/8”): 3.125, Dia.

6.17.3 *Sheet Scale 1”=10’*
Text, Dimensions, and Notes: 1.25
Title: 2.0
Subtitle: 1.75
Section Callout (3/8”): 3.75, Dia.
Pay Item Mark (3/8”): 3.75, Square
Section/Elevation Bubble (5/8”): 6.25, Dia.

6.17.4 *Sheet Scale 1”=20’*
Text, Dimensions, and Notes: 2.5
Title: 4.0
Subtitle: 3.5
Section Callout (3/8”): 7.5, Dia.
Pay Item Mark (3/8”): 7.5, Square
Section/Elevation Bubble (5/8”): 12.5, Dia.

6.17.5 *Sheet Scale 1”=30’*
Text, Dimensions, and Notes: 3.75
Title: 7.16
Subtitle: 5.25
Section callout (3/8”): 11.25, Dia.
Pay Item Mark (3/8”): 11.25, Square
Section/Elevation Bubble (5/8”): 18.75, Dia.

6.17.6 *Sheet Scale 1”=40’*
Text, Dimensions, and Notes: 5.0
Title: 8.0
Subtitle: 7.0
Section Callout (3/8”): 15.0, Dia.
Pay Item Mark (3/8”): 15.0, Square
Section/Elevation bubble (5/8”): 25.0, Dia.

6.17.7 *Sheet Scale 1”=50’*
Text, Dimensions, and Notes: 6.25
Title: 10.0
Subtitle: 8.75
Section Callout (3/8”): 18.75, Dia.
Pay Item Mark (3/8”): 18.75, Square
Section/Elevation Bubble (5/8”): 31.25, Dia.

6.17.8 *Sheet Scale 1”=100’*
Text, Dimensions, and Notes: 12.5
Title: 20.0
Subtitle: 17.5
Section Callout (3/8”): 37.5, Dia.
Pay Item Mark (3/8”): 37.5, Square
Section/Elevation Bubble (5/8”): 62.5, Dia.

6.17.9 *Sheet Scale 1/8”=1’- 0”*
Text, Dimensions, and Notes: 1:0
Title: 1:7
Subtitle: 1:5
Section Callout (3/8”): 3:0, Dia.
Pay Item Mark (3/8”): 3:0, Square
Section/Elevation Bubble (5/8”): 5:0, Dia.

6.17.10 *Sheet Scale 3/16”=1’- 0”*
Text, Dimensions, and Notes: 0:9
Title: 1:2
Subtitle: 1:0
Section Callout (3/8”): 2:3, Dia.
Pay Item Mark (3/8”): 2:3, Square
Section/Elevation Bubble (5/8”): 3:9, Dia.

6.17.11 *Sheet Scale 1/4”=1’- 0”*
Text, Dimensions, and Notes: 0:6
Title: 9.6
Subtitle: 0:8.4
Section Callout (3/8”): 1:6, Dia.
Pay Item Mark (3/8”): 1:6, Square
Section/Elevation Bubble (5/8”): 2:6, Dia.

6.17.12. *Sheet Scale 3/8”=1’- 0”*
Text, Dimensions, and Notes: 0:4
Title: 0:6.4
Subtitle: 0:5.6
Section Callout (3/8”): 1:0, Dia.
Pay Item Mark (3/8”): 1:0, Square
Section/Elevation bubble (5/8”): 1:8, Dia.

6.17.13 *Sheet Scale 1/2”=1’- 0”*
Text, Dimensions, and Notes: 0:3
Title: 0:4.8
Subtitle: 0:4.2
Section Callout (3/8”): 0:9, Dia.
Pay item Mark (3/8”): 0:9, Square
Section/Elevation Bubble (5/8”): 1:3, Dia. 6

6.17.14 *Sheet Scale 3/4”=1’- 0”*
Text, Dimensions, and Notes: 0:2
Title: 0:3.2
Subtitle: 0:2.8
Section Callout (3/8”): 0:6, Dia.
Pay Item Mark (3/8”): 0:6, Square
Section/Elevation Bubble (5/8”): 0:10, Dia.

6.17.15 *Sheet Scale 1”=1’*
Text, Dimensions, and Notes: 0:1.5
Title: 0:2.4
Subtitle: 0:2.1
Section Callout (3/8”): 0:4.5, Dia.
Pay Item Mark (3/8”): 0:4.5, Square
Section/Elevation Bubble (5/8”): 7.5, Dia

6.17.16 *Sheet Scale 1 1/2”=1’- 0”*
Text, dimensions, and notes: 0:1
Title: 0:1.6
Subtitle: 0:1.4
Section Callout (3/8”): 0:3, Dia.
Pay Item Mark (3/8”): 0:3, Square
Section/Elevation bubble (5/8”): 0:5, Dia.

6.17.17 *Sheet Scale 3”=1’- 0”*
Text, Dimensions, and Notes: 0:0.5
Title: 0:0.8
Subtitle: 0:0.7
Section Callout (3/8”): 0:1.5, Dia.
Pay Item Mark (3/8”): 0:1.5, Square
Section/Elevation Bubble (5/8”): 0:2.5, Dia.

6.18 **Title Block.** The vertical title block is placed in the right-hand margin of the border sheet as shown in Figure 4-7. Use of the vertical title block provides the most usable drawing space on a sheet. The vertical title block also ensures that the most prevalent and pertinent information remains at the bottom right of the sheet. The title block data will include the following:

- *Designer Identification Block*
- *Revision Block*
- *Image Block*
- *Management Block*
- *Project Identification Block/Sheet Title Block*
- *Sheet Identification Block*

6.18.1 *Designer Identification Block***.** The designer identification block contains the logo or name of the agency that designed the sheet. This space could also be expanded (by reducing the size of the issue block) to accommodate professional seals when required.

6.18.2 *Revision Block***.** The issue block contains a history of revisions, addenda, and/or clarifications to the sheet. The first entry should be placed on the lower left-hand line of the issue block and subsequent entries should be made above it.

6.18.3 *Image Block***.** The image block is set to arrange images within the border. The image block after images are set shall be turned off from view.

6.18.4 *Management Bloc*k**.** The management block contains information about the designer, reviewer, and submitter.

6.18.5 *Reference Files Block*. This block contains information to maintain filing information about the drawing, such as the file name.

6.18.6 *Project Identification Block/Sheet Title Block*. The project identification block/sheet title block contains two sets of information. First, the project name is identi-

fied by the name authorized by Congress, with the location or phase associated with a specific structure or reach of the project identified. If small enough, a project logo can be presented in this block. The second set of information contains a description of the content of the sheet (e.g., Architectural Floor Plan). If more than one type of information is presented on the sheet (i.e., plans, schedules, details), the most important information is identified.

6.18.7 *Sheet Identification Block*. The sheet identification block contains the sheet identifier. This sheet identifier is com-posed of the discipline designator, the sheet type designator, and the sheet sequence number described in the section, "Electronic Drawing File Naming Conventions" (Chapter 2). The "number of sheets" listing is optional and can contain either the total number of sheets for the entire project drawing set or the number of sheets for that particular discipline designator.

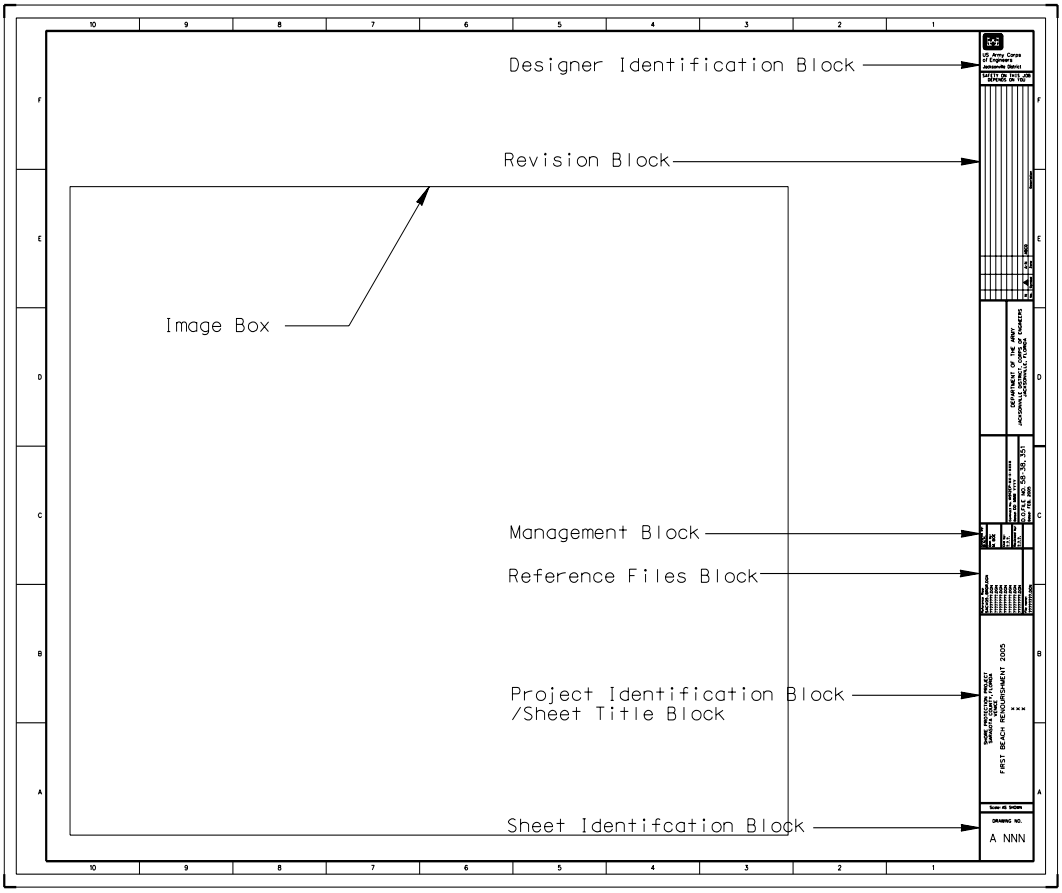


Figure 6-7

6.19 **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.

