

CCWA As-Built CAD Standards

Effective Date: June 1, 2002

Revised: December 29, 2006

As of June 1, 2002, all water and wastewater as-built plans submitted to the Clayton County Water Authority must be provided in electronic computer aided design (CAD) format. The following standards must be followed for all plans. Construction will not be approved until these standards are met.

Starting January 1st, 2007 the inspection of stormwater of any new project becomes the responsibility of CCWA (not Clayton County). Therefore, in addition to water and sewer, all stormwater development inspected by CCWA will be required to be included on the electronic as-built. Please note: changes made to the latest revision of this document are indicated in green (or grey when printed on black-and-white printers).

1) General Requirements

- a) All as-built drawings must be georeferenced to the US State Plane coordinate system, NAD 83, GA West Zone, US Survey Feet. All drawings must contain **two reference pins (i.e. property corners)**, which are labeled and tied to the Clayton County Water Authority (CCWA) GPS monument network (please identify referenced GPS monuments with the monument number and coordinates). Reference pins must be able to be field verified using GPS and must be easily accessible (i.e., must not be in a creek). The survey method (GPS or conventional) used to place the reference pins should be identified in the HORIZONTAL_AND_VERTICAL_TEXT layer. Information on the CCWA survey monuments can be found on the CCWA web site at: <http://www.ccwa.us/customer.service/developer.information.aspx> or may be obtained in person at the Clayton County Water Authority administrative complex.
- b) All features depicted in the as-built drawings must be surveyed *after* construction. CCWA will spot check all coordinates to ensure accuracy. Table 1 specifies the features that must be surveyed. Water system features must be surveyed at a horizontal accuracy of ≤ 0.3 ft and vertical accuracy of ≤ 0.5 ft. Sewer system features must be surveyed at a horizontal accuracy of ≤ 0.5 ft and a vertical accuracy of ≤ 0.1 ft.
- c) The following feature geometry types must be shot directly using the survey instrument and tied to the CCWA monument network:
 - I) All point features (hydrants, valves, sewer manholes, etc.),
 - II) All line features at all endpoints, bends, and turns (pipes, etc.),
 - III) All polygon features at all corners and bends (project boundaries, lots, right-of-ways, etc.)
- d) The following feature types are acceptable: Lines, Polylines, Text, Insert/Blocks. The Leaders as feature types must not be used. Where there is a need for Leaders they shall be drawn using *Line* features and must be put on a text layer. For example, the leader for the diameter of a water pipe should be on the WATER_LINE_TEXT layer, not the WATER_LINE layer.

- e) A template (or seed) drawing file, file containing the required CCWA blocks and AutoCAD tool pilot will be provided on <http://www.ccwa.us/customer.service/developer.information.aspx>
- f) The project boundary must be labeled on the PROJECT_BOUNDARY_TEXT layer, and the label must be within the extent of the project boundary.

2) Layering:

- a) Layer names for required layers must appear exactly as in Table 1.
- b) All required layers listed in CCWA CAD layers must contain only the features that are described for that layer. For example, the BOUNDARY_LINE layer must only contain the boundary line and not such features as north arrows or parcels.
- c) All required layers must be present in the drawing except for features that do not pertain to a particular project. For example, some commercial projects or apartment complexes may not contain sewer taps as part of the construction and should not be included in the drawing.
- d) All layers must be clearly differentiated from each other.
 - I) Two layers having the names “WATER_LINE” and “WATER_LINES” should not exist in the same drawing.
 - II) SEWER_LINE_TEXT and SEWER_TEXT should not exist in the same drawing.
- e) All text must appear on separate layers from the layers they annotate. For example, text describing a sewer line must be on the SEWERLINE_TEXT layer, not the SEWER_LINE layer.

3) Drawing

- a) All layers must conform to the proper geometry type (insert/block, line, polygon, text) as indicated in Table 1.

Table 1: Layer Names and Geometry Types			
Layer Name	Type	Layer Contents	Surveyed
ADDRESS_TEXT	Text	Street postal address number	No
APARTMENT	Poly	Apartment Building Footprints	Yes
APARTMENT_TEXT	Text	Apartment building numbers, etc. associated with the APPARTMENT layer	
BLOCK_LETTER_TEXT	Text	Indicates the block letter of a subdivision	No
CITY_BOUNDARY	Line	City boundary line	No
CITY_BOUNDARY_TEXT	Text	City names associated with the CITY_BOUNDARY layer	No
COUNTY_BOUNDARY	Line	County boundary lines	No
COUNTY_BOUNDARY_TEXT	Text	County Names associated with the COUNTY_BOUNDARY layer	No
FIRE_HYDRANT	Insert	Fire Hydrants	Yes
FIRE_HYDRANT_TEXT	Text	Text Associated with FIRE_HYDRANT layer	No
FLOW_ARROW	Insert	Sewer line flow arrows	No
HORIZONTAL_AND_VERTICAL_CONTROL_POINT	Point	Survey control points (rebar or monuments) with x,y,z coordinates	Yes

