

# Coconino County

## Engineering CADD Manual



**COCONINO**  
COUNTY ARIZONA

5600 East Commerce

Flagstaff, Arizona 86004

(928) 679-8300 Office

(928) 679-8301 Fax

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# Engineering CADD Manual

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ENGINEERING CADD STANDARDS



## **Chapter 1      CADD Practice**

### **1.1    Objective**

The objective of these Coconino County Public Works CADD (Computer Aided Drafting and Design) Standards is to help provide uniformity of process and presentation. This objective is achieved through standards and guidelines for folder format, file naming, content and the process by which the data is created and saved. Adherence to these standards can help to avoid confusion between workgroups and increase individual efficiency. It can also provide the following:

- Uniformity
- Ensure integrity
- Build clarity
- Simplify creation/modification
- Promote interchangeability
- Streamline workflow
- Improve communication
- Integrate new users more quickly
- Simplify procedures
- Increase efficiency

### **1.2    Maintenance & Editing**

The CADD Standards are not intended to be static and can be enhanced and updated. Suggestions for improvements are strongly encouraged which would allow subsequent CADD Standard Manuals to reflect both the input and needs of the professional CADD user. Surveyors, Engineers, Designers and other users may have differing needs and therefore may require modifications to best serve their applications.

## Chapter 2 CADD Drawing Guidelines

### 2.1 General Requirements

#### A. General Drafting Guidelines

- North arrows should be oriented up or to the left as often as possible. Direction of north arrows will also be determined by stationing with increasing stationing from west to east and south to north
- Create civil design in model space at 1 drawing unit=1 foot, structural and architectural design and details shall be 1 drawing unit=1 inch
- Abbreviations should be shown in accordance with County Standards
- The size of lettering and symbols shall be no smaller than 1/8 inch (.12 or L120)
- Plan sheets shall be 24" x 36" and sufficiently clear to allow for legible prints

#### B. Sheet File Name Conventions

Sheet names for drawings and other engineering related documents will be a combination of the project name, descriptor, sheet number and type. Project Numbers may also be incorporated but are not necessary. The following is an example:

CIP NAME	DESCRIPTION	SHT NO	TYPE.dwg
TURKEY TRAIL DRAINAGE IMPROVEMENTS		SHT04	PP01-AB.dwg

#### C. Title Blocks

Title blocks shall contain the following:

- Project title
- Sheet title
- Project location
- Sheet numbers (sheet # of #)
- Job number
- Professional seal (seal must be signed if plans are complete)
- Designer, drafter and checker initials
- Scale (horizontal and vertical if applicable; for example: H. 1" = 20', V. 1" = 10').
- If drawing has no scale, write NONE or NTS. If drawing has various scales, write AS NOTED in title block and write the scales under the view titles.
- Revisions block

## 2.2 Cover Sheet Presentation

A cover sheet is required on all plans with more than two sheets. The cover sheet should be sheet #1 and contain the following:

- Project title with name and location of project
- Indicate plan type (Paving plan, Water Plan, Final Plat etc.)
- Vicinity Map with north arrow
- Location map
- Basis of Bearing Block including:
  - Basis of bearing description
  - Description of monuments used for basis of bearing
  - Coordinates on each monument used for basis of bearing
- Vertical datum note, including:
  - Benchmark reference number, description (including location), and elevation
  - Datum name
- Detail & section referencing block
- Sheet index (may go on another sheet if more room is required)
- Blue Stake notification decal
- Owner/Developer name, address and telephone number
- Engineers name, address and phone number
- Legend with symbols, lines, etc.
- Approval block for Utilities
- Approval block for County Engineers' signature

## 2.3 Survey Control Plan

Survey control information should be included in every plan set. The survey control information may be included on the location map or may be shown on its' own sheet. The survey control information sheet must include:

- Street names
- Description of every monument (cased, buried, surface brass cap, etc.)
- Coordinates for each monument, which must include Northing and Easting
- Bearing and distance on each street between each two monuments, and distance from offset monument (if any) to intersection
- Radius, delta angle, and arc length on any curving monument lines or baselines
- Bearing and distance and/or dimension from monumented line to construction baselines (if any)
- Stations at intersections and all monuments