6.20 **Dual Units**. Only one unit system should be used on the projects.

FONT: 1 WORKING
SIZE: 1.4T
LINE WT: 2

SUBTITLES: PLAN ELEVATION SECTION SECTION

1/4 T

SUBTITLES WITH CALLOUT BUBBLE: SECTION A S-103 DETAIL 1 S-103

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: 1 WORKING
SIZE: 2T
LINE WT: 3

SECURITY GATE

1/4 T

1/2 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. T EQUALS TEXT HEIGHT.

GENERAL NOTES:

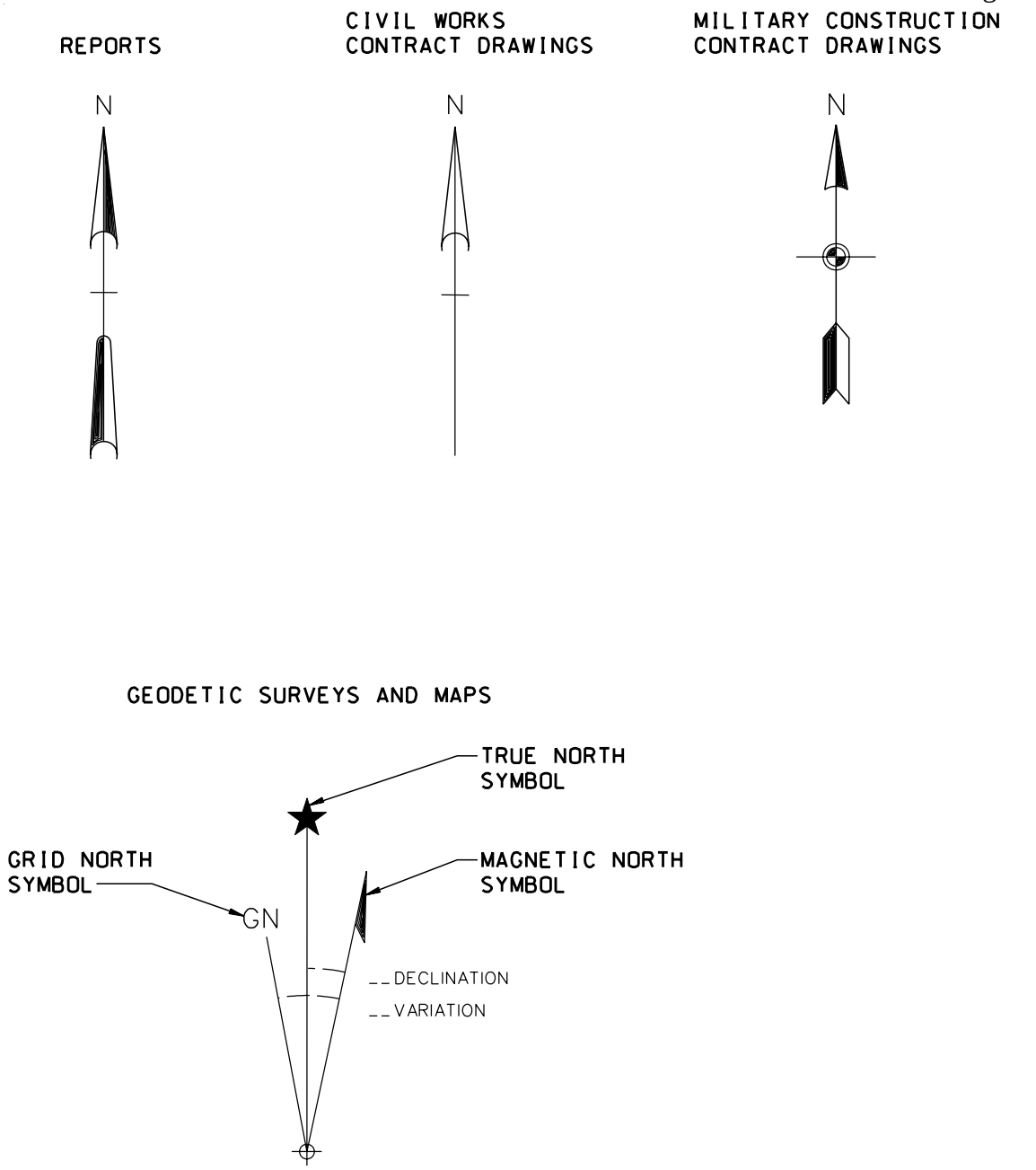
1. SUBJECT TITLES AND VIEW SUBTITLES SHALL BE BRIEF AND SIMPLE.

