

Clark County Department of Aviation

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McCarran International Airport AutoCAD Drafting Standards

Revision 3, June 2005 – in progress



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Executive Summary

The purpose of these Standards is to provide consultants working on projects for DOA with minimum requirements to be adhered to in all CAD files prepared for the CCDOA. This document may be specific to civil drawings as it is the most critical part in updating the Master Utility Database. Requirements pertaining to other disciplines are not discussed in this document; however, consultants in each discipline are expected to follow that discipline industry standards. For example, Architectural drawings should follow the AIA CAD Standards.

These standards are a working document that will be updated regularly, based on feedback and comments from our consultants as they apply the standards.

Table of Contents

Section 1:	Introduction	1
1.1	Purpose and Applicability	1
1.2	Contents	1
1.3	Basic Requirements	1
1.3.1	Compliance	1
1.3.2	Software	1
Section 2:	CCDOA Project Support	3
2.1	Administrative	3
2.1.1	Responsibilities	3
2.1.2	CCDOA Staff	3
2.1.3	Specific Services	3
2.2	Compliance Review Process	4
2.2.1	Kick-Off Meeting	4
2.2.2	Compliance Reviews	4
2.2.3	Set-up (<15%) Review	5
2.2.4	30% to 99% Reviews	5
2.2.5	Final Submittal	5
Section 3:	Elements of CCDOA Drawings	6
3.1	Classification	6
3.2	Element Phasing Descriptions	6
3.3	Components of an AutoCAD Project	7
Section 4:	Sheet numbering and Naming Protocol	8
4.1	Sheet Numbering	8
4.2	File Naming and Directory Structure	8
4.2.1	Single Sheet Per Drawing	9
4.2.2	External References	9
Section 5:	Layer Protocol and Pen Mapping	10
5.1	Layer Names	10
5.1.1	Condition/Phase (Section 3.4) – 2 Characters	10
5.1.2	Trade (Section 3.2) – Up to 2 Characters	10
5.1.3	Root - Up to 8 Characters	11
5.1.4	Root Modifier (equivalent to system component)	11
5.1.5	Optional Modifier – Wild Card Not to Exceed 4 Characters	11
5.1.6	Layer Name Breakdown by Fields	11
5.2	Requesting Additions or Changes to the Layering Standards	11
5.3	Pen Mapping	12

5.3.1	Line Color, Thickness, and Type	12
5.3.2	Suggested Line Weights/Pen Widths and Colors.....	12
Section 6:	Drawing Set-Up.....	13
6.1	Sheet Size	13
6.2	Coordinate System.....	13
6.3	AutoCAD Paperspace (Layout)/Modelspace Modes.....	13
6.4	External References (X-Refs)	14
6.4.1	Layering 14	
6.4.2	External Reference Control to Support File Exchange.....	14
Section 7:	Drawing and AutoCAD Protocol	16
7.1	Drawing Layout	16
7.2	AutoCAD Drafting Protocol.....	16
Section 8:	Graphics Standards	18
8.1	Library	18
8.2	Title Blocks/Forms.....	18
8.3	Text Styles/Sizes.....	18
8.4	Hatching	18
8.5	Symbols/Blocks.....	18
8.6	Dimensions and Call-Outs.....	19
8.7	Line Types.....	20
	Standard CAD Files	21
	Layering Guide.....	23
	Abbreviations	25
	AutoCAD Pen Table Set-Up	38
	For Full Size Monochrome Plots	38
	Electronic Submittal	Error! Bookmark not defined.

Appendices

Appendix A – Compact Disc Index

Appendix B – Layering Guide

Appendix C – Abbreviations

Appendix D – AutoCAD Pen Table Set-Up for Full-Size Monochrome Plots

Section 1: Introduction

1.1 Purpose and Applicability

This manual provides the CAD drafting standards to be implemented on all Clark County Department of Aviation (CCDOA) projects. It is to be used by project managers, engineers, CAD technicians, and anyone organizing and compiling information into CAD drawings for CCDOA, including CCDOA personnel, consultants, contractors and their subcontractors. This manual supersedes any previous CCDOA CAD standards.

1.2 Contents

This manual contains the information necessary for CAD technicians to maintain drawing uniformity, neatness, proficiency, speed and quality. It contains standards pertaining to drawing layouts, fonts, symbols, details, sections, views, line weights, layers, etc. The standards contained herein generally conform to standards established by authorities in each engineering field (e.g., AIA, CSI, APWA). It is important that drawings conform to the drafting standards as closely as possible since unclear drawings may cause conflicts between CCDOA and the construction contractor.

1.3 Basic Requirements

1.3.1 Compliance

Drawings prepared for CCDOA must be complete and accurate. Unnecessary elaborate drawings should be avoided. All views, sections, details, etc. must be as complete as necessary to carry out the purpose of the drawing. The design firm must meet the standards contained herein before the construction documents will be accepted. Strict adherence to the layering standards is crucial for effective implementation of updating Master Geo-Database.

Any revision or variance to the AutoCAD Drafting Standards will require a written request or email for authorization by the CCDOA CAD Manager.

1.3.2 Software

Construction documents shall be produced using the following software:

- AutoCAD –the latest version
- Microsoft Office 2000 or Office XP or current version
- Windows 98, NT, 2000 or XP or current version

Other software may be used that improves the efficiency or quality of the construction drawings. The software may also make the drafting tasks easier. Add-on or overlay software shall produce documents that can be readily modified by AutoCAD. Examples are:

- Land Development 3, Civil Design, Surveying or current version
- CAD Overlay 2002 or current version
- AutoCAD Bonus Tools
- AutoDesk VIP Products
- Icon Tools

Section 2: CCDOA Project Support

2.1 Administrative

2.1.1 Responsibilities

CCDOA has a vested interest in the efficient and successful implementation of CCDOA Standards. Therefore, these standards establish a project review process in which CCDOA CAD staff supports and assists designers/CAD technicians on CCDOA engineering projects and enforces compliance to the standards via periodic reviews. In addition, the process is designed to allow consultants and contractors to provide feedback on and request changes to the standards.

2.1.2 CCDOA Staff

Section 3 describes instances in which the design team will need to interface with the CCDOA CAD staff. All requests for additions, changes, or exceptions to CCDOA Standards must be made in writing or by email. The staff contacts are listed below.

The GIS Database Administrator can be reached as follows:

Address: Clark County Department of Aviation
Attn: Majed Khater, GIS Manager
P.O. Box 11005
Las Vegas, Nevada 89111-1005

Telephone: (702) 261- 5589, or 261-3248
Fax: (702) 798-6591
Email: doagis@mccarran.com

2.1.3 Specific Services

In addition to being available for general assistance with the standards, CCDOA CAD staff may provide additional assistance, including –but not limited to the following:

- Assign project numbers. CCDOA project numbers are assigned by the Finance Department. Tenant Improvement project numbers are assigned by the Project Coordinator.
- Provide standard base drawings, border sheets, cover sheets ...etc.
- Meet with consultant representatives early in the design phase to provide orientation for the design team on the specific application of the standards to the new project.
- Review AutoCAD drawings to enforce standards compliance.
- Review of request for the addition of new layers to the approved list.

2.2 Compliance Review Process

Compliance reviews normally occur at the 30% and 90% submittal, final submittal, and record drawings submittal. The final construction document set and record drawing submittal are required to comply with CCDOA standards. Consultants may request a review even if it is not required by contract, but must also follow the contract schedule and costs.

2.2.1 Kick-Off Meeting

At the time of initiating a new project, the CAD standards and all related documents/drawing files will be provided to the consultant. A representative from the CAD staff will be available at the meeting to answer any initial questions the consultant might have. The consultant may request additional documents and or additional meetings with the CAD staff to further understand and establish the specific requirements for the project.

