King County Metro

CAD Standards

March 2024

King County
METRO
Moving forward together

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1 Drawing Guidelines

OVERVIEW

It is important to maintain an accurate coordinate system, consistent file structure and project standards to allow the reliable exchange of design information amongst the project team and to facilitate reliable collaboration across disciplines and between consultants and internal staff. Design drawings, also referred to below as XREF's, will be in model space (with nothing in paper space). These files will be referenced into Sheet drawings for plan production. Sheet drawings will contain annotations and page layouts. The base drawing and additional design drawings will be externally referenced as Overlays into your files.

These standards have been developed in accordance with the National CAD standards, supplemented to align with other partner agency standards such as City of Seattle and Sound Transit and refined to provide flexibility for additional King County Metro design needs.

GENERAL DRAFTING GUIDELINES

- Site drawings should be saved in world UCS.
- Drawing 0,0 and coordinates shall be defined by the Survey/Existing conditions drawing (X-Base). This drawing is created from survey files, when available. Aerial imagery or GIS data from an approved King County Source or Metro Facility Drawings may be used to locate design linework when Survey is not available.
- North arrows should be oriented up, to the left or aligned with Right-of-Way unless specified by permitting jurisdiction.
- Do not draw on layer 0 (zero). This layer is reserved for objects within blocks and CAD styles.
- Do not draw on layer defpoints.
- For layout guidelines use layer G-ANNO-NPLT.
- Create the site design in model space at 1 drawing unit = 1 ft. Units for details, vertical construction and building elements can be determined by discipline. Please note drawing unit settings in model space to the right of drawing elements together with other pertinent CAD settings and adjustments to file norms.
- Create each site design element/discipline as a separate file (XREF). All XREF's should be inserted into files as Overlay. The file name should follow this format: X-DESIGN ELEMENT-ABBREVIATED PROJECT NAME.DWG.
- Sample List:
  - X-BASE-Proj (survey or existing conditions)
  - X-SITE-Proj (site design)
  - X-DEMO-Proj (site demolition)
  - X-ARCH-Proj (building information)
  - X-GRID-Proj (building/MEP grid)
  - X-POWR-Proj (site electrical)
  - X-MECH-Proj (site mechanical)
  - X-STRC-Proj (site structural)

  - X-TESC-Proj (site erosion and sedimentation control)
  - X-GRAD-Proj (site grading and surface linework)
  - X-PAVE-Proj (site paving)
  - X-CHAN-Proj (site channelization)
  - X-UTIL-Proj (all site utilities, for simple projects; site franchise utilities only, for complex projects with separate coordination needs)
  - X-SSWR-Proj (site sewer, for complex projects with separate coordination needs)
  - X-STORM-Proj (site storm, for complex projects with separate coordination needs)
- All work internal to the building will be created in separate drawing files by discipline. If using Revit, please see BIM Standards. When using Revit, all standards are defined within the BIM PXP.
- Define building grid A,0 in the X-BASE FILE on the defpoints layer as a circle with a label (Grid basepoint)
- Create files in the appropriate folders. Give each file an appropriate name. (Contact Project Manager or Project Engineer for required naming conventions.)
- The XREF type should always be "overlay".
- The XREF path type should always be "relative path".
- Work in the correct vertical and horizontal datums as defined by project contract or Project Engineer.
- Draft at Z = 0, design at Z = true elevation.
- Use standard KCM text styles and text heights and follow standard annotation practices (see SECTION 2: Annotation).
- Use standard KCM text styles as included in the KCM C3D Template.
- STANDARD text style is for text within linetypes only. STANDARD text style should use Arial as the embedded font to avoid errors when loading custom linetype definitions.
- Do not use .SHX fonts.
- Capitalize all text.
- Use standard KCM layers, colors and linetypes (see SECTION 3: Layers). These have been developed in accordance with the National CAD Standards.
- Features should be drawn in accordance with King County Engineering Design Standards.
- Use standard KCM blocks as included in the KCM C3D Template.
- Abbreviations should be shown in accordance with industry standards.
- Lettering should not be shown to identify features for which standard symbols are used unless lettering is shown in the standard symbols.
- Plot with KCM color table (see SECTION 4: Colors).
- Lock all viewports.
- Linetype variables LTSCALE, PSLTSCALE, MSLTSCALE & CELTSCALE should always be set to 1.