2. CENTER ALL TITLES AND SUBTITLES BELOW THEIR SUBJECTS.

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

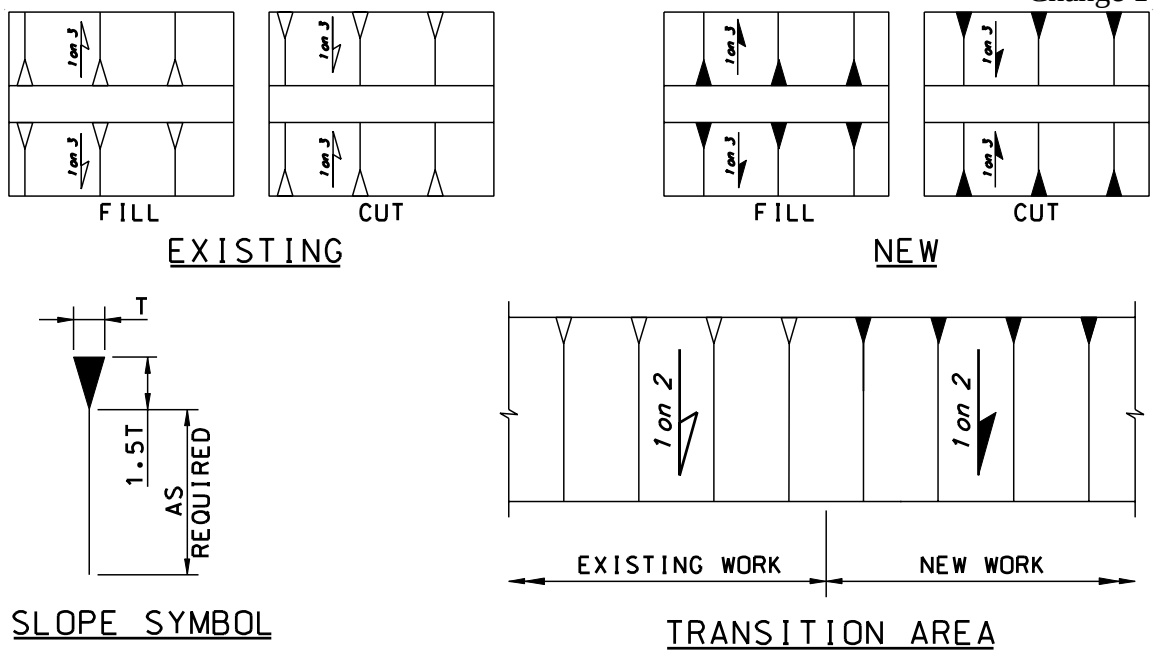
SUBJECT TITLES

Figure 6-8

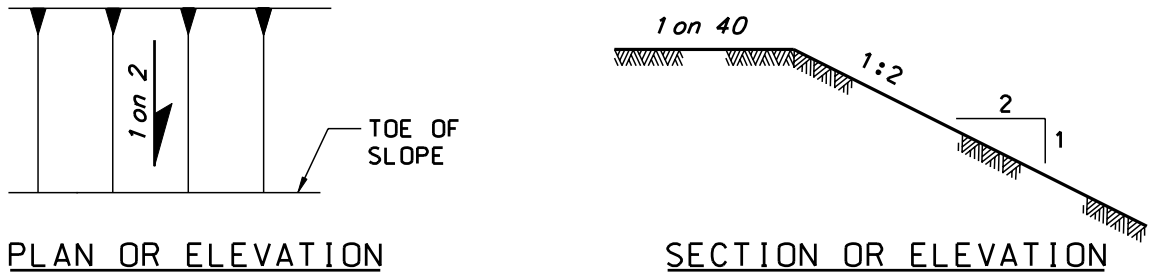


NORTH ARROW CONVENTIONS

Figure 6-9

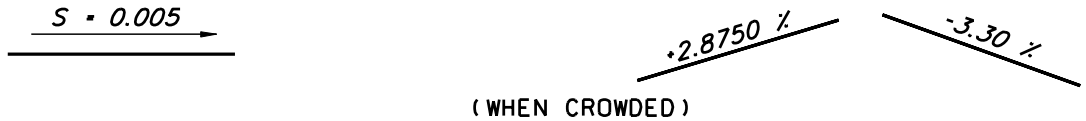


GRADE SYMBOLOGY



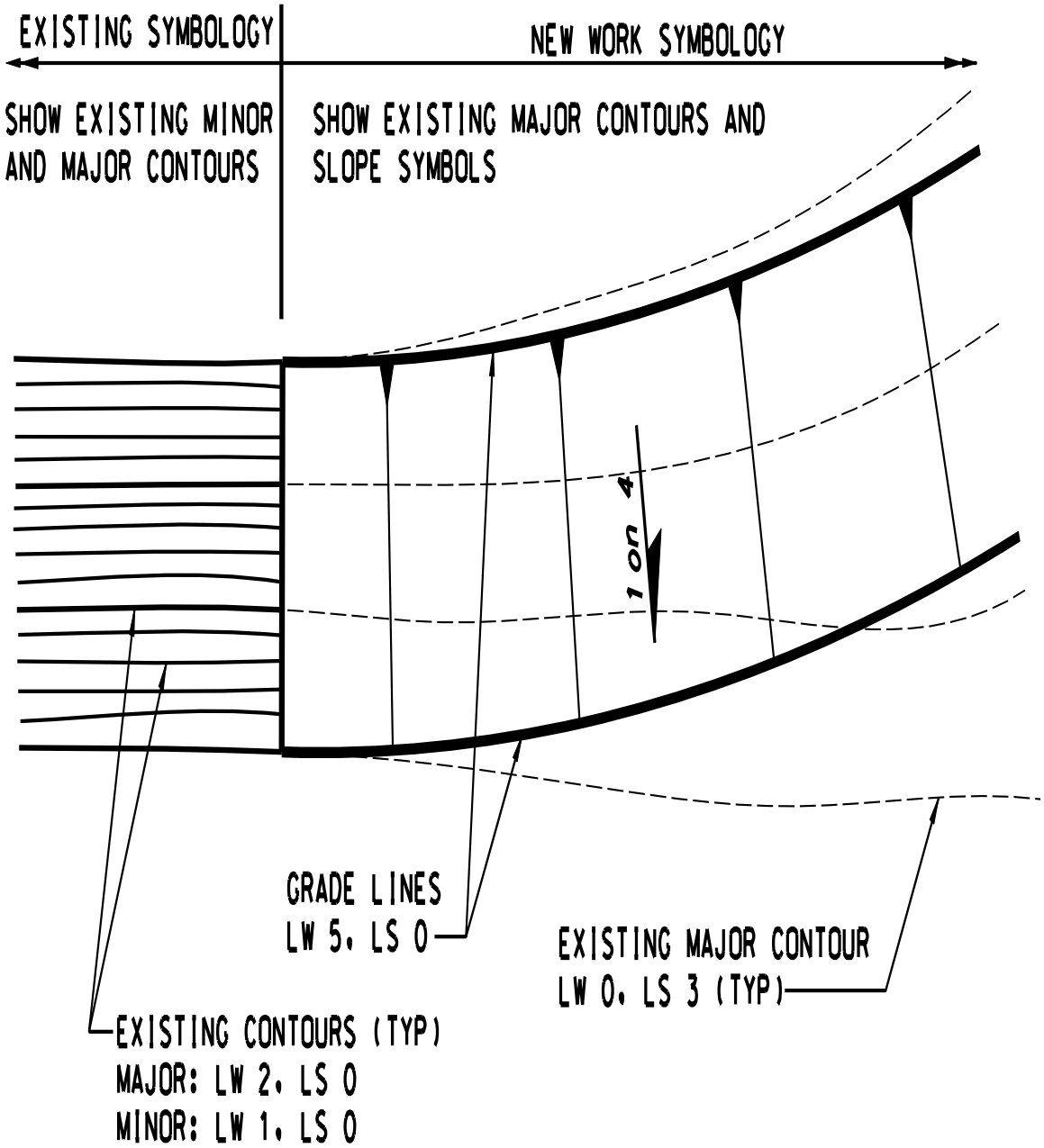
NOTES:

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.



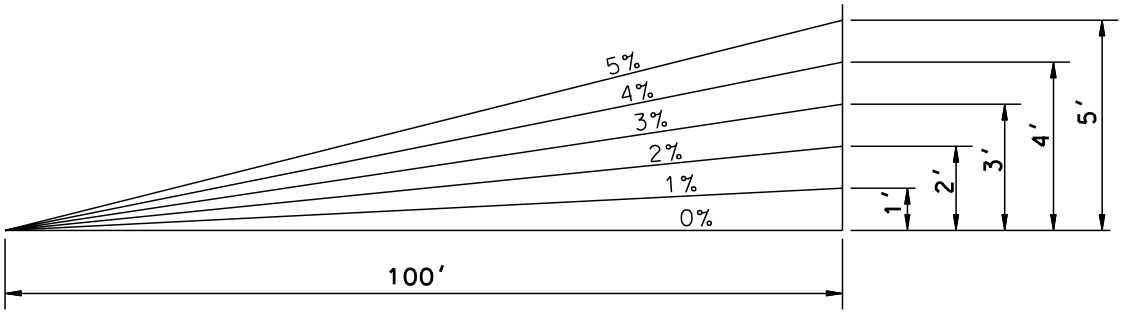
GRADES

Figure 6-10



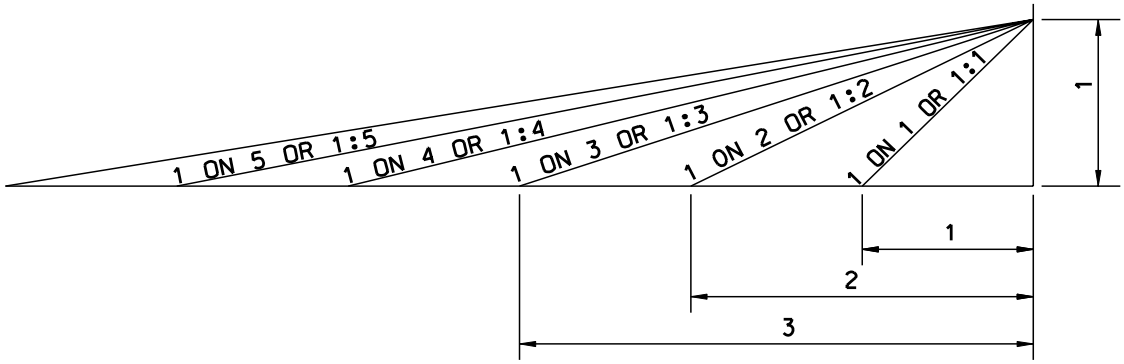
TOPOGRAPHICAL SYMBOLOGY

Figure 6-11



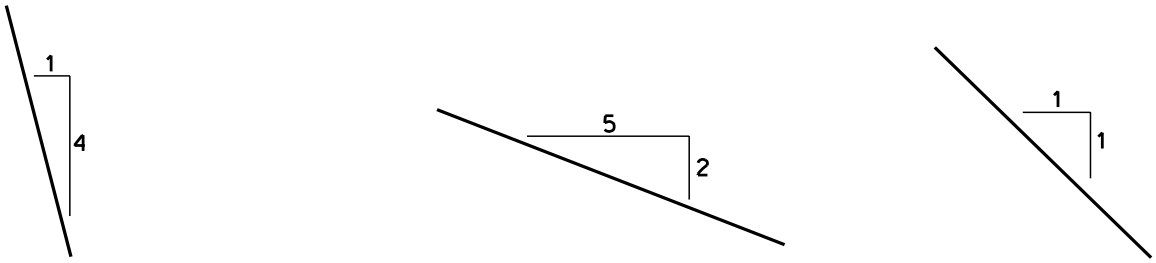
1% SLOPE RISE 1' IN DISTANCE OF 100'
2% SLOPE RISE 2' IN DISTANCE OF 100'
2.5% SLOPE RISE 2½' IN DISTANCE OF 100'
2.75% SLOPE RISE 2¾' IN DISTANCE OF 100'