The following information shall accompany any communication regarding the standards:

- Project name and number
- Contract number
- Name of Firm
- Consultant's Representative
- Anticipated date (month/year) of contract document completion.

During the project kick off meeting a CCDOA CAD staff will be available to discuss and explain the standards and answer any questions the consultant may have. In addition, the CCDOA CAD staff and consultant's representative will propose and/or develop the project specific protocol for tracking and recording changes to the standards.

2.2.2 Compliance Reviews

The CCDOA may comment on any information that is submitted. As a general rule the main areas of concern are as follows:

- Coordinate system
- Layer naming (Purge and delete all unused layers in each drawing prior to submittal.)
- CCDOA title block and borders
- CCDOA symbols
- Correct use of AutoCAD Paperspace & Modelspace
- External references
- CCDOA abbreviations
- Building grid
- Submittal file naming and spreadsheet
- Electronic drawing index spreadsheet

- Drawings will be routed back to the consultant via the CCDOA Project Representative for correction of non-compliant items.

Requests for reviews shall be made to CCDOA CAD staff in writing or by email. Copy this request to the appropriate CCDOA Project Manager. The request should include the following information:

- Project name and number
- Contract number
- Name of Firm
- Type of work being done
- Location of project
- Consultant's representative
- Anticipated date (month/year) of contract document completion
- Number of files
- Titles of drawings that are being submitted if a cover sheet is not part of the submittal.

2.2.3 Set-up (<15%) Review (optional)

At this stage of the project the consultant should have a good understanding of the standards and be able to identify any suggested/required changes. To make sure that things are on the right track, the consultant may choose to submit a sample of the electronic drawing files for review. As an example, the following is a suggested sample of drawings on a typical project:

- Cover Sheet
- Initial site plan
- CAD drawing with a border, sample plan layers, and a pcp file
- Proposed directory structure for the Final Submittal

2.2.4 30% to 99% Reviews

Submit in accordance with your contract. The review process is intended to be iterative. Therefore, early stage compliance and demonstration of an understanding of the standards will reduce later stage review time. During each review, if a spot check indicates that a project is clearly not compliant, the submittal will be returned only partially reviewed. Reviews may be requested at any time, even if it is not required by contract, but must also follow the contract schedule and costs. Any additional costs will be borne by the consultant.

2.2.5 Final Submittal

A submittal will not be considered final until it complies with the standards, as evaluated during the 30%-99% reviews. Lack of compliance can cause a delay to a project going to bid. This delay will be the consultant's responsibility.

Section 3: Elements of CCDOA Drawings

3.1 Classification

- Discipline – Designation of an engineering or architectural field that encompasses the design of particular systems. CCDOA-recognized disciplines are:
 - Architectural (A)
 - Civil (C)
 - Electrical/Power (E)
 - Fire Protection (FP)
 - Water (W)
 - Hydrology/Hydraulics (H)
 - Fueling (F)
 - Landscaping (L)
 - Mechanical (M)
 - Plumbing (P)
 - Structural (S)
 - Storm Drain (SD)
 - Sanitary Sewer (SS)
 - Telecommunications (T)
 - Utilities (U)
 - General (G), this discipline is used to categorize general design information such as title blocks, notes, legends, abbreviations and indexes.
- Sub-discipline – CCDOA will recognize specialization within disciplines to allow for more descriptive categorization of design information.
- Each project should include a Cover Sheet, which is provided as part of these standards, the project location should be indicated using the grid system provided on the cover sheet.

3.2 Element Phasing Descriptions

Elements in a drawing set may represent existing conditions that will remain, that will be demolished, or they may represent new facilities that could be constructed in phases. The following is a list of element classifications based on these possible phases.

- Existing – elements constructed or installed prior to a current project; represented on an approved record drawing and/or survey and in the master record drawings, once updated.
- Concurrent – currently non-existent but being designed as part of concurrent separate project and has an effect on the design of the current project.

- Demolished – existing elements that will not exist at project completion. Demolition can occur in phases
- Relocated - existing elements that will not exist in the same location at project completion as they were prior to construction.
- Project – current project elements including:
 - Design/phased – elements constructed or installed during the current project or within a particular phase of a multi-phase project.
 - Future (planned) – elements roughly depicted in a current project to allow for space planning, system load planning or future compatibility.
- Record Drawing – object and line work modifications resulting from as-built red-lining that are distinguished from models created by the design team.
- Abandoned – elements left in place and no longer in use.

3.3 Components of an AutoCAD Project

The following is a list of AutoCAD components that describe how design information can be generated and organized within an AutoCAD file set.

- Drawing file – a project may contain several drawing files, but each file should be specific by discipline and space (area). Areas represented by each drawing should be as contiguous as possible, for example, one drawing file for the architectural layout of the floor plan of level 2 of terminal 2.
- Model/Lay out - A compilation of AutoCAD entities to graphically depict a design element. Schedules, notes, legends, key maps and other indexing information are not considered models. All the layers, colors, line types, fonts...etc. should adhere to the standards outlined by discipline.
- Every sheet of the project should be represented by a separate drawing file (i.e. one layout). External References (Xrefs) could be used to create the different project sheets. Attach Xrefs into model space with no nesting (using overlay is not considered nesting).

Section 4: Sheet numbering and Naming Protocol

4.1 Sheet Numbering

Drawing sheets are numbered according to the following protocol:

- Discipline/Sheet No. - E100

Designator	Facility Name
LAS	McCarran International Airport
OL7	Jean Airport
1L3	Searchlight Airport
VGT	North Las Vegas Airport
HND	Henderson Executive Airport
UO8	Perkinsfield/Overton
IVP	Ivanpah

All sheet numbers shall begin with one of the following discipline letters:

Trade Name	Discipline	Trade Name	Discipline
G	General	CS	Control System
C	Civil	W	Water
U	Utilities	SS	Sanitary Sewer
A	Architectural	H	Hydrology/Hydraulic
S	Structural	NG	Natural Gas
M	Mechanical	F	Fueling
P	Plumbing	FL	FAA Lighting
FP	Fire Protection	NA	Navigational Aids
E	Electrical/Power	ST	Steam System
T	Telecommunication	CW	Chilled Water
SD	Storm Drain	CT	Cooling Towers
L	Landscape	SE	Security
D	Demolition		

Title and index sheets shall be general (G) sheets and the drawing set cover/title shall be G0. The selection of sub-discipline characters is subject to CCDOA approval.

4.2 File Naming and Directory Structure

It is suggested that every project will have sub-folders -classified by discipline (Architectural, Civil ...etc). All X-refs files should be included in the same folder so all X-Refs will be available when each drawing is viewed using DOA network. A separate folder should be designated for plot files (DWF format), using one DWF file with several sheets per discipline. All fonts and support files, shall be submitted in a directory named 'Support_Files'

4.2.1 Single Sheet Per Drawing

Every sheet should be represented by one electronic (drawing) file. Multiple layouts/sheets per drawing file is not allowed. All sheet files submitted to CCDOA shall be named the same as the sheet number except decimals (.) shall be replaced with underscores (_). The sheet number (3 digits) shall be immediately after the discipline letter. Below are some examples for project number 2167 at McCarran International Airport:

Sheet Number	File Name
E1	LAS2167E001
C2.3	LAS2167C002_3
S61.8.1	LAS2167S061_8_1

4.2.2 External References

External References (Xrefs): Within the Xref Manager of a sheet file, limit the Xref name to no more than eight characters. X-ref file names shall be in the following format:

Indexing Location	Format	Example
Xref Manager	Xrefname (not to exceed 8 characters)	SITEPLAN FLORPLAN
File name	X_XREFNAME user defined	X_SITEPLAN_ABCInc X_FLORPLAN_ACME
Name for layer inserted onto (see Section 5)	X1_d_XREFNAME where 'd' is the discipline	X1_C_SITEPLAN X1_A_FLORPLAN

The user defined portion of the file name is to distinguish Xrefs originating from the same source that are slightly modified by the end users, e.g., the prime and sub-consultants.