HORIZONTAL_AND_VERTICAL_TEXT	Text	Text associated with HORIZONTAL_AND_VERTICAL_CONTROL_POINT (coordinate values, monument number, survey method etc.).	No
LAND_LOT_LINE	Line	Land lot lines.	No
LAND_LOT_LINE_TEXT	Text	Land lot numbers and other text.	No
LOT_NUMBER_TEXT	Text	Individual lot numbers	No
PROJECT_BOUNDARY	Poly	The boundary line of the subdivision or commercial property.	Yes
PROJECT_BOUNDARY_TEXT	Text	Project (Development) Name	No
PROPERTY_LINE	Poly	Property Lines (parcel lines)	Yes
PUMP_STATION	Point	Represents the centermost point of a pump station	Yes
PUMP_STATION_TEXT	Text	Text associated with PUMP_STATION	No
RAILROAD_LINE	Line	Railroad Lines	Yes
RAILROAD_TEXT	Text	Text Associated with RAILROAD	No
ROAD_EDGE_OF_PAVEMENT	Poly	Street Edge of Pavement (not back of curb); this layer should not include parking lots or curbing	Yes
ROAD_TEXT	Text	Road Names	No
ROAD_RIGHT-OF-WAY	Poly	Road Right-of-Way	Yes
ROAD_RIGHT-OF-WAY_TEXT	Text	Text relating to the road right of way layer	No
SEWER_END-OF-LINE	Insert	End of sewer line.	Yes
SEWER_END-OF-LINE_TEXT	Text	Text associated with SEWER_END-OF-LINE	No
SEWER_EXISTING	Line	Sewer lines present before the subdivision/project was built	Yes
SEWER_EXISTING_TEXT	Text	Text associated with the SEWER_EXISTING layer	No
SEWER_MANHOLE_EXISTING	Insert	Existing Sewer Manholes	Yes
SEWER_MANHOLE_EXISTING_TEXT	Text	Text associated with the SEWER_MANHOLE_EXISTING layer	No
SEWER_FORCE_MAIN	Line	Sewer force mains	Yes
SEWER_FORCE_MAIN_TEXT	Text	Text associated with SEWER_FORCE_MAIN	No
SEWER_LINE	Line	Sewer lines built as part of the subdivision/project.	Yes
SEWER_LINE_TEXT	Text	Text associated with the SEWER_LINE layer.	No
SEWER_MANHOLE	Insert	Sewer Manholes	Yes
SEWER_MANHOLE_TEXT	Text	Text associated with the SEWER_MANHOLE layer	No
SEWER_TAP	Line	Sewer taps	Yes
SEWER_TAP_TEXT	Text	Distance between taps in feet	Yes
STORM_BMP	Poly	Engineered structures designed to improve management of Stormwater system (see section e-I)	No
STORM_BMP_TEXT	Text	Label showing the BMP_ID (assigned by CCWA – see section e-II)	No
STORM_BMP_EXISTING	Poly	Engineered structures designed to improve management of Stormwater system (see section e-I) that existed prior to construction	No