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'

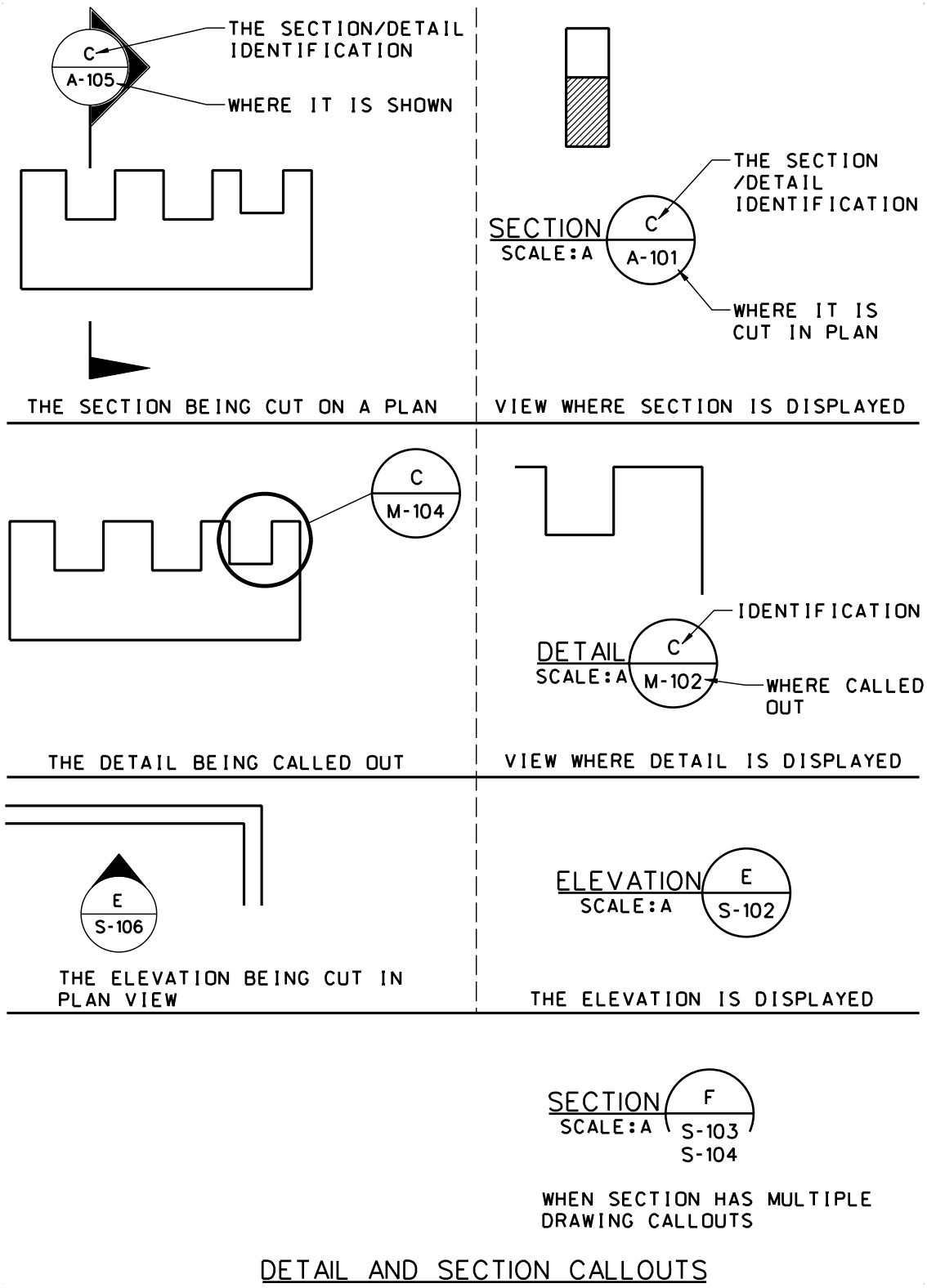
RATIO



ILLUSTRATION

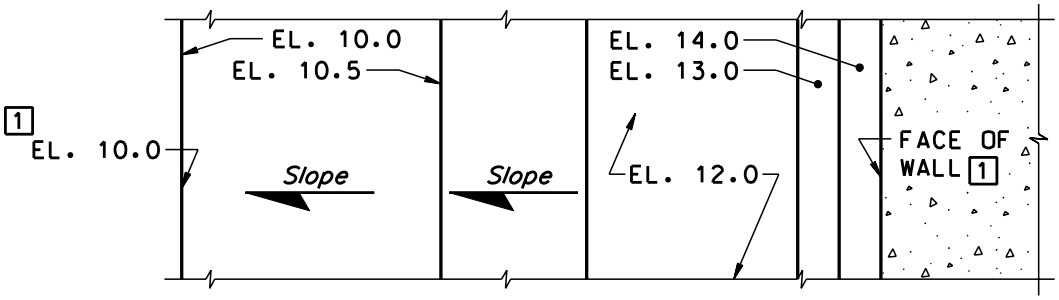
SLOPE EXPRESSIONS

Figure 6-11

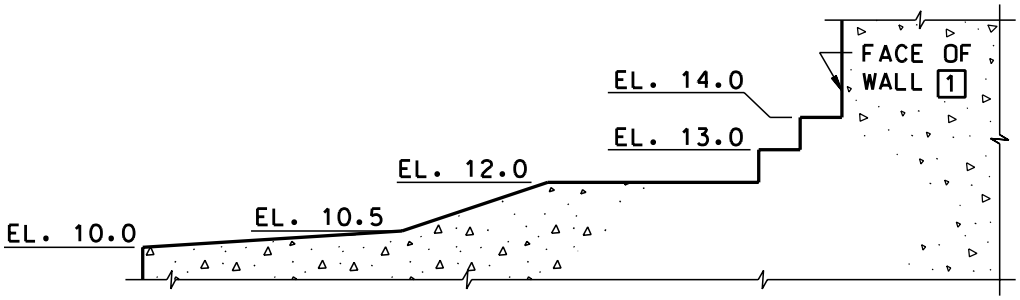


DETAIL AND SECTION CALLOUTS

Figure 6-12



PLAN VIEW



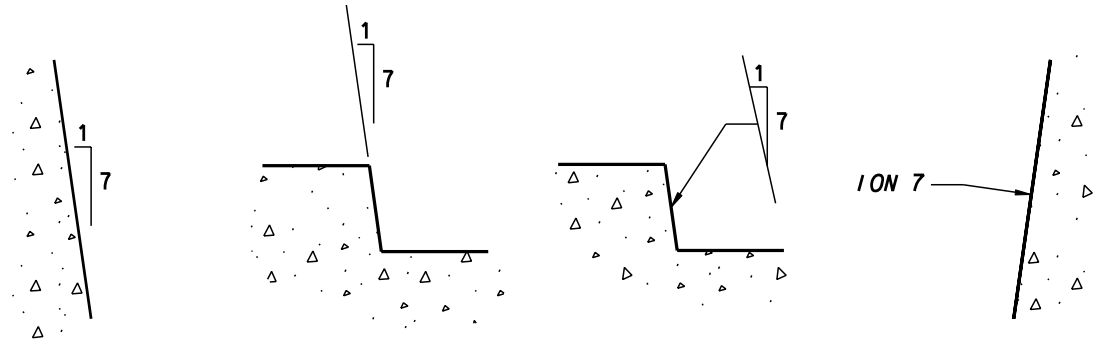
SECTION VIEW

KEY NOTES:

1 ONLY FOR CROWDED CONDITIONS.

ELEVATION (HEIGHT) INDICATIONS

Figure 6-13

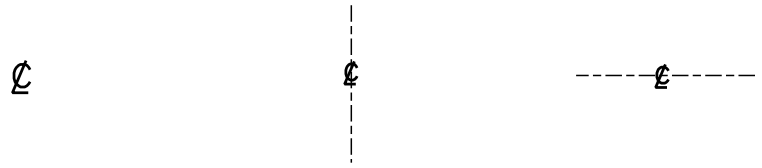


SECTION OR ELEVATION

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 6-14

Section 7

Design View Projections

7.1 **Methods of Projections**. Third-angle orthographic projection shall be used for engineering drawings. Isometric perspective, etc. may be used where particular advantage exists. Draw only necessary views to illustrate the required characteristics of the object.

7.1.1 *One-View Drawings*. One-view drawings are permissible for objects where one view and feature characteristics such as thickness or length, stated as a dimension or note, can completely define an object.

7.1.2 *Partial Views of Symmetrical Object*. Partial views of symmetrical objects are permissible and may be represented by half views. Half views shall extend slightly beyond centerline of symmetry and terminate with a break line. If the adjacent view is beyond centerline of symmetry it shall terminate with a break line. If the adjacent view is full or half section, the far half of the symmetrical view shall be drawn.