Section 5: Layer Protocol and Pen Mapping

5.1 Layer Names

Layer names are formatted to convey classifications as described in Section 3, also see Appendix B. Naming for architectural drawings is based on the American Institute of Architects (AIA) layering standards with an addition of a condition/phasing group. There are five distinct group variables within the layer name, as described in the following subsections.

5.1.1 Condition/Phase (Section 3.4) – 2 Characters

Phase/Condition	1 st Character	2 nd Character	Comments
Existing	E	A, B, C, D	1
Concurrent	C	1, 2, 3....	2
Project design or phased design	P	1, 2, 3....	2
Future	F	1, 2, 3....	2
Demolished	D	1, 2, 3....	2
Relocated	R	1, 2, 3....	2
As built (record Drawings)	A	1, 2, 3....	2

Comments:

1. 2nd character is quality level. Quality is determined only by CCDOA survey and applies to underground utilities only.
2. 2nd character is phase, if applicable. Default = 1

5.1.2 Trade (Section 3.2) – Up to 2 Characters

Trade Name	Discipline
G	General
C	Civil
A	Architectural
S	Structural
M	Mechanical
P	Plumbing
FP	Fire Protection
E	Electrical
L	Landscape
H	Hydrology/Hydraulics
U	Utilities
CS	Control systems
W	Water
SS	Sanitary Sewer
SD	Storm Drainage
T	Telecommunication
NG	Natural Gas
F	Fueling

Trade Name	Discipline
FL	FAA Lighting
NA	Navigational Aids
ST	Steam System
CW	Chilled Water
CT	Cooling Towers
SE	Security

5.1.3 Root - Up to 8 Characters

This group is fixed by CCDOA and generally follows the AIA standard. Changes or additions shall be submitted to the CCDOA for approval.

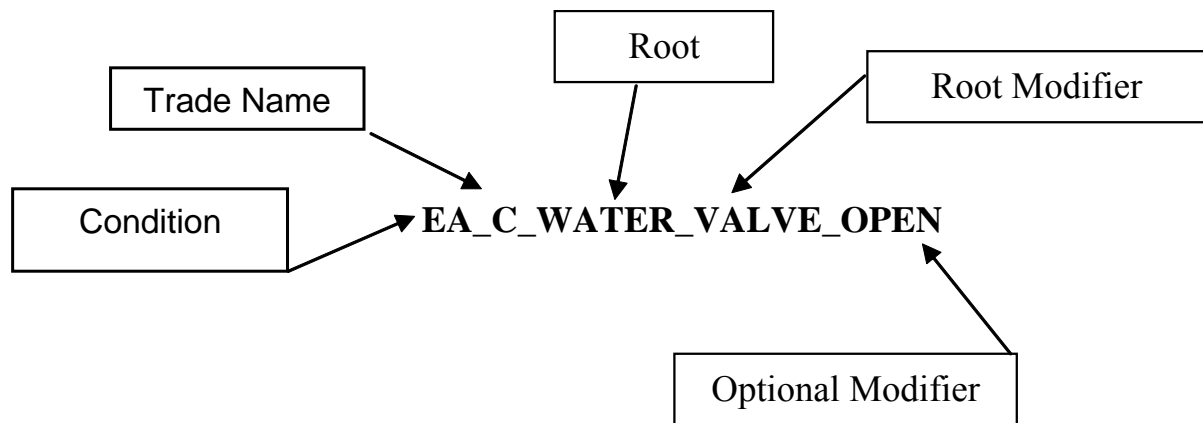
5.1.4 Root Modifier (equivalent to system component)

This group is fixed by CCDOA and generally follows the AIA standard. Changes or additions shall be submitted to the CCDOA for approval.

5.1.5 Optional Modifier – Wild Card Not to Exceed 4 Characters

If the optional modifier is available, the consultant may use this field on an as needs basis and the consultant does not need to submit the layer to CCDOA for approval. The layer should be submitted to CCDOA during the review process, so that it will be recognized as a valid layer during the drawing review.

5.1.6 Layer Name Breakdown by Fields



5.2 Requesting Additions or Changes to the Layering Standards

Layer names are continuously being updated and are available upon request from the CCDOA. The consultant may request that layers be added to CCDOA Standards. Notify the Geo-Database Administrator in writing or email requesting a new layer name. Requests may be

refused if not in the best interest of CCDOA. Reasons for approving new layers include the following:

- Adds to the clarity of the Construction Documents
- Increases the future flexibility of the CAD document
- Applicable to a variety of projects
- Required to complete the design work
- Assists in coordinating the work between disciplines.

No new layers shall be on the Final or Record Drawings submittals without the approval of the Geo-Database Administrator. The consultant's fee shall be based on CCDOA Standards in effect when your contract was signed. ***A denial of a request is not considered just cause for scope adjustment.***

5.3 Pen Mapping

5.3.1 Line Color, Thickness, and Type

Requirements for line color; thickness and type are project specific and shall be established according to the needs of the contract documents.

Include an AutoCAD pcp file with all CAD submittals. Submittals absent the pcp file may be rejected.

5.3.2 Line Weights/Pen Widths and Colors

See Appendix D.

Section 6: Drawing Set-Up

6.1 Sheet Size

Standard borders and title sheets for all Civil related drawings shall be 24" x 36". Architectural and related disciplines may be 24" x 36" or 30" x 42". Any civil work done in conjunction with Architectural projects should be prepared using a 24" x 36" and printed on the same size as architectural.

6.2 Coordinate System

The UCS World Coordinate point and orientation in a plan drawing shall be set. Land Desktop 3 Northings will match AutoCAD Y coordinates and Eastings will match X coordinates. Use the named UCS views and named view commands to create the views required to work and to create the appropriate orientation for the construction document.

AutoCAD drawings will be set up using ground coordinates based on the Nevada State Plane Coordinate System (NCS 83). Record coordinate values for monuments within the Airport boundaries are available on the following Records of Survey.

- McCarran International Airport – Record of Surveys File 90, Page 7
- Henderson Executive Airport – Record of Survey File 83, Page 27
- North Las Vegas Airport – Record of Survey File 47, Page 1
- Jean Airport – Record of Survey File 79, Page 6
- Overton Airport – Record of Survey File 131, Page 87
- Searchlight Airport – Survey Pending as of 4 February 2004

The vertical datum for all construction work will be NAVD 88.

CAUTION TO ALL DESIGNERS: Failure to use the standard coordinate system or vertical datum may require uncompensated design rework. Failure to confirm actual horizontal and vertical positions of existing tie-in points may result in additional construction costs. Such additional costs will be borne by the designer.

6.3 AutoCAD Paperspace (Layout)/Modelspace Modes

- Paperspace Mode: Use Paperspace for the following:
 - Arrange, annotate, and plot various views of the drawing
 - Sheet Borders, Title blocks and anything in the title block.
 - North Arrows and Graphic Scales.
 - General Notes and Sheet Notes.

- Schedules and Legends.
- Sheet Layout information.
- Plan, Elevation, Section and Detail Title Bubbles and Text. Grid lines used to divide details shall be placed in Paperspace.
- Details shall be brought individually into Paperspace viewports.
- Modelspace Mode: Draw the following in Modelspace:
 - Physical building objects such as walls, doors, columns, lights, conduit, fixtures, pipe, and ducts. Building plans, sections, elevations and details are drawn in Modelspace.
 - Text that is used to identify a line or a specific object. Typically text with a leader is drawn in Modelspace.
 - Hatch patterns.
 - Dimensions.
 - Detail call outs and section cuts.
 - Object symbols such as wall type symbols, door symbols, column types and equipment symbols.
 - Diagrams.

