The CAD Standards External Requirements (CAD Standards) shall be used by Consultants on projects submitted to Denver Water. They supplement Denver Water's current Capital Projects Drafting Standards (Drafting Standards).

Consultants and contractors submitting to or working for Denver Water shall have a minimum working knowledge of Denver Water's current AutoCAD 2022 version, AutoCAD Civil 3D, and Denver Water's Drafting Standards.

Software Applications

Denver Water will accept a current AutoCAD DWG file that conforms to the specifications stated in these CAD Standards and the current Engineering Standards (Engineering Standards). A PDF file of the final plot shall accompany the DWG file, as applicable. If Denver Water implements a new version of the AutoCAD software, the documents posted on the Denver Water website, the CAD Standards, and the Engineering Standards will be updated to reflect applicable changes.

If submittals are created using a program other than AutoCAD, the submitter shall convert them to a plain (no proxy) current AutoCAD DWG file of Denver Water's current version (or up to three prior releases). Contact Denver Water's CAD Manager if you are using a newer version than Denver Water's current version. Denver Water reserves the right to decline any submittal due to incompatibility issues including, but not limited to, corrupt files.

Denver Water Engineering

- Work performed by Distribution Engineering includes the design of main improvement and replacement projects under the City Pipe program, plan review under the Plan Review process, and associated as-built drawings (see Section 1: Main Extensions).
- Work performed by Property Management includes easement acquisitions in support of Capital projects, plan review under the Plan Review process, land sales and exchanges, and the management and granting of license agreements on Denver Water's operating and non-operating properties (see Section 2: Easements & Licenses).
- Work performed by Design Drafting supports the Capital projects for new and existing Denver Water facilities delivered through the Programs and Projects section. These drafting services include scheduling and coordination with other divisions, sections, and outside agencies outlined in the Capital Projects Procedures Manual (see Section 3: Capital Projects).

Drawing Tools and Practices

- The annotation scale shall be set for Model Space and for each viewport in Paper Space. Acceptable Denver Water scales are predefined within the provided drawings and templates.
- Within the provided drawings, layers are assigned specific linetypes that shall remain as-is. Denver Water provides a LIN file (see Support Files) with Denver Water linetypes.
- External references (xrefs) are acceptable as an overlay.
- Each color is assigned a pen number based on the ending number of the color. If the color is in a screened row it will plot gray with the corresponding pen width (see Appendix A).
- Text shall be placed in model space; revision clouds, notes, and the north arrow shall be placed in paper space.

Batch Standards Checker

Denver Water provided drawings have a DWS file with the same name that is used to help ensure the standards are properly utilized. The DWS file contains the same layers as the drawing and audits and analyzes drawings for Denver Water text styles, heights, scales, and proper layer use (see Support Files). Run the Batch Standards Checker against Denver Water layers. The errors shown are used solely to assess issues. This is for reference only, submittals no longer require standards audit report. For instruction, see Appendix A.

Standards Audit Report / Save Check File

Submittals no longer require a standards audit report. Reports are for reference only. For instruction, see Appendix A.

eTransmit

Submittals can be streamlined via eTransmit. Files shall include AutoCAD drawing files, AutoCAD linetypes and font files, and related dependent files. For further instruction, see Appendix A.

Support Files

Design Standards are available for download:

> https://www.denverwater.org/contractors/construction-information/design-standards

Support Files (ZIP folders) for the CAD Standards are available for download:

> https://www.denverwater.org/contractors/construction-information/design-standards/cad-standards

For questions related to the CAD Standards, email: CADStandards@denverwater.org.

CAD Standards Appendices

Appendix A – General Information

Appendix B – Layer Requirements

Appendix C – Example Sheets

Section 1: Main Extensions

Within the City and County of Denver (CCD) and the Total Service Contract Areas the term main extensions is used; within the Distributor Contract Area the term distributor main extensions is used. Plan sets and CAD files shall be submitted and meet the requirements and specifications detailed in the Engineering Standards in addition to requirements listed in the CAD Standards.