7.1.3 *Three-View Drawings*. Three-view drawings may be arranged at any three adjacent views in standard orthographic projection. Where two side views are required to illustrate an object, they may not be completed views if together they depict the shape of the object. When space is limited, or the part can be more clearly indicated, the side view may placed near the top view.

7.1.4 *Auxiliary Views*. Objects having inclined faces or other features not parallel to any of the three principal planes of projection require auxiliary views to show the true shape of these features. Partial auxiliary views, showing only pertinent features shall be employed to illustrate features not clearly shown by principal views. Auxiliary sectional views may also be employed to advantage in many cases to illustrate features not clearly shown by principal views. Views not projected directly shall be clearly to indicate location and direction from which viewed.

7.1.5 *Detail Views*. A detail view shows a part of the drawing in the same plane and in the same arrangement, but in detail if necessary drawn to a larger scale than shown in the principal view. The part of the drawing to be detailed shall be suitable identified.

7.1.6 *Spacing and Identification of Views*. Ample space shall be provided between views to permit placing of dimensions without crowding and to preclude the possibility of notes pertaining to one view overlapping or crowding the other views.

7.1.7 *Intentional Exaggeration of Views*. When features are too small to be drawn to scale, they shall be drawn exaggerated as necessary to illustrate the feature.

7.2 **Delineation of Implied Features**. Drawings need show only the information necessary to clearly delineate the part. Excessive illustration of superfluous details shall be avoided, if in doing so, this practice does not reduce the clarity of completeness of the drawings. Where a feature of an item occurs may times in a continuous regular pattern, only sufficient information to illustrate the feature and its regularity is necessary, e.g., rows of bolts or rivet heads, long consistent section lines, repletion of holes, features in a bolt circle, repetition of slots, spines or gears, or any other details of a repetitious nature.

7.3 **Variations From True Projection**. Variations from the rules of true projection are permissible for clarity.

7.4 **Views, Sections and Cutting Planes.** A section or sectional view is obtained by cutting away part of an object to show the shape and construction at the cutting plane. They shall be used when the interior construction or hidden features of an object cannot be shown clearly by outside views. Hidden lines and details beyond the cutting plane can be omitted unless required to adequately portray the object. A sectional view shall be made through an outside view and not through another sectional view, unless a drawing is so clarified. Sectional Views may be rotated, provided an explanatory note is shown adjacent to the view.

7.4.1 *Cutting Plane and Viewing Plane Indications*. Cutting plane lines together with symbols make up a cutting plane indication. Symbols at the end of cutting plane lines are used to indicate direction in which the symbols at the end of cutting plane lines are used to indicate direction in which the sections are viewed. The cutting plane may be a single continuous plane, or offset if the detail can be shown to better advantage. Viewing planes are indicated similar to the cutting plane indications, except that they are placed outside the object to indicate the surfaces shown in the auxiliary views.

7.4.2 *Identification of Cutting Planes*. Cutting plane indications shall be suitably identified by use of reference letters. Where a change in direction of the cutting plane is not clear, reference may also be placed at each change of direction. Cutting plane indications shall be identified in alphabetical series.

7.4.3 *Sectional Views on Separate Sheet*. Sectional views should appear on the same sheet as the subassembly, assembly, or detail drawings from which they are taken. When it is necessary to draw sectional views on a separate sheet, views shall be arranged from left to right in alphabetical order, or suitably cross-referenced by zone designations. When a sectional view appears on a sheet separated from one contain the cutting plane indication, the sheet number where the cutting plane indication appears shall be cross-referenced.

7.5 **Scales of Sections.** Sectional views are preferred drawn to the same scale as the outside views from which they are taken.

APPENDICES

Glossary

Appendix A

Appendix A

Glossary

abnd	abandon
accs	access
acid	acid, alkaline and oil waste
adpc	automated data processing components
AE or A/E	Architecture and Engineering
AEC	Architecture Engineering and Construction
aeri	aerial
aff	afff lagoon/detention pond
afrz	antifreeze
airf	airfield
airq	air quality
airs	air samples
alg	alignment
algn	alignment
alrm	alarm
anno	annotation
anod	anode system
appr	approach
aprn	apron
artw	art work
asph	asphalt
base	bases
bcns	miscellaneous navaids - wind cones and beacons
bkln	break line
bldg	building
blst	blast pad
bnch	bench
bndy	boundary
boil	biological
borw	borrow
brac	bracing
brdg	bridge
brin	brine system
brng	bearing
brst	breast wall
burr	burrow
bush	bushes and shrubs
busw	bus ways and wire ways
cabl	cable trays
cabn	cabin
CAD	Computer Aided Drafting

CADD	Computer Aided Drafting Design
case	casework
catv	cable television system
cavi	cavity
cdff	ceiling diffusers, registers, and grills
CERP	comprehensive Everglades Restoration Plan
chan	channel
chem	chemical
chll	main chilled water piping
chlp	chilled water plan
chls	chilled water service piping
chut	chutes and concrete erosion control structures
circ	circuit
clhd	ceiling head
clng	ceiling
cmpa	compressed air system
cmuw	cmu outline
cndw	condensor water
cnsl	construction joints – longitudinal
cnst	construction joints – transverse
cntl	**c**ontraction joints – longitudinal
cntr	centerline
cntt	contraction joints – transverse
coff	cutoff wall
cols	columns
comb	combination
comm	communication
comp	components
conc	concrete
cond	condensation
cond	conductors
conc	concern area
conn	connection
cons	construction limits/controls, staging area
cont	controls
copp	distribution equipment for copper
coor	coordinate grid ticks and text
covr	cover
cpip	cold water piping
cran	bridge cranes, jib cranes, and monorails
crts	crickets
ctlj	control joints
ctln	centerline
ctnr	containers or planters
ctrl	control/expansion joints, joint materials (e.g., felt) vapor barrier, water
culv	culvert

curr	current
cwtr	chilled water system
cwmg	curtain wall mullions and glass
dacl	deauthorized channel
damp	dampers
data	data/lan
defl	defueling piping
deg	degree
demo	demolition
detl	detail
devc	device
dgn	microstation drawing file
dia	diameter
diag	diagrams
dict	dictation
dims	dimension
disc	disciplines
dist	distance
disp	displaced
disp	disposal
domw	domestic water
drwg	drawing
dran	drainage
dred	dredge
dsgn	design
dtch	ditches and swales
dtct	detector
dtm	digital terrain model
duct	ductwork
dust	dust and fume
eco	dcosystem
edge	thickened edges
eg	example
egre	egress
elec	electric
elev	elevation
emcs	energy monitoring control system
emer	emergency
encls	enclosure
eqpm	equipment
equi	equipotential
eros	erosion control
esm	easement
etc	excreta
evtr	elevator cars and equipment
ewat	edge of water

exgl	Existing finished grade line
exhs	Exhaust
expn	Expansion joints
exst	Existing
extn	Extinguisher
extr	Exterior
eyew	Eyewash
fast	Miscellaneous fasteners, anchor bolts, supports (Structural)
fast	Support, brackets, and frame fasteners, and anchor bolts (structural)
fdff	Floor diffusers, registers and grills
fdta	Field data
fenc	Fencing
feed	Feeders
feat	Features
fetp	Feature points
fgas	Fuel gas piping
fill	Cut/fill
fixd	Fixed
fixt	Fixture
fibr	Fiber optics
filt	Filtration
fire	Firewall designators
fixd	Fixed
fixt	Miscellaneous fixtures
flor	Floor
fldr	Floor drain
flow	Flow direction arrows
fmon	Flow monitoring station
foil	Fuel oil piping
fndn	Foundation
fpip	Filtered piping
fram	Stair/elevator framing
free	Freestanding
fngr	Finished grade
fnsh	Finish
fttg	Caps, cleanouts, crosses, and tees
fuel	Liquid fuel
full	Full height
furn	Furnishings
gate	Gates flap, sluice, etch.
gatr	Gator hole
genf	General features
genr	Generators and auxiliary equipment
glaz	Glazed walls and partitions
grad	Grading
gral	Guardrails

grat	Grating
grnd	Ground cover
grbm	Grade beam
grid	Grid lines
grnd	Ground
grdl	Grade line
grph	Graphics
grvl	Gravel
gthp	Geothermal
gutr	Internal gutter
guys	Guying equipment
gwtr	Ground water
hazm	Hazardous materials
hazw	Hazardous waste
haln	Halon
hbar	Horizontal secondary reinforcement
hdwl	Headwalls and end walls
hois	Hoist and hooks
hpip	Hot water piping
hral	Handrails, railings
htcw	High temperature and chilled water
htpl	Main high temperature piping
https	High temperature service piping
htpp	High temperature water plant
humk	Hammocks
hvac	Heating ventilation and cooling
hwtr	Hot water system
hydr	Hydraulic system
hydr	Hydrant
id or i.d.	Identification
iden	Identifier
ie or i.e	Example
igas	Inert gas
indw	Industrial waste
info	Information
ini	Inroads Preferences and Geometry Styles
impr	Improvement
indw	Industrial wastewater
info	Information
indx	Index
inpd	Inch pound
insl	Insulating oil
intl	Inlet
intr	Interior
irrg	Irrigation
jbox	Junction box

