



City of Columbus  
Department of Public Utilities  
Division of Water

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**Design Guidelines  
For  
Water Distribution System  
Capital Improvement Projects**

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## **Preface**

The following document shall serve as a guideline for water main design for Capital Improvement Projects within the City of Columbus. It was prepared to assist engineering consultants in the design of water main distribution improvements. These guidelines are not all inclusive and do not replace good engineering judgment. Any deviation from these guidelines shall be approved by the Division of Water Engineer. All technical details shall remain the responsibility of the Engineer preparing the plans.

All of the following guidelines are currently under review by the City of Columbus Division of Water. The Division reserves the right to modify any or all of these guidelines during design of any Capital Improvement Project.

## Water Main Design

- Establish a centerline of the proposed water main. Centerline shall be shown with accurate station marks at 50-ft intervals and labels at 100-ft intervals. Water main stationing shall run from south to north and west to east. Provide unique stationing for non-continuous runs of water main. All text shall read from left to right and all stationing shall increase from left to right on the page. The north arrow shall be up or to the right.
- Maintain consistent parallel distance from right-of-way. Minimize use of bends & deflections.
- Show the full width of right-of-way on the plan view, including a distance of 25 feet outside of the right-of-way. Dimension the centerline of water main from right-of-way line on each plan sheet and at all horizontal alignment changes. The information should be labeled a minimum of once per sheet. Label both the plan and the profile with the proposed water main size.
- Design of water mains shall be a minimum of 7.5-ft away from right-of-way. The edge of trench (D+2 ft) should be a minimum of 3-ft away from the curb or gutter. (D+4 ft for water mains greater than or equal to 36-inches in diameter)
- A minimum of 20-ft clear distance from all building structures is strongly preferred. Any variance must be approved by the Division of Water.
- A minimum of 5-ft shall be maintained between fittings on the water main.
- When water mains parallel curves that are too small to use standard deflections, then the Engineer should use a limited number of bends to obtain a satisfactory alignment.
- When a water main is parallel to a curve, provide curve data and callout the beginning and ending locations of the proposed deflection.
- Place valves, bends, tees, etc. at whole number stations.
- Layout should provide the ability to easily field locate mains, bends, tees, deflections, etc.
- Layout - The designer shall consider the following items when determining the layout at each end of the project and at the connections:
  - Age
  - Break History
  - Type of Road – Arterial vs. Local
  - Future Replacement
  - Future Development / Construction
  - Residential vs. Business Users
  - Location of Existing Mains & Valves
  - Size of Existing Mains
  - Other Utility Impacts
  - Misc. Factors

If a future extension or replacement is anticipated through these factors, the water main design should extend through the intersection with a valve placed on the right-of-way line. The main should extend 20-ft past valve, and bend back into the existing water main.

- Use a cross connection in areas where a proposed main crosses an existing main that is not being abandoned.
- For side street connections or stub-outs for future expansion, a minimum pipe size of 8-inch diameter is required, unless the trunk main is smaller than 8-inches in diameter. If the side street pipe is smaller than 8-inches, a reducer is required after the first horizontal 45° bend for the branch connection.