General Checklist

The following items are applicable to most projects submitted through plan review:

- Plans comply with the Engineering Standards.
- Defined drawing scales – Model Space and Paper Space viewports.
- Xrefs are inserted as overlays using a relative path.
- Use Denver Water standard layers, linetypes, blocks, and symbols.
- Drawings shall bear the Fire Prevention Bureau signature block provided in MainExtension.dwg.
- Each sheet is a separate layout; layouts may be contained in one drawing or separated into individual drawings at the engineering firm's discretion.
- Refer to the Engineering Standards for abbreviation usage on plans.
- Standards check performed.
- Drawings are free from any intelligent (proxy) objects.
- Plot using DW_Engineering.ctb or other grayscale CTB (unless otherwise specified); hardcopies and PDFs/DWFs shall match.

PDF/DWF Files

An electronic drawing set is the digital equivalent of a set of plotted drawings. Files and hardcopies shall be identical. If hardcopies are required, plot them from the PDF/DWF files. Export the file to PDF/DWF as a multi-sheet file with the following requirements:

- All sheets shall be included in a multi-sheet PDF/DWF file; no single-sheets.
- Use grayscale (black and white) only.
- File names shall match the title of each plot sheet (e.g., PID_PlanSet.dwf).

For further instruction, see Appendix A.

Main Extensions Drawing

Within the MainExtensions.dwg are approved layers, linetypes, and symbols.

General

- Drawing units are Decimal – US Survey Feet.
- Only acceptable drawing scales are in the drawing; refer to the Engineering Standards.

Layering

- The provided drawing is preloaded with standard layers (see Appendix B as it includes approved layers with layer specific information including: *Name, Color, Linetype*, *Plot*, and *Description*).
- Layer names are based on the current U. S. National CAD Standards (NCS) and consist of distinct data fields separated from one another by dashes. These fields are as follows: *Discipline Designator, Major Group, Minor Groups* (up to two), and *Status* (e.g., AI-WALL-FULL-DIMS-N).
- The CU prefix was adopted for water facilities. Each layer's linetype and color are predefined based on the provided LIN and CTB files (see Support Files).
- Linetypes shall not include text; use layers and labeling to indicate the size of water lines on plans.
- When creating layers for existing features (not surveyed), maintain the original layer name, include a status of E at the end of the layer, update the descriptions, and make the layer screened.

- Survey base layers, for existing water utilities, with the NCS prefix (Discipline Designator) of VU were added to the drawing. Any form of the V prefix from the NCS is acceptable on submittals for existing features; however, pipe sizes shall be shown with specified linetypes per size.
- If the layers are insufficient, refer to the NCS before contacting Denver Water's IT Technical Support Manager.

Symbols/Blocks

- Symbols (added as blocks and placed on the proper layers) may have dynamic properties and contain wipeouts. They are for graphic respresentation only and are annotative.
- The Fire Prevention Bureau stamp (added as a block) is required on submitted plans.

Text

- Text for labeling water facilities shall be placed on CU-WATR-TEXT. Do not use hatching, solids, or wipeouts to create text.

Example Sheets

See Appendix C.

All Submittals – Main Extensions

Pre-submittals shall be PDF/DWF files (see Water Plan Submittal – PRE-DESIGN LAYOUT – Pre-Submittal Review on the Denver Water website).

Formal submittals shall include, but are not limited to, DWG files and an eTransmit of those files.

Main Extensions Final Product

The final product submitted shall include the following:

- Plans and supporting documentation submittal comply with the Engineering Standards.
- Dropbox requirements:
  - A single ZIP folder including DWG files and supporting dependencies.
  - Any remaining support files not included with eTransmit.
  - A multi-sheet PDF/DWF file of the complete drawing set.

Section 2: Easements & Licenses

The following procedures shall be used to process easements and revocable licenses. Submitted CAD drawings shall meet the requirements and specifications detailed in the Engineering Standards and the CAD Standards.