- Station numbering must be unique for each street. Use different starting stations for each street alignment so that the numbers do not overlap (start with 10+00 and go up from there)
- Stationing on North/South alignments must increase to the South to abide by presentation standard of north up or left. Stationing on East/West alignments must increase to the East to abide by presentation standard of north up or left
- Station at the beginning, end, at each intersection and at PCs and PTs of curving monument lines
- Description and elevation of any site Bench Marks or control points with elevation
- Arizona Registered Land surveyor's seal (seal must be signed if plans are complete). Current contact information for the surveyor whose seal appears on the drawing (name, address, phone, and/or email)

## 2.4 Paving Plans

Paving plans shall be compiled per the Coconino County Engineering and Design Manual and contain a plan and profile view with each sheet containing the following:

### A. Plan View

- North Arrow and Graphic scale
- Construction Notes
- Lot or APN numbers with addresses
- Street names
- Proposed and existing utilities
- Centerline stationing
- Centerline & Curb return curve and line data
- Centerline intersection stations equations
- Typical cross section dimensions
- Match lines & stations
- Driveway dimensions & stations
- Grade Breaks

### B. Profile View

- Horizontal & Vertical Scale
- Proposed Centerline, Top of curb & gutter geometry (Triple profiles may be necessary to define right and left edge of pavement)
- Callout existing & proposed utilities

- Label proposed grades
- Label grade breaks station & elevation
- Show elevations at all “match existing” points
- Label valley gutter grades
- Label curb returns station & elevations
- Label centerline intersections station equations & elevations
- Provide vertical curve information

## 2.5 Grading Plans

- North Arrow & Graphic Scale
- Legend
- Construction Notes
- Earthwork volumes for Cut/Fill
- Floodway/Floodplain Boundaries (where applicable)
- Lot Numbers & Address
- Proposed & Existing Utilities
- Typical Cross Sections & Section Details
- Street names
- Callouts for Top of Curb, Flow line, Finish Grades, Finish Floor
- Proposed & Existing Contours
- Callouts for Street Grades & Ditches w/ flow arrows
- Grade break Symbols
- Match lines

## 2.6 Sanitary Sewer Plans

### A. Plan View

- North Arrow
- Graphic vertical & horizontal scale
- Lot Numbers & addresses
- Street names
- Proposed Sewer line & taps
- Flow arrows
- Existing & Proposed utilities w/ size, type & location
- Sewer Easements & Rights-of Way dimensions
- Easement instrument number, Doc and Page
- Manhole Rim & flow line Callouts (No., Sta., Elev)
- Construction Notes

- Sewer tap Stationing
- Dimension Sewer taps from Property Line
- Match Lines
- Dimension Sewer Line from CL Road
- CL Road data
- Sewer line horizontal separation from other utilities
- Sewer Line Stationing is always from downstream to upstream

## B. Profile View

- Horizontal & Vertical Scale
- Existing & proposed surface grades @ centerline of pipe
- Existing & proposed utilities size & location
- Label proposed total pipe length & slopes ft/ft
- Label pipe size and materials
- Label Manhole Size, Station and Rim, Invert, & lateral Elevations
- Show Vertical separation from existing & proposed utilities
- Match Lines

## 2.7 Water Plans

### A. Plan View

- North Arrow
- Graphic Scale
- Lot Numbers & Address
- Street Names
- Proposed Water line & Services
- Existing & Proposed Utilities (size, type, location)
- Water Line Easements & PUE's
- Station / Offset Hydrants
- Water Main location & Dimensions from CL
- CL Road Data
- Construction Notes
- Match Lines

### B. Profile View

- Horizontal & Vertical Scale
- Existing & proposed grades @ centerline of pipe
- Existing & proposed utilities size & location



- Label proposed total pipe length, size, material & slopes ft/ft
- Label Fitting Station & Offset
- Show Vertical separation from existing & proposed utilities