AutoCAD lets you work on your drawings in Modelspace or Paperspace. Use Modelspace to do most drafting and design work. Use paper space to arrange, annotate, and plot various views of your model. Each view can show a different part of the model or display it from a different viewpoint. Title blocks, general notes, sheet notes, and entities that are not attached to entities that represent “real objects” must be placed in PaperSpace. The rest of the entities, such as “real” entities and objects referring to them, should be placed in ModelSpace.

6.4 External References (X-Refs)

6.4.1 Layering

Insert external references onto designated layers, the consultant to provide and document the appropriate layers for X-Refs. External references are NOT to be inserted onto layer 0 (zero). Use only background layers that are provided for each discipline. Use the overlay option for x-referencing unless the document requires otherwise.

In some circumstances it may be necessary to bind X-references into a drawing. Because some layer names may be as long as 21 characters, X-reference file names must be limited to eight characters to ensure that layer names that result after binding do not exceed the 31-character AutoCAD 14-character limit.

6.4.2 External Reference Control to Support File Exchange

These CAD production standards make a clear distinction between AutoCAD sheet files and supporting (X-reference) files. The following guidance is provided:

- Sheet files shall not be used as X-references in other sheet files. If a drawing that was originally developed in model space for a sheet file is to be used as an X-reference, that

model must be saved as a separate file (eight characters) then referenced back into the original sheet file and any other sheet files for which it is needed.

Section 7: Drawing and AutoCAD Protocol

7.1 Drawing Layout

Consistent drawing layout ensures organization and clarity of elements within a drawing. General guidelines are as follows:

- Notes: Notes are written to the upper right side of the sheet.
- Legend: Legends appear under the 'Notes'.
- Vicinity Plan: Vicinity Plans on a site plan drawing appears to the left or below the legend. The Vicinity Plan (or map) shows the general area where the work is to be performed.
- Location Map: A location map is used when a vicinity map does not give enough information on job site location and access.
- Graphic Scale Blocks: Scales should be written out and designated with graphic scale bar.
- Layout Spacing: All drawing elements (details, sections, etc.) should have at least 1-inch between them to prevent confusion with adjacent elements.
- Sheet Layout: Layout details (elevations, sections, etc.) in a grid pattern so that they relate to each other horizontally and vertically.
- North Arrow: North arrow is placed in the upper right portion of the site plan. North is oriented up or to the right.
- Numbering Protocol: Number details horizontally by rows starting at top row, left side of the sheet. Continue numbering horizontally to the right, and then proceed to the next row.

7.2 AutoCAD Drafting Protocol

The following are general guidelines and cannot address every drafting condition. The consultant may request or propose changes (in writing) to these requirements.

- Plot Date: All prints submitted to CCDOA shall have a plot date and drawing file name in the lower left side of the drawing.
- Scale and Units: Objects shall be drawn to actual scale. Use architectural units for building drawings. Use engineering units for site plans, utility plans, demolition plans, and grading and paving plans. Use architectural units for sections, details, floor plans, and reflected ceiling plans.
- Object Properties: Properties shall be set "BYLAYER." Do not adjust object properties by entity (forcing colors or line types) unless approved by CCDOA.
- Layer Control: Freeze layers rather than layers OFF. Elements that are part of a block that are on a different layer than others in that block may still appear when you turn the layer off instead of freezing it.
- Dimensioning: Use associative dimensioning. Do not force the distance text in a dimension, except as follows:

- Details or sections where the item being dimensioned is divided by break lines or is partially drawn.
- Diagrams that are not drawn to scale.
- All drawings prepared for or by CCDOA shall be drawn in two dimensions (2-D), unless otherwise requested by CCDOA.
- Line types: Use only CCDOA approved line types. Refer to Appendix A.
- Fonts: Use only AutoCAD standard fonts. Do not submit third party fonts.
- Menu Files: Do not submit or use any third party “mnu” files or menus in the drawing.

Section 8: Graphics Standards

8.1 Library

Refer to Appendix A.

8.2 Title Blocks/Forms

The CCDOA standard title and border sheets are to be used for all drawings prepared for and by CCDOA. Title and border sheets are inserted into Paperspace at 0,0 and attribute information entered in full. AutoCAD files of title and border sheets will be made available to the consultant at the start of every project.

8.3 Text Styles/Sizes

Standard AutoCAD text styles are used for CCDOA CAD drawings. The required text styles are ROMAN D and SIMPLEX. Other acceptable fonts are ROMAN S and ARIAL fonts, which may be used for survey point text.

- Detail call-outs, dimension text, notes and subtitles (under Sections, Details, and Elevations) use ROMAN D text style. ROMAN S can be used if space is limited.
- Titles, headings, or major call-outs use ROMAN D text style.

Text heights shall be as shown in the table below.

Table 1: Text Height

	Notes	Titles/Headings	Dimensions Text
Civil	0.125 0.10 minimum	.1875 to .25	0.125 0.10 minimum
Architectural	1/8" 3/32" minimum	3/16" to 1/4"	1/8" 3/32" minimum

8.4 Hatching

The use of hatching is limited to the AutoCAD default hatch patterns. The scale of the pattern shall be relative to the scale of the drawing. Use the appropriate layer assigned for hatching. Refer to Appendix D.

8.5 Symbols/Blocks

The following are general guidelines for creating blocks. Nested blocks are prohibited when drawing in two dimensions.

Blocks that have all objects on the same layer shall be created on layer 0 (zero). The block should then be inserted into the drawing on CCDOA designated layer. Nested Blocks are prohibited.

Blocks may contain multiple elements on different layers. The construction of these type blocks is more complex and requires planning. Some objects in the block may need to match the properties of the layer on which the block is inserted. These objects shall be created on layer 0. Block objects that are not created on layer 0 shall follow CCDOA standards. The block should then be inserted into the drawing on CCDOA designated layer.

8.6 Dimensions and Call-Outs

Dimensions and call-outs can both enhance and clarify a drawing's purpose or cause confusion for the intended viewer. The following guidelines can help ensure clarity in drawings.

- Repetition of dimensions and elevations should be avoided to eliminate the errors when revisions occur.
- In a chain of dimensions, the overall total is omitted. It is preferred to omit the least significant dimension of a chain and include the total dimension. Longer and larger dimensions should appear on the outside of all other call outs.
- On mechanical and electrical drawings, dimensions irrelevant to the drawing's discipline, such as civil, architectural, structural dimensions, are not shown.
- Dimension lines are to be located far enough from the item being dimensioned to ensure clarity between the dimension lines and the object being dimensioned.
- Dimension text height is .125 at 1:1 scale.
- All fractions to be written as: $\frac{1}{2}$
- Avoid crossing dimension and leader lines. If crossing is unavoidable, break one of the lines (leader lines first) at the point of crossing.
- Wherever possible, text should appear inside and above dimension lines. If impossible to dimension otherwise, text can be shown outside dimension lines with leader extension connecting text and dimension lines.
- Wherever possible AVOID:
 - Crossing leader lines
 - Long leader lines
 - Horizontal and vertical leader lines
 - Leaders parallel to adjacent dimension lines, extensions lines, or cross-hatching
 - Small angles between leaders and the lines upon which they terminate.

8.7 Line Types

All line types should be standard AutoCAD defined line types. When changes are authorized, the Consultant shall provide CCDOA Engineering Division a copy of the line type files on disk during the design phase. All unused line types should be purged from each drawing.

Appendix A

Standard CAD Files

APPENDIX A STANDARD CAD FILES

The CCDOA will make available with this manual the standard CAD files for the border and cover sheets. Data will be made available via e-mail, FTP site or in a CD if requested.

Appendix B

Layering Guide

APPENDIX B LAYERING GUIDE

The CCDOA CAD staff will use the Root and Root Modifier to isolate the layers to add to the Feature Data Sets in the Geo-Database. It is important to keep all entities associated with the systems on the correct layers. The following are a few examples using the project as phase 1 and the trade name.