- Minimize the impact of construction on curb ramps wherever possible.
- The Engineer shall consult with the City, County and/or State Offices to inquire about any existing or future roadway projects that may affect the location or gradient of the proposed water mains. Due regard shall be given to the location of water mains so that the lines will be protected from damage by future construction or land use based upon the information provided by the authorities.
- The Engineer is responsible for locating utilities from record drawings, field survey, and/or other detectable methods.
- Proposed water mains should be shown a minimum of four feet (4-ft) below existing or proposed grades for streets with curb. When installing a new water main where an existing main is to be abandoned, generally maintain a minimum 4.5 feet of cover for the proposed main. The grade (existing or proposed) which provides the greatest amount of cover at the time of construction shall govern. For unimproved streets (i.e. no curb or gutter), generally maintain a minimum of 6-ft of cover, unless otherwise directed by the Division of Water. For unimproved streets, the cover may vary due to certain circumstances.
- All mains must have 10-ft horizontal and 18-in vertical separation from sanitary and storm sewer piping (outside diameter to outside diameter). Maintain 3-ft horizontal and 12-in vertical separation from all other utilities unless otherwise required by the applicable utility company.
- When lowering is required to avoid utilities, the layout should conform to L-7401 (Typical Water Main Lowering) with bends placed at whole number stations.
- Proposed water main grade breaks shall be kept to a minimum. Proposed water mains can be deeper than the minimum depth in order to minimize grade breaks. In planning the gradient of the proposed water mains, the Engineer shall confer with the Division of Water to verify that the proposed grades are acceptable.
- Design water mains to minimize locations where air can be trapped. Strategically space hydrants to use for air release. If still unsuccessful, use air release valves for 12-in mains and larger. Air release valves are not required for mains less than 12-inches in diameter unless requested by the Division of Water.
- Surface elevations, elevations of centerline of proposed water main, and cut-to-invert shall be given every fifty feet (50-ft).
- Elevation of centerline of proposed water main shall also be given at all horizontal bends and deflections, vertical grade breaks, and all other fittings.
- Provide steel casing pipe at railroad crossings, if directed by Division of Water. Casing pipes should extend 5-ft past the railroad right-of-way line where the crossing is perpendicular. At locations where the crossing is skewed, the casing pipe should extend 10-ft past the railroad right-of-way.
- Provide steel casing pipe at locations where water mains are required to be constructed below sewers 54-inches or greater in diameter. The casing pipe should extend 5-ft past the O.D. of the sewer.
- No grade breaks, bends (horizontal or vertical), tees or other fittings should be within 5' of the end of casing pipe.
- When abandoning mains, it is preferred to replace tees with sleeves in lieu of cut and plugs. The ultimate decision should be based on the factors listed under "Layout" within this Water Main Design section.
- For transmission mains, if fire hydrants are not required due to parallel mains, add a fire hydrant at the low point of the main for flushing purposes.

- Where desired backfill differs from the specifications, the type and limits of the backfill shall be clearly denoted in the profile.
- Any water service connection that provides water to a hospital, nursing home, or any other facility where 24-hour services is critical, shall have a main line valve placed at each side of the tap to avoid service disruption.
- A list of critical users that will be affected by a shut shall be provided on the plans. DOW will assist with developing this list of users.
- For proposed 20-inch or larger water mains, show the required restrained joint lengths and flange isolation kit locations. Access ports (Tees with blind flanges) shall be shown on the main, as directed by the Division of Water Engineer.
- For proposed 20-inch or larger water mains, coordinate with Division of Water on any desired Pitometer Tap locations.
- A geotechnical investigation shall be performed at locations where proposed 20-inch or larger water mains are being installed. Coordinate with the Division of Water.
- When water main is crossing a river or a creek, the design shall follow the "Ten State Standards" in regards to surface water crossings. This includes items such as providing a minimum of 5-feet of cover, using flexible and restrained joints, installing valves at both ends, and provisions for leak detection capability.

## Valves

- In general, locate valves where right-of-way lines intersect with proposed water mains (i.e. street intersections).
- When possible and practical, valves shall be located at a minimum depth and on a 0% grade (2% max).
- Do NOT call out where heavy duty valve boxes or ferrule boxes are required.
- Use butterfly valves for all mains 20-in and greater. Note: The operator shall be set on either the south or east side of the proposed water main. The engineer shall ensure that adequate room is available to install and operate the valve at this location and in this configuration.
- Main line valves should be placed a maximum of 1,000-ft apart for distribution mains and 2,000-ft apart for transmission mains (at the nearest intersections), unless otherwise directed by the Division of Water Engineer.
- Additional valves may be required in areas where a high volume of customers could be affected by future maintenance and construction. The Engineer should determine the optimum location of the valves so as to reduce the disturbance to customers when future construction occurs.
- Distinguish between field located valves and valves located per records.
- The Engineer shall consider the factors under "Layout" within the Water Main Design section to determine whether to use a tapping sleeve & valve or to cut-in a tee at connections to existing mains.
- When connecting to a 16-in water main or larger, a second valve is required and should be shown where the right-of-way line intersects the main.
- Restoration of valve boxes to be removed as part of a water main abandonment should include a 5-ft x 5-ft area of applicable surface restoration.