## 2.8 Details & Section Plans

- Details should be drawn to scale and typically dimensioned in an architectural format
- There are two types of Sections: “civil sections” and “detail sections”
- Civil sections relate to a plan view and are dimensioned in an engineering format
- Detail sections relate to a detail view and are dimensioned in an architectural format
- Label details and sections with a title, scale, reference number and page

## 2.9 Revisions and Drawing Filing Procedures

- A. Addenda - Creating an Addendum Drawing
  - Addenda are made after general distributions and project advertisement but before the bid opening.
- B. Revise Drawing
  - Revise drawing and place a revision delta near each change.
  - Draw revision cloud around revise area, on separate "revision cloud" layer.
  - Remove any previous revision cloud.
- C. Update Revision Block
  - Fill out revision block in ascending order.
  - Add revision delta to the revision block; describe revision, type initials for
  - "approved by" and "date" (e.g. 5/96).
- D. Issue Drawing
  - Plot drawing
- E. As-built Plan
  - As-built plans are plans of record and the final update of the drawings, they reflect how the project was constructed. Normally they contain the original plan identification followed by an “-AB” distinction. An engineers’ seal is needed for all As-builts and revisions.
  - All revisions require a seal specific to the change. If revisions are approved by anybody other than the original registrant, a new seal by the approving registrant is required. This may be the case where plans sit dormant after completion and before construction.

## 2.10 Markup Guidelines

Drawings can be plotted digitally or physically for review and mark up. Handwriting must be legible and clear. For clear written communication, it is recommend using the following colors

- RED new/revised linework or text to be added/modified in dwg
- GREEN deletions
- BLUE clarifying comments to CAD technician

It is also useful to highlight edits over the mark-up with a highlighter to indicate that the issue has been addressed and for later reference.

### Chapter 3 Engineering Standards

#### 3.1 Abbreviations

A. General

Abbreviations, as a rule, are to be avoided. Different words sometimes have identical abbreviations or acronyms, others are unfamiliar or confusing. The word should be spelled out where the meaning may be in doubt.

- Abbreviations and acronyms may need to be spelled out on first reference
- Apostrophes are usually not used. Exceptions: pav't., req'd, etc.
- Abbreviations for plurals are usually the same as the singular. Exceptions: figs., nos., pp. etc.

Abbreviations and acronyms are constantly used and easy to misconstrue there for the “when in doubt spell it out” rule should apply. However, when the following abbreviations are used in these specifications, standard details or on the plans, they are to be construed the same as the respective expressions represented below.

B. Abbreviations:

<b>A</b>	Architectural
<b>AAC</b>	Arizona Administrative Code
<b>AAN</b>	American Association of Nurserymen
<b>AASHTO</b>	American Association of State Highway and Transportation Officials
<b>AB</b>	Aggregate base
<b>Aban</b>	Abandon
<b>ABC</b>	Aggregate base course
<b>AC</b>	Asphalt cement or concrete
<b>ACB</b>	Asphalt concrete base
<b>ACI</b>	American Concrete Institute
<b>ACP</b>	Asbestos cement pipe
<b>ACPA</b>	American Concrete Pipe Association
<b>ACWS</b>	Asphalt Concrete Wearing Surface

## Engineering CADD Standards

<b>ADEQ</b>	Arizona Department of Environmental Quality
<b>ADOT</b>	Arizona Department of Transportation
<b>AEC</b>	Arizona Electric Code
<b>AFRB</b>	Arizona Fire Rating Bureau
<b>AGA</b>	American Gas Association
<b>AGC</b>	Associated General Constructors of America, Inc.
<b>Agg</b>	Aggregate
<b>Ahd</b>	Ahead
<b>AIA</b>	American Institute of Architects
<b>AIEE</b>	American Institute of Electrical Engineers
<b>AISC</b>	American Institute of Steel Construction
<b>ALIN</b>	Alignments
<b>ANNO</b>	Annotation
<b>ANSI</b>	American National Standards Institute
<b>APA</b>	American Plywood Association
<b>Approx</b>	Approximate
<b>APWA</b>	American Public Works Association
<b>AR</b>	Aged residue
<b>ARS</b>	Arizona Revised Statutes
<b>ASCE</b>	American Society of Civil Engineers
<b>ASME</b>	American Society of Mechanical Engineers
<b>Asph</b>	Asphalt
<b>ASTM</b>	American Society for Testing Materials
<b>Ave</b>	Avenue
<b>AWPA</b>	American Wood Preservers Association
<b>AWSC</b>	American Welding Society Code
<b>AWWA</b>	American Water Works Association
<b>B</b>	
<b>BC</b>	Beginning of curve
<b>BCR</b>	Beginning of curb return