Water System

P1_C_WATER_LINE_10PVC

P1_C_WATER_FH

P1_C_WATER_TEXT

Sewer System

P1_C_SEWER_LINE_8PVC

P1_C_SEWER_LATERAL

P1_C_SEWER_TEXT

Storm System

P1_C_STORM_LINE_18RCP

P1_C_STORM_INLET

P1_C_STORM_TEXT

Electric System

P1_E_ELECT_LINE

P1_E_ELECT_DUCT

P1_E_ELECT_TEXT

Data Communication

P1_E_DATA_LINE

P1_E_DATA_CABLE

P1_E_DATA_TEXT

Natural Gas

P1_C_GAS_LINE_2PIPE

P1_C_GAS_FITTING

P1_C_GAS_TEXT

Fuel System

P1_C_FUEL_LINE_12STL

P1_C_FUEL_VALVE

P1_C_FUEL_TEXT

Appendix C

Abbreviations

APPENDIX C ABBREVIATIONS

&	AND
∠	ANGLE
±	APPROXIMATELY
@	AT
CL	CENTERLINE
	DEFLECTION
°	DEGREE
=	EQUALS
'	FOOT
>	GREATER THAN
"	INCH
%%c	PHASE
<	LESS THAN
#	NUMBER
%	PERCENT
a	CIRCUIT BREAKER AUX. CONTACT AMMETER
A	AREA
AB	ANCHOR BOLT (-S)
ABAN	ABANDON (-ED)
ABS	ABSOLUTE
ABS	ACRYLONITRILE-BUTADIENE-STYRENE
AC	ACRE
AC	ASBESTOS CEMENT
A/C	ASPHALT CONCRETE
ACOUS	ACOUSTICAL
ACT	ACTIVATE
ADDL	ADDITIONAL
ADJ	ADJUST (-ED, -MENT, -ABLE)
ADJT	ADJACENT
ADWF	AVERAGE DRY WEATHER FLOW
AF	ACRE-FEET
AF	AMPERE FRAME
AFD	ADJUSTABLE FREQUENCY DRIVE
AGG	AGGREGATE
AIC	AMPERES INTERRUPTING CAPACITY
AIR-CON	AIR CONDITION (-ER, -ING)
AIRVAC	AIR AND VACUUM VALVE
AL/ALUM	ALUMINUM
ALT	ALTERNAT (-E, -IVE)
ALT	ALTERNATOR
ALTD	ALTITUDE
A/M	AUTO/MANUAL CONTROLLER
ANC	ANCHOR
ANN	ANNUNCIATOR
ANSI	AMERICAN NATIONAL STANDARD INSTIT
APPROX	APPROXIMAT (-E, -LY)
ARCH	ARCHITECT (-URAL)
ARV	AIR RELEASE VALVE
AS	AMMETER SWITCH
ASB	ASBESTOS
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING & AIR CONDITIONING ENGINEERS

ASPH	ASPHALT
ASST	ASSISTANT
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AT	AMMETER TRIP
ATM	ATMOSPHERE (14.7 LB/IN) ²
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AWG	AMERICAN WIRE GAUGE
AWWA	AMERICAN WATER WORKS ASSOCIATION
AUX	AUXILIARY
AVAR	AIR VACUUM AIR RELEASE
AVE	AVENUE
AVG	AVERAGE
B	CIRCUIT BREAKER AUX. CONTACT CLOSED WHEN BREAKER IS OPEN
BARM	BARMINUTOR
BC	BACK OF CURB
BC	BEGINNING OF HORIZONTAL CURVE
BCG	BARE COPPER GROUND
BCV	BALL CHECK VALVE
BD	BOARD
BF	BLIND FLANGE
BFP	BACKFLOW PREVENTER
BFV	BUTTERFLY VALVE
BHP	BRAKE HORSEPOWER
BIO	BIOFILTER
BIOL	BIOLOGICAL
BITUM	BITUMINOUS
BL	BUILDING LINE
BLDG	BUILDING
BLK	BLOCK (-S)
BLKG	BLOCKING
BM	BEAM
BM	BENCH MARK
BOD5	BIOCHEMICAL OXYGEN DEMAND (5 DAY)
BOT	BOTTOM
BRG	BEARING
BS	BLACK STEEL
BSMT	BASEMENT
BTU	BRITISH THERMAL UNIT
BTWN	BETWEEN
BV	BALL VALVE
BVC	BEGINNING OF VERTICAL CURVE
C	DEGREES CELSIUS (CENTIGRADE)
C	CONDUIT
CAB	CABINET
CAP	CAPACITOR
CB	CATCH BASIN/CIRCUIT BREAKER
CC	CENTER TO CENTER
CC	CONTROL CABLE/CLOSING COIL
CEM	CEMENT
CEN	CENTRAL
CF	CUBIC FEET
CFM	CUBIC FEET PER MINUTE
CFS	CUBIC FEET PER SECOND
CH	CHAMBER
CHAN	CHANNEL
CHEM	CHEMI (-CAL, -STRY)
CHH	COMMUNICATION HANDHOLD

CHKD	CHECKERED
CI	CAST IRON
CIP	CAST IRON PIPE
CIRC	CIRCULA (-R, -TION)
CIRCUM	CIRCUMFERENCE
CISP	CAST IRON SOIL PIPE
CKT	CIRCUIT
CL	CENTERLINE
CL2	CHLORINE
CLASS	CLASSIFICATION
CLG	CEILING
CLOS	CLOSET
CLR	CLEAR (-ANCE)
CLWA	CASTAIC LAKE WATER AGENCY
CM3	CUBIC CENTIMETER
CM2	SQUARE CENTIMETER
CM	CENTIMETER
CMC	CEMENT MORTAR COATED
CMH	COMMUNICATION MANHOLE
CML	CEMENT MORTAR LINED
CML&C	CEMENT MORTAR LINED & COATED
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT(-S)
CNTR	COUNTER
CNTRSK	COUNTERSUNK
CO	CLEANOUT
CO2	CARBON DIOXIDE
COD	CHEMICAL OXYGEN DEMAND
COL	COLUMN
COMM	COMMUNICATION
COMP	COMPRESSOR
CONC	CONCRETE
COND	CONDENSATE/CONDUCTOR
CONN	CONNECT (-S, -ION)
CONST	CONSTRUCT (-ION)
CONST	JT, CJ CONSTRUCTION JOINT
CONT	CONTINU (-ED, -OUS, -ATION)
CONTR	CONTRACTOR
COORD	COORDINATE
COR	CORNER
CORR	CORRUGATED
CPLG	COUPLING
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CPVC	CHLORINATED POLYVINYL CHLORIDE
CR	CONTROL RELAY
C/S, CS	CONSTANT SPEED/CONTROL SWITCH
CT	COURT
CT	CURRENT TRANSFORMER
CTR	CENTER
CTS	CATHODIC TEST STATION
CV	CHECK VALVE
CW	COLD WATER
CWP	COLD WATER PIPE
CWT	ONE HUNDRED POUNDS
CY	CUBIC YARD
D	DRAIN
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE (-S)
DEMO	DEMOLISH