STORM_BMP_EXISTING_TEXT	Text	Text associated with the STORM_BMP_EXISTING	No
STORM_CULVERT	Poly	A polygon representing the extent of pipe culvert or box culvert structure (see section e-III)	Yes
STORM_CULVERT_TEXT	Text	Label for the STORM_CULVERT features ID (see section e-III)	No
STORM_CULVERT_EXISTING	Poly	A polygon representing the extent of a culvert structure (see section e-III), that existed prior to construction	Yes
STORM_CULVERT_EXISTING_TEXT	Text	Label for the STORM_CULVERT_EXISTING features (see section e-III)	No
STORM_CULVERT_CHART	n/a	Describes the required STORM_CULVERT parameters (e-III)	n/a
STORM_DROPINLET	Insert	CCWA standard named block representing a stormwater drop inlet. (see section e-IV)	Yes
STORM_DROPINLET_TEXT	Text	Text describing STORM_DROPINLET layer (i.e. Invert Elevation)	No
STORM_DROPINLET_EXISTING	Insert	CCWA standard named block representing a stormwater drop inlet (see section e-IV) that existed prior to construction	Yes
STORM_DROPINLET_EXISTING_TEXT	Text	Text describing STORM_DROPINLET_EXISTING layer	No
STORM_FLUME	Line	The centerline of a Flume structure drawn in the direction of flow (see section V)	Yes
STORM_FLUME_TEXT	Text	Text associated with STORM_FLUME layer: material (lining), slope (see section e-VI)	No
STORM_FLUME_EXISTING	Line	The centerline of a Flume structure that existed prior to construction. Must be drawn in the direction of flow (see section V)	Yes
STORM_FLUME_EXISTING_TEXT	Text	Text associated with STORM_FLUME_EXISTING layer (see section e-VI)	No
STORM_JUNCTION_BOX	Insert	Block representing the location of a Stormwater Junction Box	Yes
STORM_JUNCTION_BOX_TEXT	Text	Text associated with STORM_JUNCTION_BOX layer that must at least show: Rim Elevation, Invert Elevation, and Junction Box material.	No
STORM_JUNCTION_BOX_EXISTING	Insert	A block representing the location of a Storm Junction Box that existed prior to construction	Yes
STORM_JUNCTION_BOX_EXISTING_TEXT	Text	Text associated with STORM_JUNCTION_BOX_EXISTING layer that must at least show: Rim Elevation, Invert Elevation, and Junction Box material.	No
STORM_LINE	Line	Stormwater line (pipe line or driveway pipe) built as a part of the Subdivision/Project (see section e-VII)	Yes
STORM_LINE_TEXT	Text	Text associated with STORM_LINE layer (i.e. slope, diameter, material)	No
STORM_LINE_EXISTING	Line	Stormwater line that existed prior to construction (pipe line or driveway pipe) drawn in the direction of flow (see section e-VII)	Yes
STORM_LINE_EXISTING_TEXT	Text	Text associated with STORM_LINE_EXISTING layer (i.e. slope, diameter, material)	No

STORM_OPEN_CHANNEL	Line	The centerline of an Open Channel structure drawn in the direction of flow (see section e-V)	Yes
STORM_OPEN_CHANNEL_TEXT	Text	Text associated with STORM_OPEN_CHANNEL layer: material (lining), slope (see section e-VI)	No
STORM_OPEN_CHANNEL_EXISTING	Line	The centerline of an Open Channel structure that existed prior to construction. Must be drawn in the direction of flow (see section e-V)	Yes
STORM_OPEN_CHANNEL_EXISTING_TEXT	Text	Text associated with STORM_OPEN_CHANNEL_EXISTING layer (see section e-VI)	No
STORM_LINE_END	Insert	The structure at the Line End or a node representing the bare end of pipe drawn using a CCWA standard named block (see section e-VIII)	Yes
STORM_LINE_END_TEXT	Text	Text associated with STORM_LINE_END layer (i.e. slope, diameter, material)	No
STORM_LINE_END_EXISTING	Insert	The structure at the Line End or a node representing the bare end of pipe that existed prior to construction, drawn using a CCWA standard named block (see section e-VIII)	Yes
STORM_LINE_END_EXISTING_TEXT	Text	Text associated with STORM_LINE_END_EXISTING layer	No
UTILITY_EASEMENT	Poly	Utility line easements	Yes
UTILITY_EASEMENT_TEXT	Text	Text Associated with Utility Easements	No
WATER_CAP	Insert	Cap at the end of water line.	Yes
WATER_CAP_TEXT	Text	Text associated with WATER_CAP_TEXT	No
WATER_EXISTING	Line	Water lines present before the subdivision/project was built	Yes
WATER_EXISTING_TEXT	Text	Text associated with WATER_EXISTING	No
WATER_LINE	Line	Water lines built as part of the subdivision/project.	Yes
WATER_LINE_TEXT	Text	Text associated with WATER_LINE	No
WATER_METER	Insert	Customer water meters	Yes
WATER_METER_TEXT	Text	Text associated with WATER_METER	No
WATER_REDUCER	Insert	Water line reducer	Yes
WATER_REDUCER_TEXT	Text	Text associated with WATER_REDUCER	No
WATER_SERVICE	Line	Water service lines	Yes
WATER_SERVICE_TEXT	Text	Text associated with WATER_SERVICE	No
WATER_VALVE_EXISTING	Insert	Existing water valves	Yes
WATER_VALVE_EXISTING_TEXT	Text	Text associated with WATER_VALVE_EXISTING	No
WATER_VALVE	Insert	Water valves	Yes
WATER_VALVE_TEXT	Text	Text associated with WATER_VALVE	No
WATER_VAULT	Insert	Large meter or fire connection vault	Yes
WATER_VAULT_TEXT	Text	Text associated with WATER_VAULT	No

- b) All Polygon type features must be completely closed. Lines may need to be duplicated on more than one layer.
 - I) Subdivision/project parcels must be closed figures on their layer (not closed with the subdivision/project boundary).
 - II) Road edge-of-pavement and road right-of-way must be drawn as closed polygons.