join	Joint materials (e.g., felt), vapor barrier, other
keyn	Key in
ladd	Ladder, ladder handrails, safety guard, grab bars
lagn	Lagoons, ponds, watersheds, and basins
land	Landfill gas
latl	Lateral
ldta	Laboratory data
leac	Leach field
legn	Legend
leve	Levee
levl	Level changes
lgas	Liquid gas
lift	Trash rack and miscellaneous lifting equipment
lite	Light
load	Load bearing
lrot	Large rotating
lsft	Life safety
ltng	Lightning
ltpl	Main low temperature piping
ltps	Low temperature service piping
ltpt	Main low temperature piping
lube	Lubrication oil
mach	Machinery
magn	Magnetometer location point
manl	Manual
mark1	Bridges, piers, breakwaters, docks, annotation
matl	Material
majr	Major
mbnd	Material beyond section cut
mcut	Material cut by section
medi	Medical
metl	Metal
metr	Meters
mhol	Manholes
misc	Miscellaneous
minr	Minor
mlch	Mulch
mm	millimeter
motr	motors and utilization equipment
move	movable
motr	machinery motors
mrkg	marking/sign
mrsh	marsh
msc	miscellaneous
mtch	match
mtrl	Joint material, water stop, and barrier

mult	multiple
munt	munitions
nec	national electric code
ngas	liquid Propane and Natural gas piping
nhyd	non-potable hydrants/flushing hydrants
nicn	not in contract
nitf	nitrification drain fields
nopnl	nonload bearing
nplt	nonplotting
npot	nonpotable water piping
nts	not to scale
numb	number
obst	obstruction
occ	occupant
ohwm	ordinary high water mark
open	openings
orig	origin
othr	other
otln	outline
outs	cross tees
ovhd	ceiling mounted or suspended equipment
padm	pad mounted
patt	pattern
panl	panel
panl	panel boards, switches, mcc, unit substations
pcb	polychlorinated biphenyl
pcsn	pocosins
pcst	precast
peds	pedestal
pene	penetration
perm	perimeter
pfix	plumbing fixtures
phol	vernal Pools, Playas, Prairie Potholes, Wet Meadows, and Wet Prairies
phon	phone
pile	piles
pipe	piping
pkng	parking
plnt	plant
plts	plants
pnls	panel power
pocosins	Swamp on a hill usually located in upland areas
poll	pollution
powr	power
prch	perch/nesting hole
prht	partial height
prim	primary

prim	primary beams/girders
proc	process
proj	project
prop	property
prot	protection
pshp	plot shape
ptn	potential
pump	pump stations
pvmt	pavement
r	radius
rbar	reinforcing bar
rail	railroad
rais	raised
rcov	recovery
redc	pressure reducing station
redl	redlines
refg	refrigerant
refr	reference
retn	return
revs	revisions
rfdr	roof drain
risr	riser
rprn	riparian forested wetlands
rsvr	reservoirs
rtrn	return
rtwl	retaining wall
runw	runway
rway	right of way
rwk	project opens alignments for inroads
rwl	roadway library
rwtr	raw water
Safe	safety
sallt	tidal saltwater marshes
Salt	salt water marsh
Samp	samples
Sanr	sanitary
Scnd	secondary
secd	secondary
Sect	section
Secu	security
Sedi	sediment
Sers	series
Sert	sensor
Serv	service
Shad	shadow area
Shea	shear walls

Show	emergency showers
Shld	shoulder transverse strips
Shps	supports, brackets, and frames shapes, plates (non structural)
slgh	sloughs
Smok	smoke
Soli	solid material
Soun	sound
Spcl	special systems
Spkl	sprinkler
Spot	spot elevations
Sprt	sport field
Sppt	support
Sprg	sprigs
Sprn	sprinkler
Sswr	sanitary waste water
Stan	standpipe
Stml	main stream piping
Stms	steam service piping
Stat	status
Stat	stationing
Stem	steam lines
Stls	wide flange shapes, plates, open web joists, decking
Stml	main stream piping
Stms	steam servicing piping
Stor	storage
Strb	strobe
Strc	structure
Strm	stream
Strm	storm
Strs	stairs
Subs	substation
Subs	subsurface
Supp	supply
Sur	surface
Surv	survey
Susp	suspended
Swch	disconnect switches, motor starters, contactors, etc
Swmp	swamp
Swtr	surface water
Sxts	Sixteenth lines (40 lines)
Symb	symbols
Syst	systems
Tags	diffuser register grille tag and air flow arrows
TC	transition control
Tdzm	touchdown zone markers
Term	terminal

Thrs	threshold
ther	thermostat
tidl	tidal
tml	template library
topt	top/toe
topo	topography
tptn	toilet partition
traf	traffic
trak	track
tran	transformer
trsh	trash
trc	fuel line trench
trch	trench
ttlb	title block
trus	trusses
trvl	travel
tray	transformer and wire symbols
tvan	TV antenna system
undr	underground
urac	under floor raceways
util	utilities
V8	version 8
vege	existing vegetation
vert	vertical
vlve	Valve pits/vaults, steam pits
wall	wall/floor outlets
wast	waste
watr	water
wdff	wall diffusers, registers, and grills
wdwk	woodwork
weld	welding symbols
wing	structure and pump station wing walls
wksf	work surface
wood	wood outline
wysiwyg	what you see is what you get

ProjectWise Information

Appendix B

Appendix B

SAJ ProjectWise Information

1.0 Information required to create a project.

1.1 To create a project in the Jacksonville ProjectWise system an e-mail should be sent to **Mr. Roger W. Porzig** with Name of project, P2 ID number, and team members who will be working on the project.

2.0 Adding design files to a project.

2.1 *Drag and drop or create new*. With ProjectWise Explorer open along with the Windows Explorer you can select files, then drag and drop them into your project directory or sub-folders. To create a new document in ProjectWise use a right click in the folder of choice, chose New Document and you will get a dialog that will create a new PW document. Remember that you also have to Import the file under the Advanced tab in the File area of the dialog. This only works with single files where the drag and drop works for multiple files. The down side of drag and drop is that you must go back and add attributes after the fact. With drag and drop the File Name, Name and Description of the document all end up being the same. This is not very useful to others on the team working in your project.

2.2 *Why use attributes*? Attributes are those items that will allow others, and yourself, to locate files at a later date. They also provide a way to let those you are working with know something the file. This may be something like the kind of work the drawing depicts or just the plate number of the Sheet model.

2.3 *How to enter attributes*. You enter attributes using the properties menu of the document. Select a document in the ProjectWise explorer and press the spacebar as this will bring up the needed dialog. The general tab has areas you can edit in white. The system will only be as useful as we make it by using meaningful descriptions for the data we store.

3.0 Scanning reference files. ProjectWise alone does not know anything about the reference files that go with the drawing you just dropped into your project. It takes the process of running the Scan References Wizard to connect your reference files with your drawing. Take the time to read each page of the wizard and you will find process very efficient at not only connecting which reference files go with your drawing but also that you may have missing files in the drawing set you received from another source. Please see the ProjectWise help for details on running the wizard.

4.0 Checking out a file. There are two basic ways to check out a file to make modifications. The first is to double click the file while in the ProjectWise Explorer. If

you have permission to work on the file this will open MicroStation in edit mode. The other way is to start MicroStation and log into ProjectWise before choosing the drawing to edit.

5.0 Adding a reference to an existing PW drawing. In order to add a reference file to your drawing you first must be in the ProjectWise environment in MicroStation. By that I mean you should log into ProjectWise when starting MicroStation or double click a drawing in the ProjectWise Explorer to start a checkout of a drawing. Then, using the MicroStation reference tools you can attach any file, anywhere in ProjectWise, to your active drawing. Once attached and checked back into the ProjectWise server the reference will always be found when opening the drawing from ProjectWise.

5.1 *There should be only one project border file*. Usually the project border will reside in the general folder of a project. By using the one project border issues like a slight project name or contact number change can be made once, rather quickly, even for projects with hundreds of files.

5.2 *Survey data – don't copy it, reference it*! Our survey data is not survey data if you change it. By copying survey data to your project you run the risk of missing Survey Section updates to the data and you also cause additional disk space to be used (and backup time) adding to our overall cost of doing business. Just reference in the survey data and fewer problems will arise.

5.3 *When a reference files moves*. Sometime it is necessary to rearrange the PW data holding. When this happens files that you have referenced using ProjectWise are tracked and the next time you open your design all of the references will still be attached. The ability of ProjectWise to manage references makes it easy to structure your project without having to have multiple copies of files. This will in turn keep the chance of someone editing the "wrong" file low.