2 Annotation

ANNOTATION STYLES

Note: Oblique angle 0 degrees for all text

Style Name	Font	Font Style	Width
KCM	Arial.ttf	Regular	1
KCM Exist	Arial.ttf	Regular	1
KCM Anno	Arial.ttf	Regular	1
KCM Exist Anno	Arial.ttf	Regular	1
STANDARD	Arial.ttf	Regular	1
KCM Narrow	Arial.ttf	Regular	0.8

ANNOTATION OBJECTS

Annotation Object	Text Style	Size (inch)
General Annotation	KCM	0.125 (1/8”)
Legend & Notes (General, View, and Key Notes)		
Note Header	KCM	0.1875 (3/16”)
Note Body	KCM	0.125 (1/8”)
Headers		
Column Header	KCM	0.1875 (3/16”)
Note Header	KCM	0.1875 (3/16”)
Township / Range Header	KCM	0.250 (1/4”)
Primary Table Header	KCM	0.1875 (3/16”)
Secondary Table Header	KCM	0.125 (3/16”)
Cover Page Titles	KCM	Varies
View Titles		
Main Title	KCM	0.25 (1/4”)
Sub-titles	KCM	0.1875 (3/16”)
Scale	KCM	0.125 (1/8”)
Dimensions	KCM	0.125 (1/8”)
Callouts (Labels)		
General / Proposed Items	KCM or KCM Anno	0.125 (1/8”)
Existing Features - Base Map	KCM Exist or KCM Exist Anno	0.100 (1/10”)
Existing Features - Large Scale Plans	KCM Exist or KCM Exist Anno	0.125 (1/8”)
Match Lines	KCM	0.1875 (3/16”)
Roadway/Street Names	KCM	0.1875 (3/16”)

3 Creating Civil 3D Data in Xrefs

It is important to add understandable names and descriptions to Civil 3D® objects. Some object types may be "data referenced" into other drawings. Well planned layer-control will help ensure duplicate objects are not visible when XREFs are overlaid in sheet drawings.

There are a variety of approaches to style management. You may choose the style that works best for the project approach. The final deliverable received by KCM must meet the layering standards defined in this manual. Additional information on managing Civil 3D object styles and using grading objects can be found at About Layers in Autodesk Civil 3D and A Practical Grading Workflow.

All Civil 3D® label styles must meet our annotation standards (see Annotation).

Points

Points may be used to display features, modify/define a surface or be used as key notes.

Surfaces

The finish grade surface is created in the X-GRAD drawing and should be displayed as labeled contours via external reference on the sheet drawing(s). Civil 3D® "grading" objects such as Corridors, Feature Lines and Grading Objects are intended to be flexible tools for creating surfaces and site design. These objects should not be printed on the sheets if created solely for surface creation in the X-GRAD file.

Alignments

Existing alignments should be labeled according to our presentation standards with 100-foot tics. Proposed alignments should reside in the XREF drawing they are associated with. For example, a water main alignment should be created in the X-WATR drawing.

Profiles and Profile Views

All stationing callouts in profiles must reference the appropriate project alignment. For work in the roadway, profiles should reference the surveyed roadway centerline if the project includes multiple impacts to the roadway or is part of a ROW improvement plan. Some Profiles may be created for presentation purposes (shown on sheets) while others may be created for reference or design purposes only and not shown on the sheets.

Pipe Networks

Pipe Networks should reside in the XREF they are associated with and are used for design. Polylines, Multilines and Blocks may be used for accurate presentation.

Other Objects

Other Civil 3D® objects may be utilized as needed to support the creation of drawings, but care must be taken to ensure presentation standards are met.