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### ENGINEERING CADD STANDARDS

<b>Beg</b>	Beginning
<b>Bk</b>	Book or Back
<b>BLDG</b>	Building
<b>Blvd</b>	Boulevard
<b>BM</b>	Bench Mark or Board Measure
<b>BNDY</b>	Boundary
<b>BORE</b>	Test Borings
<b>Brg</b>	Bearing
<b>BRIDGE</b>	Bridges
<b>BRKL</b>	Break/ Fault lines
<b>Brl</b>	Barrel
<b>BST</b>	Bituminous Surface Treatment
<b>BTB</b>	Bituminous Treated Base
<b>BTU</b>	British Thermal Units
<b>BVC</b>	Beginning of Vertical Curve

<b>C</b>	
<b>C</b>	Centigrade or Curb
<b>C</b>	Civil
<b>CAD</b>	Computer Aided Drafting
<b>CB</b>	Catch Basin
<b>CBF&amp;C</b>	Catch basin frame & cover
<b>CC or C/C</b>	Center to Center
<b>CCR</b>	Coconino County Records
<b>CE</b>	County Engineer
<b>CF</b>	Curb Face
<b>cfs</b>	Cubic Feet per second
<b>CHAN</b>	Channels
<b>CIP</b>	Cast Iron pipe
<b>CL</b>	Centerline

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ENGINEERING CADD STANDARDS

<b>CL</b>	Centerline
<b>Cm</b>	Centimeter
<b>CMP</b>	Corrugated metal pipe
<b>CO</b>	Clean Out
<b>Col</b>	Column
<b>COMM</b>	Communications
<b>CONC</b>	Concrete
<b>Conc</b>	Concrete
<b>Const</b>	Construct
<b>CONT MIN</b>	Contours (Minor)
<b>CONT MJR</b>	Contours (Major)
<b>CONT1</b>	Contours (1 foot)
<b>CONT5</b>	Contours (5 foot)
<b>CP</b>	Concrete Pipe (non-reinforced)
<b>CTB</b>	Cement Treated Base
<b>CTRL</b>	Control
<b>Cu</b>	Cubic
<b>CV</b>	Cover
<b>D</b>	
<b>Deg</b>	Degree
<b>DEMO</b>	Demolition
<b>DF</b>	Douglas Fir
<b>DG</b>	Decomposed granite
<b>Dia</b>	Diameter
<b>DIAG</b>	Diagrams
<b>Dim</b>	Dimension
<b>DIP</b>	Ductile Iron Pipe
<b>DITCH</b>	Ditches
<b>Div</b>	Division
<b>DM</b>	Demolition

<b>DR</b>	Drainage
<b>Dr</b>	Drive
<b>DTL</b>	Details
<b>DWF</b>	Design Web Format
<b>Dwg</b>	Drawing
<b>Dwy</b>	Driveway
<b>DWY/DW</b>	Driveways
<b>E</b>	
<b>E</b>	Electrical
<b>E</b>	East
<b>Ea</b>	Each
<b>Ease</b>	Easement
<b>EASE</b>	Easement
<b>EC</b>	End of Curve
<b>ECR</b>	End of Curb Return
<b>EG</b>	Edge of Gravel
<b>El or Elv</b>	Elevation
<b>ELEC/ELE</b>	Electric
<b>EP</b>	Edge of Pavement
<b>Equa or Eq</b>	Equation
<b>EVC</b>	End of vertical curve
<b>Ex or Exist</b>	Existing
<b>F</b>	
<b>F</b>	Fahrenheit
<b>F &amp; C</b>	Frame & cover
<b>FB</b>	Field book
<b>FEN</b>	Fence
<b>FF</b>	Finish Floor Elevation
<b>FGC</b>	Federal Communications Commission
<b>FH</b>	Fire Hydrant