DET	DETAIL (-S)
DF	DOUGLAS FIR; DRINKING FOUNTAIN
DGRM	DIAGRAM
DI	DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL (-S)/DIAGRAM
DIAPH	DIAPHRAGM
DIM	DIMENSION (-S)
DIP	DUCTILE IRON PIPE
DIR	DIRECTION
DISCH	DISCHARGE
DIST	DISTRIBUTION
DN	DOWN
DO	DISSOLVED OXYGEN
DP	DISTRIBUTION PANEL
DPDT	DOUBLE POLE, DOUBLE THROW
DPST	DOUBLE POLE, SINGLE THROW
DR	DOOR
DRG	DOUBLE RUBBER GASKET JOINT
DS	DOWN SPOUT
DUP	DUPLEX
DWG(s)	DRAWING (-S)
E	EAST/EXISTING
EA	EACH
EC	END OF HORIZONTAL CURVE
ECC	ECCENTRIC
ECD	EPOXY COATED
EF	EACH FACE; EXHAUST FAN
EFFIC	EFFICIENCY
EFF	EFFLUENT
EG	EXISTING GRADE
EGL	ENERGY GRADE LINE
EHH	ELECTRICAL HANDHOLE
EL	EPOXY LINED
ELEV	ELEVATION
ELB	ELBOW
EL&C	EPOXY LINED & COATED
ELEC	ELECTRIC (-AL)
ELEM	ELEMENTARY
EMERG	EMERGENCY
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EP	EDGE OF PAVEMENT
EPA	ENVIRONMENTAL PROTECTION AGENCY
EQ	EQUAL (-LY)
EQUAL.	EQUALIZATION
EQUIP.	EQUIPMENT
EST	ESTIMATE (-D)
ETC	ET CETERA
ETM	ELAPSED TIME METER
EUC	EUCALYPTUS
EXC	EXCAVATE
EXH	EXHAUSTER (-S)
EXP	EXPANSION
EXP JT	EXPANSION JOINT
EXT	EXTERIOR
EVC	END OF VERTICAL CURVE
EW	EACH WAY
F	DEGREE FAHRENHEIT

(F)	FIXTURE
FT	FEET, FOOT
FA	FIRE ALARM
FAI	FRESH AIR INTAKE
FB	FLAT BAR
FC	FLEXIBLE COUPLING
FCA	FLANGED COUPLING ADAPTER
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FDC	FIRE DEPARTMENT CONNECTION
FDR	FEEDER
FE	FIRE EXTINGUISHER
FF	FAR FACE/FINISHED FLOOR
FG	FLAP GATE
FH	FIRE HYDRANT
FL	FLOW LINE
FM	FLOW METER
FOS	FACE OF STUD
FRC	FLEXIBLE RUBBER COUPLING
FRP	FIBERGLASS REINFORCED PLASTIC
FAB	FABRICATE (-D)
FAC	FACTORY
FACIL	FACILITY (-IES)
FDR	FEEDER
FIG	FIGURE
FILT	FILTER
FIN	FINISH (-ED)
FIN GD	FINISH GRADE
FLASH	FLASHING
FLEX	FLEXIBLE
FLG	FLANGE (-D)
FLR	FLOOR
FLUOR	FLUORESCENT
FDN	FOUNDATION
FREQ	FREQUENCY
FT2	SQUARE FEET
FT3	CUBIC FEET
FTG	FOOTING
FU	FUSE
FURN	FURNACE
FURR	FURRING
FUT	FUTURE
FVNR	FULL VOLTAGE, NON REVERSING
FVR	FULL VOLTAGE, REVERSING
FWD	FORWARD
GA	GAUGE
GAL	GALLON (-S)
GALV	GALVANIZE (-D)
GASO	GASOLINE
GB	GRADE BREAK
GC	GROOVED COUPLING
GDL	GROUND LEVEL
GEN	GENERATOR
GENL	GENERAL
GFI	GROUND FLOW INTERRUPTER
GL	GLASS
GLV	GLOBE VALVE
GLL	GLASS LINED
GND	GROUND
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR

GPM	GALLONS PER MINUTE
GR	GRAM
GRL	GUARDRAIL
GRS	GALVANIZED RIGID STEEL
GS	GALVANIZED STEEL
GV	GATE VALVE
GYP BD	GYPSUM BOARD
H	HIGH
H2 O2	HYDROGEN PEROXIDE
HB	HOSEBIBB
HDPE	HIGH DENSITY POLYETHYLENE
HDWD	HARDWOOD
HGL	HYDRAULIC GRADE LINE
HGR	HANGER
HGT,HT	HEIGHT
HH	HANDHOLE
HM	HOLLOW METAL
HMI	HUMAN MACHINE INTERFACE
HOA	HAND-OFF-AUTOMATIC
HOR	HAND-OFF-REMOTE
HORIZ	HORIZONTAL
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIOM
HP	HIGH POINT
HR	HOURL
HRL	HANDRAIL
HTR	HEATER
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATING & AIR COND
HVY	HEAVY
HW	HOT WATER
HWL	HIGH WATER LEVEL
HWY	HIGHWAY
HYD	HYDRAULIC
HZ	HERTZ
I & C	INSTRUMENTATION AND CONTROLS
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IF	INSIDE FACE
IN	INCH (-ES)
IN3	CUBIC INCHES
INCAN	INCANDESCENT
IN2	SQUARE INCHES
IND LT	INDICATOR LIGHT
INFL	INFLUENT
INSTR	INSTRUMENT
INSUL	INSULAT (-E,-ION)
INT	INTERIOR
INV	INVERT
IPS	INTERNATIONAL PIPE STANDARD
IW	INDUSTRIAL WASTES
JAN	JANITOR
JB,J-BOX	JUNCTION BOX
JST	JOIST
JT	JOINT
KA	KILOAMPERES
KCMIL	THOUSANDS OF CIRCULAR MILS

KG	KILOGRAM; KNIFE GATE
KIP	ONE THOUSAND POUNDS
Km	KILOMETER
KV	KILOVOLTS
KVA	KILOVOLT-AMPERES
KVAR	KILOVOLT-AMPERES REACTIVE
KVARH	KILOVOLT-AMPERES REACTIVE HOURS
KW	KILOWATT
KWH	KILOWATT HOURS
L	LENGTH; LITER
LAB	LABORATORY
LAM	LAMINATE
LAT	LATERAL
LAV	LAVATORY
LB	POUND (-S)
L/D	LITERS PER DAY
LDG	LANDING
LE	LIFTING EYE
LEL	LOWER EXPLOSION LIMIT
LF	LINEAR FEET
LG	LONG
LGT	LIGHT
LH	LEFT HAND
LIQ	LIQUID
LL	LIVE LOAD
LLV	LONG LEG VERTICAL
LO	LIVE OAK
LOC	LOCATION
LONG.	LONGITUDINAL
LP	LOW POINT/LIGHTING PANEL
LPG	LIQUIFIED PETROLEUM GAS -PROPANE OR BUTANE AS NOTED
LPS	LOW PRESSURE SODIUM
LS	LIMIT SWITCH
LT	LEFT
LTG	LIGHTING
LTS	LIGHTS
LWL	LOW WATER LEVEL
(M)	MODIF -Y, -IED
mA	MILLIAMPERES
M3	CUBIC METERS
M2	SQUARE METERS
M	METER
MACH	MACHINE
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MECH	MECHANICAL
MET	METAL
MFR	MANUFACTURER
MG	MILLIGRAMS
MG	MILLION GALLONS
MGD	MILLION GALLONS PER DAY
MG/L	MILLIGRAMS PER LITER
MH	MANHOLE
MIL's	1/1000 INCH
MIN	MINIMUM; MINUTE
MISC	MISCELLANEOUS