6.0 Checking in a file. There are two ways to check in a file you have checked out from ProjectWise. One way is using the ProjectWise explorer and the other way is using MicroStation in the ProjectWise environment. Using PW Explorer you can either right click on a drawing you have checked out and chose "Check In", or you can open the PW Organizer from the Tools menu, highlight your checked out files and check them in using the Action menu or the toolbar icon.

7.0 Copying out a file. There are two general uses of the copy out command in ProjectWise. The first is to just copy out the file for viewing or printing while the other method would be used in case you needed modify the file for use in another project.

7.1 *Just to view or print*: In this case you would use the "Open as Read-Only" command from a right-click on the file. This would start MicroStation and allow you to view and or print the drawing.. Because this is read only copy, you will not be allowed to check the file back into PW. You can also use the Copy Out command on the right click menu. This would provide you with a read only copy of the file, along with all the attached

reference files on your local drive. You can see a list of all files you have copied out and the location of the files by using the PW Organizer (from the Tools menu)

7.2 *To modify and re-use*: If you need to pull data from PW so you change it and then add it as new data into a different project you would be best served using the Document Export or Folder Export Wizards. Don't just click Next when the wizard opens but READ the opening page. This will let you know you use the wizard to COPY out the documents. They can also be exported so that some other organization can get control of the files for editing. The hope here is that you would then import them when the work by the other organization is finished. Pay attention to the second page of the wizard, as it is here you chose the "Send to Folder" option to copy out the file(s). Be aware that the default action is to Export the files, not copy them to a folder.

8.0 Freeing a checked out file. There are times when you have checked-out a file and you do not want to check it back into PW. Maybe you made some mistake with the data or your system crashed. The file then is locked for others and not available for modification Or, maybe you just want to discard your changes and start again. In any case a file you have checked out can be freed using the "Free" command on the right click. This will put the file back to the state just before you checked it out. You can free any document you have permission to modify.

9.0 Moving files among projects. There may be times when one or more files need to move from one project to another. This can be accomplished by using a right click-drag on one or more files. When you have reached the destination folder and release the right mouse button a menu pops up with a Copy Here or Move Here choice. There is also a Cancel action if you realize this is not the action you want to perform. By using the Move Here choice, the file(s) you have selected will be moved to the target folder. All reference file linkages in the files moved will be maintained. The reference files will not move to the target folder.

Netspex Workflow

Appendix C

Appendix C

Netspex Workflow

Workflow:

1.0 **Preliminary preparation for design project flow.** There are various resources available for the user. These include, Standard Seed files, Cell Libraries, Borders and Companion files, Inroads INI files *(Inroads Preferences and Geometry Styles).* The user can retrieve and down load, these files from the web at http://w3saj/cadd/end/caddmanagementandsupport.htm. It is important to move all the needed resources to your project in Project Wise. This will require advance planning to determine the kinds of design files, which will be created in the project workflow.

1.1 **Netspex and the AEC Standard.** Netspex maintains a connection to the AEC CADD Standard. The Netspex application is a duel purpose product, (a) it manages the Standard, and (b) it is a drafting/design tool for the user enabling compliance with the standards while generating the project design elements through selection of menu options and placing design elements in the project design file.

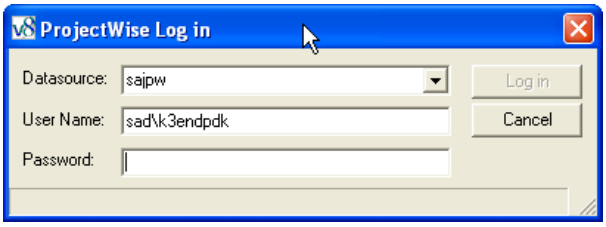
1.2 **Model Files Types and File Names.** There are a few rules to follow in using Netspex and working within the AEC CADD Standard Framework.

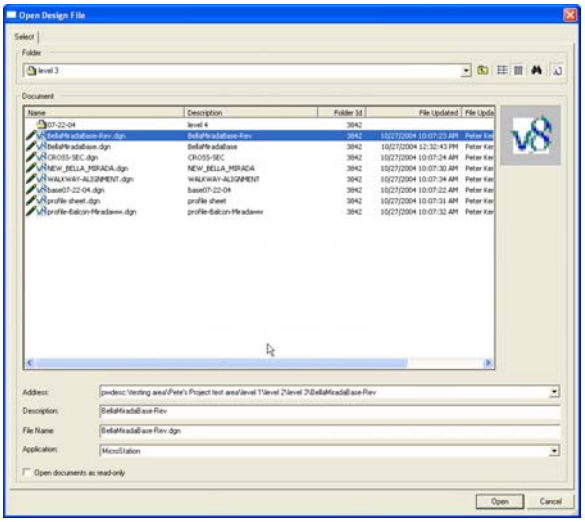
1.2.1 Model type files are DGN files that focus specific elements of the project. For example, a set of civil works channel cross sections are required to be in a DGN file containing *only* cross sections. This is true in all disciplines. NetSpex is configured in such a way that only menus containing items pertaining to the specific model type you have chosen are available. These files will be referenced to sheet files as well as the border/title block to complete the drawing set.

1.2.2 Netspex does not control the file naming convention. This procedure is defined in the Standards implementation and resource guide. Corps team members whether in-house District members, AE firms, or Brokering Districts must use this naming format for model and sheet files.

2.0 **Executing the NetSpex Program**. On your desktop you should find an Icon titled Netspex Designer. If initiated, you should see Microstation V8 start.

2.1 Once Microstation starts, the Project Wise Login Dialog should appear. It is important that you login to this dialog. If you are in the Project Wise Explorer and browse to a DGN file in your project and double click to open the file, Netspex will not activate.

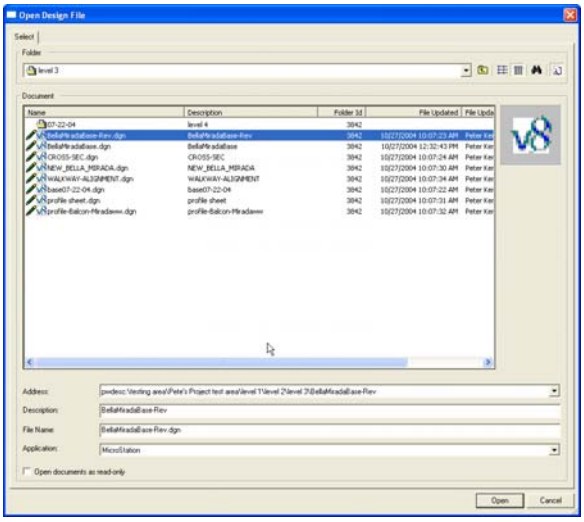




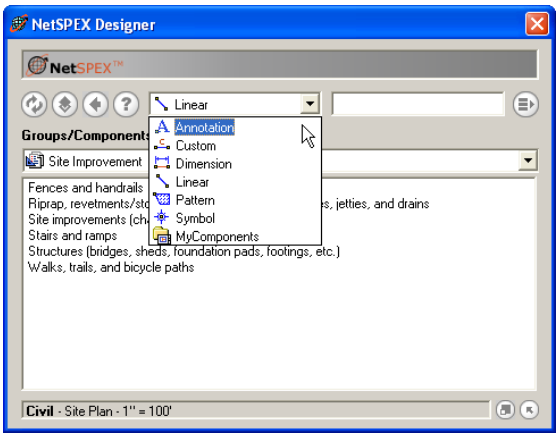
2.2 <u>Project Wise and Open File Dialog</u>. When the Project Wise Login is successful, you will be prompted to open a file (DGN) the dialog presented will be a Project Wise open file dialog. Select the project, and file you whish to checkout and edit.

When open the screen should prompt you with a Netspex Branding Wizard dialog.

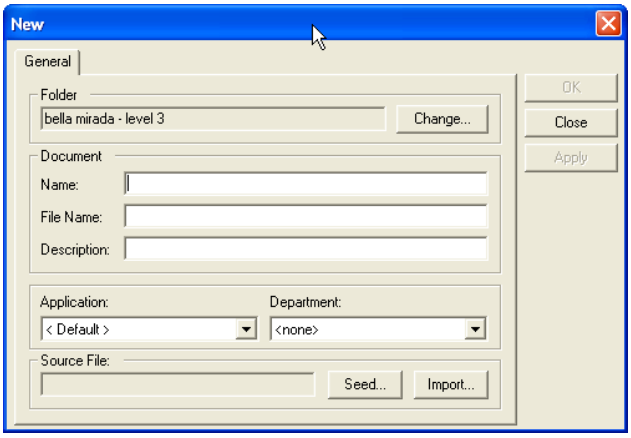
2.3 <u>Branding Design Files</u>. The branding Wizard is generated because the file being opened has never been branded in the past. Netspex will not continue unless the branding is complete. Branding is simply marking a file to define its discipline, model type, and finished plot scale.