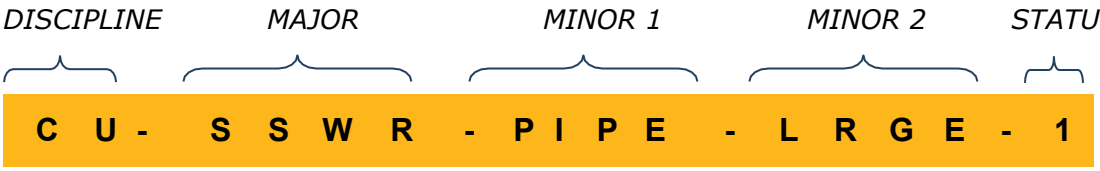
4 Layers

For Building and Interior layer standards see your project BIM execution plan. Refer to the National CAD Standards for additional information and layer field codes if 2D CAD files are created.

HORIZONTAL CONSTRUCTION & SITE PLANS

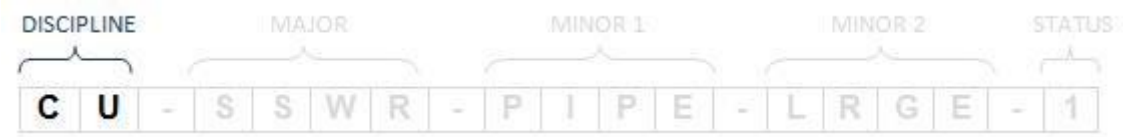
The layer name format is organized as a hierarchy. This arrangement allows users to select from several options for naming layers according to the level of detailed information desired. Layer names consist of distinct data fields separated from one another by dashes. A detailed list of abbreviations, or field codes, is prescribed to define the content of layers. Most field codes are mnemonic English abbreviations of construction terminology that are easy to remember.

The layer name format, showing the Discipline Designator, the Major Group, two Minor Groups (optional), and the Status (optional) fields looks like this:



Below, and on the next few pages are lists of common layer fields. Not all field codes are represented. Refer to the National CAD Standards for additional information and layer field codes of disciplines not defined in this CAD Manual.