- III) Where a polygon feature extends beyond the edge of the plan, the property boundary (repeated on the polygon feature's layer) will be used to close the polygon.
 - IV) All edges on polygon features must be snapped together at the vertices. Gaps in polygon boundaries will not be accepted.
- c) Sewer Features
- I) Sewer Lines and Sewer Taps need to be digitized with proper directionality: lines must be drawn from the uphill node to the downhill node or flipped after the lines have been digitized.
 - II) All tangents between sewer manholes need to be drawn with a single line. Lines must not continue for more than one tangent.
 - III) All tangents must be snapped at endpoints intersecting at the exact center of the manhole. No gaps should exist between tangents.
 - IV) Manholes need to be symbolized consistently with an insert centered and snapped on the tangent endpoints.
 - V) Sewer tap locations must be snapped to the sewer tangent and accurately placed. Placement shall be based on the televising reports. CCWA will verify tap placement against the televising report. The as-built engineer is responsible for obtaining the televising report.
- d) Water Features
- I) Water lines must be digitized with all straight-line pipes consisting of only two end points. Straight-line pipes will begin and end at the following features (nodes): hydrants, valves, meters, pumps, tees, crosses, and valves. Polylines should be used wherever a water line contains elbows or bends (i.e., when the line does make a straight run from node to node).
 - II) Curves may be digitized with enough vertices to capture the curve geometry, but they must be single, continuous lines. Curves or arcs may also be used to designate curved pipe.
 - III) Hydrants must be shown in their true, surveyed location, and must be connected to the water main via a valved fire hydrant line.
 - IV) All water lines must be continuous, with pipe endpoints snapped to each other at endpoints (nodes).
 - V) End-of-line caps must be drawn to differentiate end-of-lines from lines that extend beyond the extent of the drawing. Caps should be drawn for lines that are to be permanently capped when the project is complete, not for lines that are temporarily capped pending inspection.
- e) Stormwater Features
- I) The entire BMP must be represented on the Storm_BMP layer using a polygon. The following are the examples of BMPs: Enhanced Swale, Stormwater Pond, Stormwater Wetland, Sand Filter, Bioretention Cell, Infiltration Trench, Filter Strip, Gravity Oil-Grit Separator, Proprietary Structural Control, Underground Detention, Porous Concrete, Modular Porous Paver System. Please consult with the CCWA water resources engineer for a list of currently accepted BMPs.
 - II) A BMP_ID is going to be assigned to each STORM_BMP feature by the CCWA engineer during the plan review process. The contractor must clearly mark every BMP feature with the assigned BMP_ID in the STORM_BMP_TEXT layer of the asbuilt.