<b>FHWA</b>	Federal Highway Administration
<b>FL or F</b>	Floor line or flow line
<b>FLOOD</b>	Flood Hazard Area
<b>Fnd</b>	Found
<b>FNDN</b>	Foundation
<b>FP</b>	Finish Pad Elevation
<b>fps</b>	Feet per second
<b>FS</b>	Finished surface
<b>FSS</b>	Federal Specifications and Standards
<b>Ft</b>	Foot or feet
<b>G</b>	
<b>G</b>	Gutter
<b>G</b>	General Data
<b>Ga</b>	Gage
<b>Galv</b>	Galvanized
<b>GAS</b>	Gas lines
<b>GD</b>	Grading
<b>GDBP</b>	Proposed Grading & Drainage
<b>GIS</b>	Geographic Information System
<b>GL</b>	Ground line
<b>GN</b>	General Notes
<b>gpm</b>	Gallons Per Minute
<b>Gr</b>	Grade
<b>GRID</b>	Profile Grid
<b>H</b>	
<b>H</b>	Hatch
<b>H</b>	High or height
<b>HB</b>	Hose Bib
<b>HC</b>	House connection
<b>Hdwl</b>	Headwall



<b>Horiz</b>	Horizontal
<b>HVAC</b>	Heating, ventilation & air conditioning
<b>Hwy</b>	Highway
<b>HZ</b>	Horizontal Control
<b>ICA</b>	Industrial Commission of Arizona
<b>I</b>	
<b>ID</b>	Improvement District or inside diameter
<b>IEEE</b>	Institute of Electrical and Electronic Engineers
<b>In</b>	Inch
<b>Inv/IE</b>	Invert or Invert Elevation
<b>IP</b>	Iron Pipe
<b>IRRG</b>	Irrigation

<b>J</b>	
<b>JC</b>	Junction Chamber
<b>Jct</b>	Junction
<b>JS</b>	Junction Structure
<b>Jt</b>	Joint
<b>L</b>	
<b>L</b>	Length
<b>Lat</b>	Latitude
<b>Lb</b>	Pound
<b>LF</b>	Linear Feet
<b>Lft</b>	Left
<b>LIMITS</b>	Construction Limits
<b>LLCG</b>	Lot lines, curb & gutter
<b>Long</b>	Longitude
<b>LOT</b>	Lot lines
<b>LS</b>	Landscape
<b>M</b>	
<b>M</b>	Mechanical
<b>MAG</b>	Maricopa Association of Governments
<b>Max</b>	Maximum
<b>Meas</b>	Measured
<b>MH</b>	Manhole
<b>Min</b>	Minutes or Minimum
<b>Misc</b>	Miscellaneous
<b>mm</b>	Millimeter
<b>Mon</b>	Monument
<b>MUTCO</b>	Manual on Uniform Traffic Control Devices
<b>N</b>	
<b>N</b>	North
<b>NBS</b>	National Bureau of Standards

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ENGINEERING CADD STANDARDS

<b>NCPI</b>	National Clay Pipe Institute
<b>NE</b>	Northeast
<b>NEC</b>	National Electric Code
<b>NEMA</b>	National Electrical Manufacturer's Association
<b>NFPA</b>	National Fire Protection Association
<b>No</b>	Number
<b>NP</b>	Non-Plastic
<b>NPI</b>	Non-Pay Item
<b>NSC</b>	National Safety Council
<b>NSF</b>	National Sanitation Foundation
<b>NW</b>	Northwest
<b>O</b>	
<b>OC</b>	On center
<b>OD</b>	Outside diameter
<b>OSHA</b>	Occupational Safety and Health Administration
<b>Oz</b>	Ounces
<b>P</b>	
<b>P</b>	Proposed
<b>PAV</b>	Pavement
<b>PC</b>	Point of curvature
<b>PCC</b>	Point of compound curve
<b>PI</b>	Point of intersection or plastic index
<b>PIPE</b>	Pipes
<b>PL</b>	Property line
<b>PM</b>	Project Manager
<b>PNT ELEV</b>	Point elevations
<b>POC</b>	Point of Curve
<b>POND</b>	Ponds
<b>POS</b>	Point of Spiral
<b>PP</b>	Plan & Profile