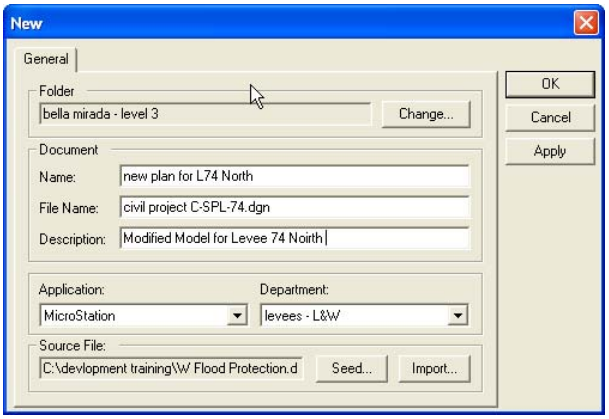
Note the freshly branded file is now marked as a Civil Site Plan at a scale of 1”=100’. Note also that the pull-down menu shown offers Annotation, Dimensions, linier, patterns, and symbols (cells); all are specific to the branded model type. Each has its own menu items. When an item is selected, a tool component is activated. If the linier menu us activated, the menu item available is shown, Fences for instance would activate the Smart line tool and set the entire standard defined element attributes.



2.4 **<u>Creating a New Design File</u>**. `Select` **New** from the Microstation Main Menu Bar.



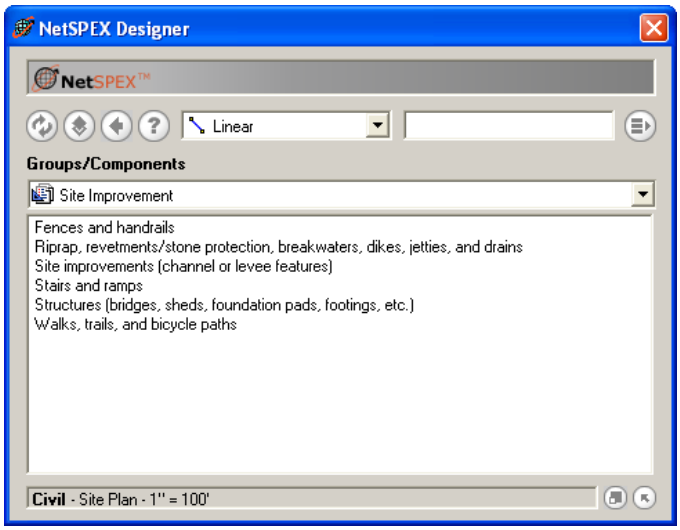
Project Wise will attempt to manage you workspace at this point. The Dialog below is presented to the user to create a new DGN file. This dialog is formatted in 3 sections. The **top section** allows for the browsing to the correct folder with the Project Wise project. The **second or middle section** controls the Document to assign (a) a general name for the design file, (b) create the Standard compliant file name (this format is defined in the Implementation and Resource Guide), (c) Description is not optional Project wise will require a description for many operations to be successful. Avoid copying the first name and pasting it into the name, file name, and description fields. This “dummies” down the entries. The file name field is rather cryptic and the users will need to follow the implementation guide to properly format the standard compliant name. The **Third Section** is important in that the model type has been branded in seed files for each model type. Each seed contains the level and graphic element assignments for each level. The Netspex discipline/model type “Brand” has been configured also.



Note: If you are creating a model file for use in inroads the Application field should be set to InRoads. If you are not in InRoads creating designs, then Choose Microstation V8 as the Application type.

The users can find the appropriate seed file for the new design file in the project on the intranet or the District Internet web CADD

page at http://w3saj/cadd/end/caddmanagementandsupport.htm



Using the NetSpex Menu System to produce compliant designs. Once the design file has been branded as a Flood Control Features model type and the menu system now provides the available items to choose from. This view shows the items for linier type elements. Pick one of the menu items and the NetSpex will activate the appropriate tool for that item. For instance, selecting fences and handrails will activate the appropriate level and levels attributes and start the Smart line tool. NetSpex work in the same way in all disciplines and model types.

When the model files are completed, the model files and border is referenced to a sheet file. The sheet file contains only general notes scale, north arrow, etc.

Appendix D

InRoads Standard Workflow

Appendix D

InRoads Standard Workflow

Workflow:

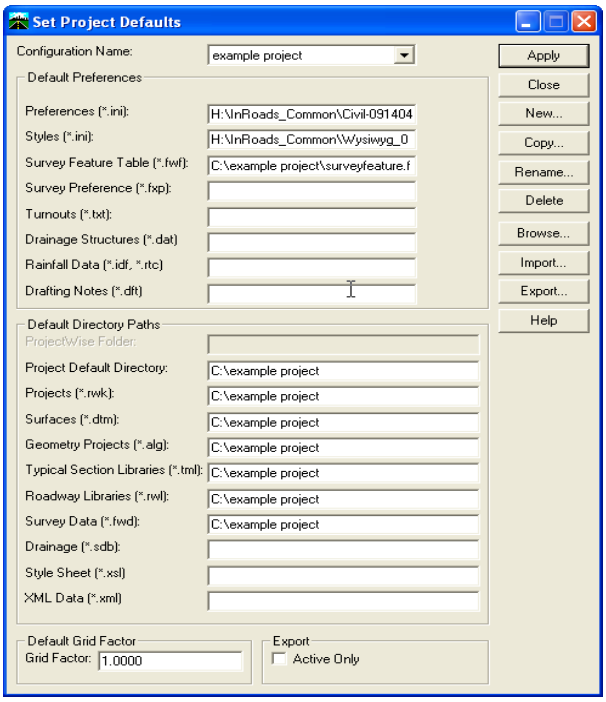
1.0 Copy the *Standard* Civil*[date]*.ini and Wysiwyg*[date]*.ini and *Standard* aec-tcnames.tml file files to the project in which you will be working.

Note. *The civil.ini is referred to as Preferences and the Wysiwyg.ini are Styles [the wysiwyg.ini contains geometry styles only]. The Template library (tml) holds the standard Transition Control Names with assigned Feature Styles.*

2.0 Set up the project defaults.

2.1 Set the path to the INI files.
2.2 Set the path to the TML file.
2.3 Set the remaining paths; i.e., RWK, RWL, etc.

Note: These project settings will save much time when subsequently opening the project model files.



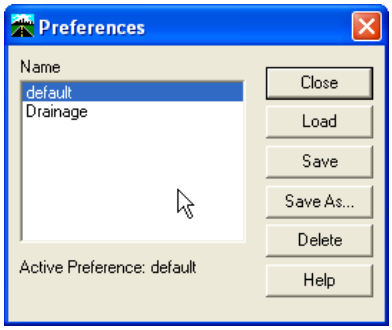
3.0 ***Set the Preference Settings*** *Select the corresponding preference name.*

2.1 Preference names are associated with disciplines, scales, and horizontal and vertical exaggeration factors.

2.1.1 *Preference settings have been set up using a base general text size of .12 feet (for English units). When the scale factor of 100 is applied, the text is placed at 12.0 feet.*

Note: It is important that the designer plan for the final plot size so that the appropriate scale is selected and therefore, the appropriate text final text height.

2.1.2 *Load the correct preference. Note:* In the various tool dialogs, you will find the "Preference" button at the bottom of the dialog. Notice that when selected, you can close, save, save as, load, or delete.



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4.0 ***Develop the Design the Model and Components***

4.1 Create a working *DGN file to develop the DTM model.*

4.2 Develop the Model (dtm) in this "working" file. Develop the various scenarios, alternatives until the final design is completed. Save the DTM, TML, ALG, RWL to a RWK or Project File. This will allow the user to retrieve the individual model components listed above by only opening the RWK file. This will open and/or checkout the components assigned.

4.3 Assign the appropriate Feature Styles, Named Symbologies, and TC Names when developing the model. This will allow the model features to display with the standard defined graphic attributes. When finished with the modeling process, save the model to the final DTM

5.0 ***Create the Standard Microstation Model Files***

5.1 Create the model files (for example, Flood Protection Features such as Levees and canals, and contours must be written to a model file that has been set up for that purpose. Cross Section would be written to a separate model file. These files then are referenced to a sheet file. Note: See the Standards Implementation and Resource Guide to see the model files and the levels and graphic attributes included in each.

5.2 Select the provided Seed Files for each model file when creating new files to display and write the dtm features.

6.0 ***Write the Graphic data to the appropriate model files.***

6.1 Model file listing for each discipline can be found on the web at.
http://
6.2 Insure that only the appropriate information is written to each Model File.

7.0 ***Reference the model files to the sheet files and complete the pagination.***

7.1 *The various model files will be referenced to the sheet file.* For example, a Flood Protection Plan, Survey and Mapping, and a Border would reference to the Sheet File. Finally the Sheet information and symbology will be added to complete the sheet.

Appendix E

References

Appendix E

References

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