- III) In the STORM_CULVERT and STORM_CULVERT_EXISTING layers, the structures must be drawn as polygons to show their length, width, location, and orientation. All the corners of the culvert extents must be surveyed. All culverts must be labeled in the corresponding STORM_CULVERT_TEXT or STORM_CULVERT_EXISTING_TEXT layer with the number matching the culvert chart shown on the asbuilt. The storm culvert chart shall be put in the STORM_CULVERT_CHART layer. For Culvert Chart contents see the Stormwater Development Guidelines (Section 6, page 48).
- IV) In the STORM_DROPINLET and STORM_DROPINLET_EXISTING layers, the structures shall be drawn with different inserts (blocks) according to the type of the Drop Inlet: Single Wing Catch Basin, Double Wing Catch Basin, Square Catch Basin, Rectangular Catch Basin, Grate Cover Inlet, Catch Basin with Grate, Curb Inlet, Circular Weir Inlet, Rectangular Weir Inlet. The contractor must only use the blocks provided by CCWA for these features.
- V) In the STORM_OPEN_CHANNEL, STORM_OPEN_CHANNEL-EXISTING, STORM_FLUME and STORM_FLUME_EXISTING layers, the feature shall be represented by a line reflecting the centerline of the structure and must be drawn in the direction of flow. The lines shall be broken at any point where the slope percent changes. All endpoints (including the points of slope changes) shall be surveyed.
- VI) STORM_OPEN_CHANNEL_TEXT, STORM_OPEN_CHANNEL_EXISTING_TEXT, STORM_FLUME_TEXT and STORM_FLUME_EXISTING TEXT layers shall contain a label indicating the percent slope and a type of material (lining) of the corresponding open channel or flume.
- VII) In the STORM_LINE or STORM_LINE_EXISTING layers, the features must be drawn in the direction of flow. This feature must be digitized with all straight-line pipes consisting of only two end points. Straight-line pipes will begin and/or end at the following features: STORM_LINE_END, STORM_JUNCTION_BOX, STORM_DROP_INLET.
- VIII) In the STORM_LINE_END and STORM_LINE_END_EXISTING layers, the structures must be drawn with different inserts (blocks) according to the type: Straight Headwall, U-type Headwall, Tapered Headwall, L-Type Headwall, Flared-End Section, Straight Wingwall, Angled Wingwall, Bare End and BMP Outlet. STORM_LINE_END and STORM_LINE_END_EXISTING features must be snapped to the ends of the STORM_LINE or STORM_LINE_EXISTING or the centers of STORM_CULVERT or STORM_CULVERT_EXISTING openings. The contractor must only use the blocks provided by CCWA for these features (see section 4) Symbolization).

4) Symbolization

- a) Symbols must be standardized according to examples provided in the CCWA template file. The following “point” features must be symbolized using standard CCWA CAD symbols and drawn as inserts:
 - I) Vault (□)
 - II) Valve (⊗)
 - III) Hydrant (⊗)

- IV) Manhole (○)
- V) Meter (⊕)
- VI) End of Line/Cap (|)
- VII) Reducer (▷)
- VIII) Junction Box (⊞)

b) All blocks used in the STORM layers must be drawn as inserts. The blocks must be standard and symbolized using only CCWA CAD blocks provided on the CCWA website <http://www.ccwa.us/customer.service/developer.information.aspx>

- I) Single Wing Catch Basin (⊞)
- II) Double Wing Catch Basin (⊞)
- III) Square Catch Basin (⊞)
- IV) Rectangular Catch Basin (⊞)
- V) Grate Cover Inlet (⊞)
- VI) Catch Basin with Grate (⊞)
- VII) Curb Inlet (⊞)
- VIII) Circular Weir Inlet (⊞)
- IX) Rectangular Weir Inlet (⊞)
- X) Straight Headwall (⊞)
- XI) U-type Headwall (⊞)
- XII) Tapered Headwall (⊞)
- XIII) L-type Headwall (⊞)
- XIV) Flared-End Section (⊞)
- XV) Straight Wingwall (⊞)
- XVI) Angled Wingwall (⊞)
- XVII) Bare End (⊞)
- XVIII) BMP Outlet (⊞)

5) Annotations

- a) Any non-standard water and sewer lines must be annotated as such. Line diameter, material, ownership, etc. that does not conform to standard practice should be noted in the corresponding annotation layer. For example, standard subdivision sewer lines are 8" in diameter. Any other diameter must be annotated on the SEWER_LINE_TEXT layer.
- b) All addresses and lot numbers must be number data type (that is no text or symbols: #, -, ft, _, ", ', etc.). If the lot does not have a number, this layer should be blank.
- c) All required text must be single line text. Project (Development) name shall be on one line.
- d) All annotation for polyline (polygon) features must be bounded by the polyline it annotates. For example, the project name must be within the project boundary, and not extend beyond it.

6) File naming and revisions

- a) File names should correspond exactly to the subdivision or project name and should be consistent from one version to the next. The file name should contain the drawing revision date (in YYMMDD format) as part of the name. There should be no blank spaces in the name, only underscores. An example file name for the May 5, 2000 revision for the third phase of the Apple Valley subdivision is: "Apple_Valley_3_000513". If a development name changes from that of indicated in the originally approved plans, the original name shall also be provided with the submittal of the as-built.
- b) File revision dates should only be updated by the contractor/developer and not by CCWA or Clayton County.

7) Deliverable Format

- a) All files will be delivered on single disk media in AutoCAD (release 14 or higher), DXF or DWG format (for projects created in Microstation). CDs, 3½" floppies, and Zip disks are all acceptable media. Files should not be spanned over more than one disk.
- b) All deliverables will be labeled with the file name, company name, contact name, and phone number. A transmission letter restating this information along with a statement requesting as-built review will also accompany the disk.