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ENGINEERING CADD STANDARDS

<b>PP</b>	Power pole
<b>ppm</b>	Parts Per Million
<b>PRBP</b>	Propo overall base
<b>PRC</b>	Point of reverse curve
<b>PRKG</b>	Parking
<b>PROF</b>	Profile
<b>Prop</b>	Property
<b>psf</b>	Pounds per square foot
<b>psi</b>	Pounds per square inch
<b>PT or POT</b>	Point of Tangent
<b>PTS</b>	Points
<b>PV</b>	Paving
<b>Pvmt</b>	Pavement
<b>PWR</b>	Power
<b>Q</b>	Rate of Flow
<b>R</b>	
<b>R or RAD</b>	Radius
<b>R/W or ROW</b>	Right-of-Way
<b>RBAR</b>	Rebar
<b>RC</b>	Reinforced concrete
<b>RCP</b>	Reinforced concrete pipe
<b>Rd</b>	Road
<b>RD</b>	Roadway
<b>Rdwy</b>	Roadway
<b>Reinf</b>	Reinforced, Reinforcing
<b>Ret Wall</b>	Retaining Wall
<b>RGRCP</b>	Rubber Gasket Reinforced Concrete Pipe
<b>RIVER</b>	River
<b>ROCK</b>	Rock
<b>ROW</b>	Right of Way

<b>rpm</b>	Revolutions Per Minute
<b>RR</b>	Railroad tracks, structures
<b>Rt</b>	Right
<b>S</b>	
<b>S</b>	South or slope
<b>S</b>	Structural
<b>SAE</b>	Society of Automotive Engineers
<b>San</b>	Sanitary
<b>SC</b>	Spiral to Curve
<b>SD</b>	Storm Drain or Sewer District
<b>SD</b>	Storm Drainage
<b>SDWK</b>	Sidewalk
<b>SE</b>	Southeast
<b>SEC</b>	Sections
<b>Sec</b>	Seconds or Section
<b>Sht</b>	Sheet
<b>SP</b>	Site Plan
<b>Spec or Specs</b>	Specifications
<b>SS</b>	Sanitary Sewer
<b>SS</b>	Sanitary Sewer
<b>SSBP</b>	Proposed Sanitary Sewer
<b>ST</b>	Striping
<b>St</b>	Street
<b>STA</b>	Stations
<b>Sta</b>	Station
<b>STBP</b>	Proposed Storm Sewer
<b>Std</b>	Standard
<b>STM</b>	Storm drain & sewer
<b>Str Gr</b>	Structural Grade
<b>STRU</b>	Structural

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ENGINEERING CADD STANDARDS

<b>Struct</b>	Structure or Structural
<b>SW</b>	Southwest
<b>SWPP</b>	Erosion control
<b>T</b>	
<b>T</b>	Tangent Distance
<b>TB</b>	Title Block
<b>TB</b>	Title Block
<b>Tel</b>	Telephone
<b>TEL</b>	Telecommunications
<b>Temp</b>	Temporary
<b>TH</b>	Test hole
<b>TIN</b>	Triangulation Network
<b>TOPO</b>	Topography
<b>TOPTBP</b>	Existing Topography
<b>TP</b>	Telephone pole
<b>TRAF</b>	Traffic control
<b>Trans</b>	Transition
<b>TS</b>	Traffic signal or Tangent to spiral
<b>TV</b>	Television
<b>TXT</b>	Text
<b>Typ</b>	Typical
<b>U</b>	
<b>UBC</b>	Uniform Building Code
<b>UL</b>	Underwriters' Laboratories, Inc.
<b>UPC</b>	Uniform Plumbing Code
<b>USC &amp; GS</b>	United States Coast and Geodetic Survey
<b>USGS</b>	United States Geological Survey
<b>UT</b>	Utilities
<b>V</b>	
<b>V</b>	Velocity of flow