MJ	MECHANICAL JOINT
ML	MILLILITER(-S)
MM	MILLIMETER(-S)
MODIF	MODIFICATION(-S)
MON	MONUMENT
MOV	MOTOR OPERATED VALVE
MPH	MILES PER HOUR
MS	MOTOR STARTER
MT	MOUNT
MTD	MOUNTED
MTG	MOUNTING
MTR	MOTOR
MUL	MULLION
MTS	MOTOR TRANSFER SWITCH
MV	MUD VALVE
N	NORTH NEW
N/A	NOT APPLICABLE
NC	NORMALLY CLOSED
NE	NORTHEAST
NEC	NATIONAL ELECTRICAL CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION
NEUT	NEUTRAL
NF	NEAR FACE
NG	NATURAL GROUND
NGVD	NATIONAL GEODETIC VERTICAL DATUM
NIC	NOT IN CONTRACT
NO	NUMBER/NORMALLY OPEN
NOM	NOMINAL
NORM	NORMAL
NRS	NON-RISING STEM (VALVE)
NT	NORMALLY THROTTLED
NTS	NOT TO SCALE
NV	NEEDLE VALVE
NW	NORTHWEST
NWL	NORMAL WATER LEVEL
OA	OVERALL
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
O/C	OPEN/CLOSE SERVICE
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE/OVERFLOW
OFE	OWNER FURNISHED EQUIPMENT
OFF	OFFICE
OFS	OUTSIDE FACE OF STUD
OH	OVERHEAD
OL	OVERLOAD
OPNG	OPENING
OPP	OPPOSITE
ORIG	ORIGINAL
OS&Y	OUTSIDE SCREW & YOKE
OSHA	OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
OT	OVER TEMPRATURE
OZ	OUNCE(-S)
P	PIPE
PB	PULLBOX, PUSH BUTTON
PC	PIECE
PC	POINT OF HORIZONTAL CURVE
PCC	POINT OF COMPOUND CURVE
PCF	POUNDS PER CUBIC FEET

PCO	PRESSURE CLEANOUT
PDV	PLUG DRAIN VALVE
PE	PLAIN END
PE	PHOTOELECTRIC/POLY POLYETHYLENE
PEC	PHOTOELECTRIC CELL
PEN	PENETRATION
PERF	PERFORAT(-E, -ED, -ES, -ATION)
PF	PROFILE/POWER FACTOR
PG	PRESSURE GAUGE
pH	MEASURE OF ACIDITY OR ALKALINTY
PH	PIPE HANGER/PHASE
PHMS	PAN HEAD MACHINE SCREW
PI	POINT OF HORIZONTAL INTERSECTION
P&ID	PROCESS (OR PIPING) & INSTRUMENTATION DIAGRAM
PIV	POST INDICATOR VALVE
PL	PROPERTY LINE/PLATE
PLAS	PLASTER
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLY	PLYWOOD
PNL	PANEL
PNLBD	PANEL BOARD
PO	PUMP OUT
POT	POINT OF TANGENCY
PP	PAGES/POWER POLE
PPB	PARTS PER BILLION
PPM	PARTS PER MILLION
PR	PAIR
PR	PULL RING
PRESS	PRESSURE
PRFV	PRESSURE RELIEF VALVE
PRV	PRESSURE REDUCING VALVE
PRI	PRIMARY
PROJ	PROJECT(-ION)
PROP	PROPERTY
PROT	PROTECTOR
PRS	PRESSURE SNUBBER
PRV	PRESSURE REDUCING VALVE
PS	PIPE SUPPORT
PS	PRESSURE SWITCH
PSF	POUNDS PER SQUARE FEET
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE (PRESSURE ABOVE VACUUM)
PSIG	POUNDS PER SQUARE INCH-GAUGE (PRESSURE ABOVE ATMOSPHERE)
PSL	PIPE SLEEVE
PSTA	PUMP STATION
PSW	PRESSURE SWITCH
PT	POINT
PV	PLUG VALVE
PVC	POINT OF VERTICAL CURVE
PVC	POLY VYNIL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENCY
PWWF	PEAK WET WEATHER FLOW
PVMT	PAVEMENT
PWR	POWER
Q	FLOW OR DISCHARGE
R	RISER
RCPT	RECEPTACLE
RAD	RADIUS
RC	REINFORCED CONCRETE

RCP	REINFORCED CONCRETE PIPE
RCT	REPEAT CYCLE TIMER
RD	ROAD
REC	RECEIVING
RECIRC	RECIRCULAT(-E, -ION)
RED	REDUCE(-R)
REF	REFERENCE
REFR	REFRIGERATOR
REG	REGULAT(-E, -OR, -ION, -ING)
REINF	REINFORC(-E, -ED, -ING, -MENT)
REL	RELATIVE
REQ'D	REQUIRED
REQT	REQUIREMENT
RSVR	RESERVOIR
RESIL	RESILIENT
REV	REVISION
RH	RIGHT HAND
RM	ROOM
RND	ROUND
RPM	REVOLUTIONS PER MINUTE
RPS	REVOLUTIONS PER SECOND
RR	RAILROAD
RT	RESET TIMER/RIGHT
RTE	ROUTE
RTN	RETURN
R/W	RIGHT-OF-WAY
RWD	REDWOOD
S	SOUTH; SLOPE
SAN	SANITARY
SCFM	STANDARD CUBIC FEET PER MINUTE
SCHED	SCHEDULE
SCR	SILICON CONTROLLED RECTIFIER
SD	SMOKE DETECTOR/STORM DRAIN
SE	SOUTHEAST
SEC	SECOND(-S, -ARTY)
SECT	SECTION(-S)
SED	SEDIMENTATION
SEW	SEWER
SF	SUPPLY FAN
SG	SLUICE GATE
SHT	SHEET
SI	SIDEWALK INLET
SIG	SIGNAL
SIM	SIMILAR
SL	SLUDGE
SO2	SULFUR DIOXIDE
SN	SOLID NEUTRAL
SP	STATIC PRESSURE
SPGR	SPECIFIC GRAVITY
SPC	SPACE
SPCD	SPACED
SPCNG	SPACING
SPCS	SPACES
SPDT	SINLE POLE, DOUBLE THROW
SPEC	SPECIFICATIONS
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCHES
SRG	SINGLE RUBBER GASKET JOINT
SS	SANITARY SEWER/STAINLESS STEEL
SS 304	STAINLESS STEEL TYPE 304

SS 316 STAINLESS STEEL TYPE 316
 ST STREET
 STA STATION
 STD STANDARD
 STIFF STIFFEN (-ER)
 STL STEEL
 STM STEAM
 STN STAINLESS
 STOR STORAGE
 STRUCT STRUCTUR(-E, -AL)
 SUB SUBNATANT
 SUBM SUBMISSION (SUBMIT)
 SUP SUPERNATANT
 SUPP SUPPORT(-S)
 SURF SURFACE
 SUSP SUSPEND(-ED)
 SV SOLENOID VALVE
 SW SOUTHWEST; SWITCH
 SWBD SWITCHBOARD
 S/W SIDEWALK
 SWGR SWITCHGEAR
 SYM SYMMETRICAL
 SYNC SYNCRONIZING

 T/ TIMER; TIME TOP OF
 TAN. TANGENT(-IAL)
 TB THRUST BLOCK/TERMINAL BOX
 TBM TEMPORARY BENCH MARK
 T & B TOP & BOTTOM
 TC TELEPHONE CABINET
 TC TOP OF CURB
 TCV TWIN ELEMENT CHECK VALVE
 TDH TOTAL DYNAMIC HEAD
 TEL, TELE TELEPHONE
 TEMP TEMPERATURE
 TEMPY TEMPORARY
 TERM TERMINAL; TERMINATION
 T & G TONGUE & GROOVE
 THK THICK(-ENED, -ENER, -NESS)
 TOC TOP OF CONCRETE
 TOD TOTAL OXYGEN DEMAND
 TOP TOP OF PAVEMENT
 TOPO TOPOGRAPHY
 TOS TOP OF STEEL; TOP OF SLAB
 TOW TOP OF WALL
 TP TELEPHONE POLE
 TR THROUGH ROOF
 TRANSF TRANSFORMER
 TRANSV TRANSVERSE
 TRTMT TREATMENT
 T'STAT THERMOSTAT
 TSP TWISTED SHIELDED PAIR
 TURB TURBIDITY
 TYP TYPICAL
 T-__-P TYPE ____ PIPE
 T-__-S TYPE ____ SUPPORT