General Checklist

- Plans comply with the Engineering Standards.
- Defined drawing scales – Model Space and Paper Space viewports. The scale used shall be large enough to ensure dimensions are clearly shown. Whenever possible, the entire easement shall be on one sheet.
- Use Denver Water standard layers and linetypes (see Appendix C – DW STANDARDS 4-06A Page 1).
- Use Denver Water standard blocks and symbols (see Appendix C – DW STANDARDS 4-06A Page 2).
- Each sheet is a separate layout; layouts may be contained in one drawing file or separated into individual drawing files at the engineering firm's discretion.
- Drawings that have a typical profile of crossing shall meet the requirements on the following examples in Appendix C:
    - CROSSING OVERHEAD 4-06D
    - CROSSING UNDERGROUND 4-06E
    - UNDERGROUND DITCH/CANAL CROSSING 4-06F
    - SIMPLIFIED AREA 4-06H
- Refer to the Engineering Standards for abbreviations.
- Standards check performed.
- Drawings are free from any intelligent (proxy) objects.
- Plot using DW_Engineering_PMGT.ctb.

Easements & Licenses Drawing

Within the EasementsAndLicenses.dwg are preferred layers, linetypes, and symbols. C3D styles are available for use if desired (see Support Files).

General

- Drawing units are Decimal – US Survey Feet.
- Only acceptable drawing scales are in the drawing; refer to the Engineering Standards.

Layering

- The provided drawing is preloaded with standard layers (see Appendix B as it includes approved layers with layer specific information including: *Name, Color, Linetype*, *Plot*, and *Description*).
- Layer names are based on the current NCS and consist of distinct data fields separated from one another by dashes. These fields are as follows: *Discipline Designator, Major Group, Minor Groups* (up to two), and *Status* (e.g., AI-WALL-FULL-DIMS-N).

Example Sheets

See Appendix C.

Submittals for Easements & Licenses

See https://www.denverwater.org/contractors/construction-information/plan-reviews/easement-requirements.

See https://www.denverwater.org/contractors/construction-information/plan-reviews/irrigation-plan-submittal.

Easements & Licenses Final Product

- Plans and supporting documentation submittal comply with the Engineering Standards.
- Dropbox requirements:
    - A single ZIP folder including DWG files, PDF files, and supporting dependencies.
    - Any remaining support files not included with eTransmit.
    - A multi-sheet PDF/DWF file of the complete drawing set.

Section 3: Capital Projects

Capital projects are designed and managed by Denver Water's Engineering Division. They include, but are not limited to, rehabilitation and replacement of existing infrastructure and system expansion projects.

General Checklist

The following items are applicable to most submitted projects:

- Plans comply with the Capital Projects Construction Standards (CPCS) and the Drafting Standards.
- Use Denver Water approved layers, linetypes, and requirements detailed in the CAD Standards and the Drafting Standards.
- Use the Denver Water drawings for standard blocks and symbols.
- Use Denver Water standard Civil 3D styles.
- Each sheet is a separate layout; multiple layouts in one drawing is allowed.
- Refer to the CPCS for abbreviation usage on plans.
- Standards check performed.
- Plot using DW_Engineering.ctb.

Capital Projects Template

General

- Drawing units are Decimal – US Survey Feet (Civil) and Fractional – Inches (AEC); the default is Decimal – US Survey Feet.
- Only acceptable drawing scales are in the template; refer to the Drafting Standards.
- Pipe slope shall be shown to five decimal places.

Layering

- The provided template is preloaded with standard layers (see Appendix B as it includes approved layers with layer specific information including: *Name, Color, Linetype*, *Plot*, and *Description*).
- Layer names are based on the current NCS and consist of distinct data fields separated from one another by dashes. These fields are as follows: *Discipline Designator, Major Group, Minor Groups* (up to two), and *Status* (e.g., AI-WALL-FULL-DIMS-N).
- If the layers are insufficient, refer to the NCS before contacting Denver Water's IT Support Technical Manager.

Submittals for Capital Projects

Formal submittals shall include, but are not limited to, DWG files, PDF files (including layers), images, and an eTransmit thereof.

Capital Projects Final Product

The final product submitted shall include the following:

- Plans and supporting documentation submittal comply with the CPCS.
- Dropbox requirements:
  - A single ZIP folder including DWG files and supporting dependencies.
  - Any remaining support files not included with eTransmit.