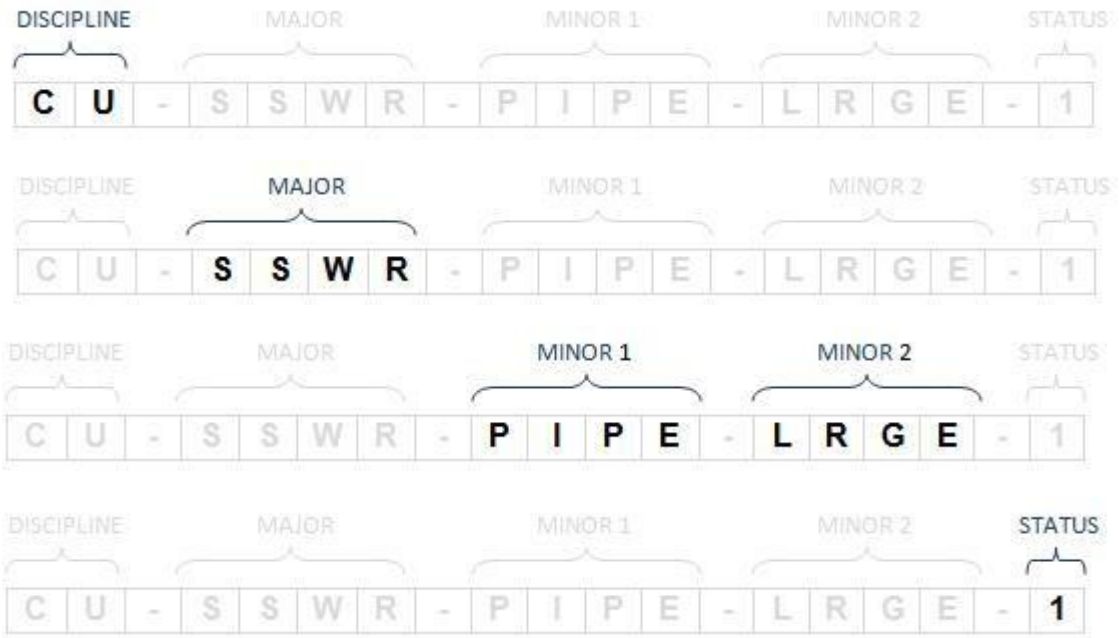
Layer Fields: Discipline Designators



Designator:	Description of Discipline Designator:
3D	3D (ACIS) Solids
A	Architectural (proposed – for schematics, floor plans, elevations, and details, use DETL layers)
AR	Architectural Record Drawing (also used for as-built information)
C	Civil (proposed)
CD	Civil Demolition
CG	Civil Grading
CJ	Civil Signalization
CP	Civil Paving
CR	Civil Record Drawing (also used for as-built information)
CS	Civil Site
CT	Civil Transportation
CU	Civil Utilities

Designator:	Description of Discipline Designator:
E	Electrical (proposed – for schematics and details, use DETL layers)
EI	Electrical Instrumentation (proposed – for schematics and diagrams)
ER	Electrical Record Drawing (also used for as-built information)
G	General
GR	General Record Drawing (also used for as-built drawings)
M	Mechanical (proposed – for schematics and details, use DETL layers found on page 10)
R	Jurisdiction Base Map (based on existing records)
RP	Jurisdiction Base Map/Record Paving
RU	Jurisdiction Base Map/Record Utilities
S	Structural (proposed – for schematics and details, use DETL layers found on page 9)
V	Survey (verified as-builts)
VA	Aerial Survey
VF	Construction Field Survey
VJ	Calculated Survey

Layer Fields: Designators



5 Colors

LAYER COLOR GUIDELINES

As a rule, different object types are assigned to separate layers. All colors should be assigned by layer and modified only in the view layer settings. It is not acceptable to assign a color 'by object'. Follow these guidelines when assigning colors to layers, unless otherwise noted in the list of Common Layer Names below:

Object Type	Existing Layer Color(s)	Proposed Layer Color(s)
Layer colors for Linework/Blocks	40	(Choose base model color from the template legend. Colors may be assigned to sheet view layers in accordance with the KCM provided .ctb to improve plan readability and clarity as needed.)
Layer colors for Annotation	40	7 (white)
Layer colors for Hatch	125	22
Recommended screening colors		50, 70 for proposed elements that are not the focus of the specific plan drawing

6 Callouts, Detail Numbering and Section Lettering

See KCM C3D template and KCM Border Instructions for additional information.

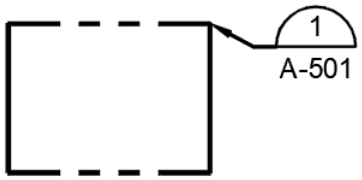
Notes and Callouts

Plan callouts should be listed as a Sheet Notes section on the right side of the plan sheet in a keynote list. Keynote callouts should be used to identify the graphic representation of the note within the drawing area. Detailed text callouts within the plan/drawing space should only be used for exhibits or to manage sheet space limitations. This deviation should be coordinated with your project designer or engineer. If you callout an item only once per sheet, include (typical) in the keynote. For additional guidance on General Notes, Sheet Notes and required content please reference the appropriate Discipline section of the Engineering Services Design Standards and Guidelines.

Referencing Symbols and Organization

Detail or Partial Plan References

Partial plans shall be sequentially lettered. Details should be sequentially numbered.

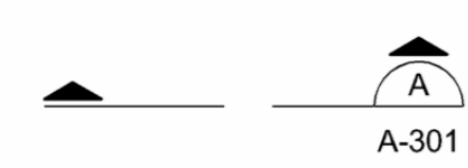


Elevation References

The filled triangle is to point in the direction of the view with the text oriented as shown. Elevations should be sequentially lettered.

Section References

Sections should be sequentially lettered.



Note:

Number and letter sections and details in a separate sequence on each sheet. When the source of the section or details occurs on the same sheet, use a dash to indicate "this sheet" (-).