 UDG UNDERGROUND
 UGE UNDERGROUND ELECTRIC

 UH UNIT HEATER
 UPR UPPER

V	VOLT
VA	VOLT-AMPERES
VAC	VACUUM
VAR	VARIABLE
VAR	VOLT AMPERES REACTIVE
VAT	VINYL ASBESTOS TILE
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VEL	VELOCITY
VERT	VERTICAL
VERTS	VERTICAL BARS
VEST	VESTIBULE
VH	VAR-HOUR
VOL	VOLUME
VPI	VERTICAL POINT OF INTERSECTION
VS	VARIABLE SPEED/VOLTMETER SWITCH
VT	VENT
W	WIDTH; WIDE; WEST
W	WIRE
W/	WITH
WC	WATER CLOSET
W CL	WATER COLUMN
WD	WOOD
WH	WATER HEATER
WHDM	WATTHOUR DEMAND METER
WHM	WATTHOUR METER
WM	WATER METER
W/O	WITHOUT
WP	WEATHERPROOF
WS	WELDED STEEL
WST	WATERSTOP
WT	WATERTIGHT/WEIGHT
WTP	WATER TREATMENT PLANT
WTR	WATER
WW	WATER WASTE
WWF	WELDED WIRE FABRIC
WWM	WELDED WIRE MESH
XFMR	TRANSFORMER
YD3	CUBIC YARD
YD2	SQUARE YARD
YD	YARD
YR	YEAR

Appendix D

AutoCAD Pen Table Set-Up
For Full Size Monochrome Plots

APPENDIX D
AutoCAD Pen Table Set-Up
For
Full Size Monochrome Plots

<u>OBJECT</u>	<u>COLOR</u>	<u>SCREENING</u>	<u>LINEWEIGHT</u> <u>(INCHES)</u>
1	Red	100%	0.010
2	Yellow	100%	0.010
3	Green	100%	0.015
4	Cyan	100%	0.015
5	Blue	100%	0.030
6	Magenta	100%	0.020
7	White/Black	100%	0.020
8	DARK Gray	100%	0.005
9	Light Gray	100%	0.005
12	Dark Red	40%	0.010
52	Dark Yellow	40%	0.010
132	Dark Cyan	40%	0.015
162	Dark Blue	40%	0.030
212	Dark Magenta	40%	0.020
221	THESE PENS ARE FOR SHADING AND HATCHING ONLY	10%	0.010
222		12%	0.010
223		14%	0.010
224		16%	0.010
225		18%	0.010
231		20%	0.010
232		22%	0.010
233		24%	0.010
234		26%	0.010
235		28%	0.010
241		30%	0.010
242		32%	0.010
243		34%	0.010
244		36%	0.010
245		38%	0.010
250	Dark Gray	40%	0.005

APPENDIX E

ELECTRONIC SUBMITTALS

PURPOSE

This section describes the document format and indexing requirements for CAD drawings and other required documents submitted for Clark County Department of Aviation project. These indexing requirements support the search, storage, retrieval and archiving of CCDOA documents. All documents submitted must conform to these standards. Documents that are not submitted in accordance to these standards shall be deemed incomplete.

ELECTRONIC AND PRINT FILES

CAD Files

CAD drawing files will be submitted to CCDOA upon completion of a project and will be formatted as outlined in this document. All CAD files having met CCDOA Standards become property of CCDOA.

Print Copies

Submit mylar reproducible copies of the Construction Drawings and As-Built Drawings along with the electronic AutoCAD files.

At the time of CAD file submittals, hardcopy versions must also be submitted for vault files. Hard copy versions can be original mylars.

As-Built Information

For contracts including as-built drawings services, the as-built information shall be submitted at the completion of each project to the Project Manager.

All drawings must comply with the Layering Standards before being accepted by CCDOA. The Project Manager and Lead Engineer shall be responsible for Drawing Set compliance when an outside consultant or contractor is hired for any drafting done.

If the work is done by 'in-house' drafting staff, the Lead Drafter would be responsible for standards compliance. Consultant drawings will be sent back to the Project Manager for non-compliance correction. Financial penalties will incur should this not be met, whether the problem is corrected by the consultant or charges made to the consultant or work order number for CCDOA personnel to correct non-compliance.

Completed drawings must also comply with all CCDOA Drafting Standards as outlined in this manual. Deviations from these standards will need to be corrected before the CCDOA Engineering Department can accept project files.

The CAD files need to be submitted to drafting at the 30% review for standards checking to ensure a timely completion at the end of the project set.

Purge and delete layers that are not used before submitting your final drawings to POS.

Document Submittals (applicable to shop drawings, reports, etc.).

Submit three hardcopies and one electronic copy complying with the following:

- Adobe Acrobat Portable Document Format (pdf) and/or Drawing Web Format (dwf).
- 3.5-inch disc or CD-ROM (as necessary).
- Files that contain more than five pages shall contain bookmarking as detailed as the document's index (e.g., table of contents for reports); the intent of this requirement is to make it as easy to navigate the PDF file as the original hardcopy document.
- PDF files shall be set to open (File/Document Info/Open) in "Bookmarks and Page" view.
- General Information (File/Document Info/General) shall be added to each PDF file including Title, Subject, Author, and Keywords.
- Optical character recognition (OCR) is not required.
- Direct conversion from the electronic source file (doc, dwg, cdr, pm6, etc.) is preferred to scanning, but not required.
- If documents to be put into PDF format need to be scanned, resolution shall be 300 dpi and shall be in color if the source document is in color.
- Include an electronic index in Excel (index.xls) with columns listing the following information for each document:
 - File name (e.g., SeismicCalculations.pdf)
 - Document title (e.g., Sewer Master Plan)
 - Document Date (e.g. 01/01/2001)
 - Discipline (e.g. Architectural, Civil, Electrical, Mechanical, etc.)
 - Submittal Type (e.g. 30%, As-Bid, Addendum01, Record, etc.)
 - Project Number
 - Project Name
 - Facility Name.

Spreadsheet for drawing submittals to include sheet number, file name, sheet title, and list of x-refs used in each drawing. For x-ref files, provide file name and basic description of the info in the drawing.

Drawing Scanning Requirements

Submit three hardcopies and one electronic copy complying with the following:

- CD-ROM deliverable
- Tiff format
- Color: Black and White
- Compression: CCITT Group 4
- Resolution: 300x300 dpi
- Include an electronic drawing index in Excel (index.xls) with columns listing the following information for each drawing:
 - File name (e.g., a01.tif, e003.tif, etc.) (Include zeros so files will sort correctly when listed in a computer directory)
 - Drawing Number (e.g., A-01)
 - Drawing title (e.g., Concourse A, Reflected Ceiling Plan)
 - Drawing Date (e.g., 01/01/2001)
 - Discipline (e.g., Architectural, Electrical, Mechanical, Structural, etc.)
 - Submittal Type (e.g., 30%, As-Bid, Addendum01, Record, etc.)
 - X-references contained
 - Project Number
 - Project Name
 - Facility Name.

CONTRACTOR shall include in bid all costs for preparation of the electronic copies of the submittal material. New electronic files shall be required for each submittal.

Electronic Information Exchange

Acceptable electronic file formats are AutoCAD 2000 .DWG unless otherwise agreed to in contract requirements. Files may be compressed using WINZIP 7.0 software. There shall be

only one drawing per electronic DWG file. Any of the following delivery methods are acceptable:

- Confirm that CCDOA has received electronic copies.
- CAD files can be exchanged to and from CCDOA by:
 - 1) Diskettes (standard 3.5 inches)
 - 2) Files can be copied or sent via the Internet using FTP sites (check with drafting if available)
- Small individual drawings can also be sent through the Internet as an attachment to an e-mail.
- Standard Compact Disks (CD-ROM).

Include all necessary font files and PCP files in submittal package with AutoCAD drawings.