<b>VC</b>	Vertical curve
<b>VCP</b>	Vitrified clay pipe
<b>VEG</b>	Vegetation
<b>Vert</b>	Vertical
<b>VP</b>	Viewport

<b>W</b>	
<b>W</b>	West or width
<b>W</b>	Water
<b>WALL</b>	Walls
<b>WATER</b>	Water Utilities
<b>WBP</b>	Proposed Water
<b>WS</b>	Water & Sewer
<b>Wt</b>	Weight
<b>X</b>	Existing
<b>Xref</b>	Xternal reference
<b>Yd</b>	Yard

<b>Symbols</b>	
'	Feet or Minutes
“	Inches or Seconds
o	Degrees
%	Percent
#	Number or Pound
@	At
/	Per
=	Equals

## 3.2 Linetypes

Fundamental line work in drawings consist of the following linetypes: Continuous, Centerlines, Hidden lines, Dashed lines, multiple Fence and utility lines and Phantom lines. There are any number of linetypes that may be incorporated into drawings.

LTSCALE is the AutoCAD line scale variable. In drawings with decimal units the Ltscale is normally set to the scale in which the drawing will be plotted, i.e  $1' = 40' \text{Ltscale} = 40$ . In architectural drawings the LTSCALE is a multiplier used to scale up line definitions to fit the drawings plotted scale. For example, a drawing scale of  $1/16" = 1'-0"$  will have a LTSCALE of 192 for model space,  $1/4" = 1'-0"$  a Ltscale of 48 and so forth. The zoom factor will then be  $1/192 \text{ XP}$  or  $1/48 \text{ XP}$  in the paperspace viewports to achieve the appropriate scale and linetype. The LTSCALE is applied to the linetype definitions used in the drawing to provide proportional spacing for all linework.

PSLTSCALE is an AutoCAD system variable inRelease12 and above. AutoCAD drawings that use single viewports should set this variable to 0. Hence the linetype scale will be the same as the model ltscale. The PSLTSCALE shall be set to "1" on drawings with multiple view ports with multiple scales. This will enable all linetypes to be plotted according to the viewport scale factor (zoom XP). Drawings such as Detail Sheets may have numerous viewports of varying scales. All the linetypes will look the same when handled in this manner.

### Plotted Line Weights

Using plot styles is recommended. Color-dependent plot style tables set style based on the color of the object. CTB files manages line weight through the graphic use of colors. Entity colors are mapped to logical pens, and each pen has an assigned value for thickness and tone. The designer is then capable of visualizing a plotted drawing by looking at the colors on the screen. Named plot styles (STB) can be assigned to an object independent of color. This allows objects to have a specific line weight and color by layer. The following is an example of a typical Color Table.



AutoCAD Entity Color Table:

COLOR#	COLOR	WIDTH	GENERAL USE
1	Red	0.1 mm	Hatching, Center Lines
2	Yellow	0.3 mm	Drawing Text and Fine Line Work
3	Green	0.45 mm	Drawing Medium Text and Fine Line Work
4	Cyan	0.6 mm	Prop. Drainage or Secondary Lines
5	Blue	0.3 mm	Ex. RJW or Prop. RJW
7	White	0.3 mm	Medium line work such as edge of pavement
8	Gray	0.2 mm	Ex. Line work - Screened 50%
21	Beige	0.1 mm	Ex. Major Contours
35	Brown	0.1 mm	Ex. Minor Contours/Ex. Features
153	Light Blue	0.1 mm	Profiles Grid
253	Light Gray		HalfTone Color - Screened 30%
254	Lighter Gray		HalfTone Color/Solid Hatch - Screened 16%

### 3.3 Lettering, Linework and Data

Consistent text on drawing construction is very important and directly impacts our quality as a county employee. The plotted size of lettering is significant as this will facilitate readability by clients, and field personnel, as well as microfilming and other photographic reducing processes. Standard text height for design plan sets is 0.125" or 1/8". Text height of .25" (2 times standard text height) is to be used for detail, section title and match line call outs.