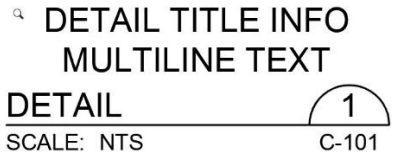
Section Labels and Detail Labels

If a detail or section is referenced by (and applies to) two or less drawings, those drawings will be referenced in the drawing label. If a detail applies to more than two drawings, the drawing number reference will be labeled as VAR denoting VARIES, after listing at least one reference.

The section is cut on the plan sheet. The detail is called out on each plan sheet. The section or detail reference will indicate the sequence letter on the top and the corresponding detail/section sheet on the bottom.

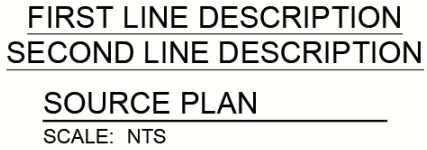
Label for Sections, Details or Partial Plans

For use with one or two references.



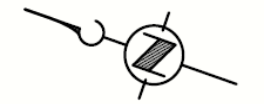
Source Plan Label

This label identifies a plan that is not cut from anywhere else in the Drawing set.



North Arrows

North arrows are to be placed in the upper left-hand corner of the plan whenever possible. Plan north should be towards the top or to the left side of the drawing.

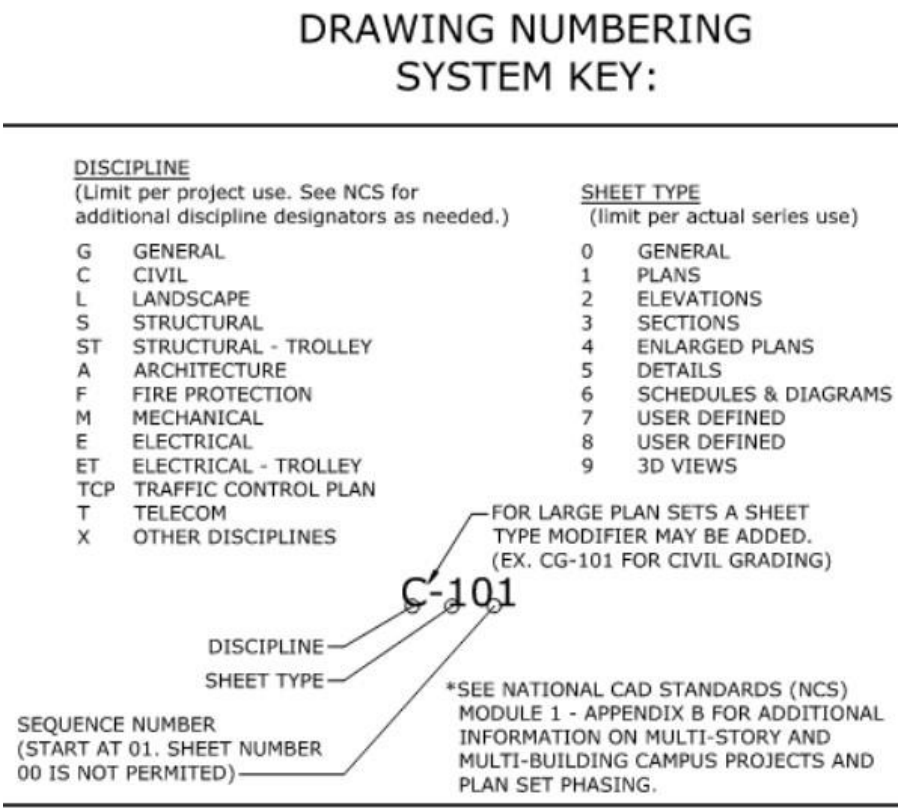


Key Plans

May be identified with a Source Plan label. Use Key Plans to show where a Partial Plan is within a Plan that is divided into a grid of Partial Plans.

7 Drawing Numbering System Key

The KCM drawing numbering system follows the National CAD standards guidelines. Additional information and examples can be found in KCM Border Instructions PDF provided with your project CAD standards and at https://www.nationalcadstandard.org/ncs6/uds/mod1_7.php.



Note:

The information before the dash identifies discipline, subdiscipline, and area/floor.

The information after the dash identifies sheet type.

Phasing information is added to the end after a second dash.