## Fire Hydrants

- Confirm hydrants and required distances from roads can be met per L-6637 and L-6409.
- The spacing between fire hydrants is 400 ft maximum for single family residential areas and 300 ft maximum for commercial, industrial, and multi-family residential areas.
- In areas where fire hydrants are within Township jurisdiction, new fire hydrants shall replace the existing hydrants in the same location as the existing hydrants. The number of new hydrants shall match the number of existing hydrants.
- When feasible, fire hydrants shall be located at high points on the water main profile to allow for air release.
- For transmission mains, if fire hydrants are not required due to parallel mains, add a fire hydrant at the low point of the main for flushing purposes.
- Fire hydrant locations shall minimize the impact to existing parking and pull off areas.
- The location of fire hydrants should minimize the impact on existing trees. They should be placed a minimum of 6-ft away from driveway returns (minimum of 10-ft away from commercial driveway returns). The fire hydrants should not be placed on sharp curves in streets.
- Fire hydrant valves
  - One (1) valve should always be located at the anchoring tee on a Type “A” hydrant.
  - If fire hydrant lead is greater than 15-ft, a second valve is required. This valve should be located within 2-ft of the fire hydrant.
- The designer should confirm that all fire hydrants have a maximum bury depth of 7-ft. In locations where bury depths exceed 7-ft, standard detail L-7601 should be used first to obtain the required depths. If hydrant lead is between 5-ft and 7-ft deep, fire hydrant extensions may be used. In no case may fire hydrant extensions be more than 2-ft high.
- If a fire hydrant lead crosses existing utilities, determine if vertical bends are required. If vertical bends are required, a profile of the hydrant lead shall be provided from the main to the hydrant.
- If fire hydrant extensions are required, the quantity of fire hydrant extensions should be calculated by the Engineer for each length based on the design depth of the fire hydrant at each specific location. The quantity of each extension with the applicable size should be provided in the “Table of Estimated Quantities”.
- A quantity for hydrants (EA), 6-in water main (LF), and valves (EA) should be included in the summary of quantities.
- For proposed fire hydrants and leads, restoration quantities should include pavement restoration (D+2 ft), curb restoration (D+2 ft), and sidewalk (5-ft x 5-ft) if applicable. (D+4 ft for water mains greater than or equal to 36-inches in diameter)
- For fire hydrants abandoned, restoration shall include sidewalk (5-ft x 5-ft).
- Type “A” fire hydrant settings are preferred over Type “B” fire hydrant settings.
- The following are examples of acceptable call-outs:
  - Fire Hydrant, Type “A” Setting
  - Fire Hydrant, Type “A” Setting with second 6” valve
- In the profile, an anchoring tee should be called out for Type “A” fire hydrants. A tee should be called out for Type “B” fire hydrants.



## Water Taps

- The Engineer is responsible to field locate and survey all existing curb boxes. For water taps not found in the field, the Division of Water will provide the water tap records to aid in locating the water taps. The records shall be used to field locate and survey the remaining taps. All existing water taps should be shown on the plan per the field survey.
- Existing water taps which are found in the field should be labeled 'WT'. If a tap cannot be field located but there is an active tap, the tap should be located on the plan by record. This tap shall be labeled as 'WTNF'. The nomenclature should be indicated in the legend.
- Existing water tap material shall be noted for each tap. The nomenclature should be indicated in the legend. (i.e. WT (C,LE,G,P) C=Copper, LE=Lead, G=Galvanized, P=Plastic)
- Provide only one curb box per property, unless existing conditions require more than one. If properties are vacant (i.e. no structure on the site), do not provide a proposed tap.
- All curb boxes and water service line transfer locations shall be located within the right-of-way.
- Taps should be located as to minimize the impact on existing trees.
- In general, curb box locations shall be shown per the Division of Water Standard Drawing L-9901. However, situations may arise where curb box locations should be revised to facilitate construction and minimize disturbance/restoration limits. When feasible, the proposed water tap shall connect to the existing water service line at a point beyond the existing curb stop. Curb boxes shall be located at a consistent distance from the right-of-way. The Consultant shall utilize good engineering judgment when determining proposed curb box locations. If there is inadequate room for a curb box to be located outside the limits of pavement and still remain inside the right-of-way, then the curb box may be located within the pavement but a standard Columbus ferrule box must be used in that location. It is preferred to keep new curb boxes outside of driveways.
- When given the choice between installing a new curb box in the sidewalk or within a fenced area, it is preferred, from a maintenance standpoint, to install the curb box in the sidewalk. This is only when the existing conditions leave no other options.
- In plan view, show the location of proposed water taps. Label as either long (L) or short (S) taps. Each property should only include the address number and the size of the water service line to be transferred. Do not include any additional property information (i.e. property owners and PIN numbers).
- In profile view, only show proposed water taps that are 3-inches or larger in diameter.
- In the "Table of Estimated Quantities", separate quantities should be provided for both "\_\_ Inch Water Service Line Transfer, Short)" and "\_\_ Inch Water Service Line Transfer, Long". All water service line transfers should only be quantified in "Each" units unless otherwise requested by the Division.
- For corner lots whose water taps are located on the side street, label existing taps as "Water tap from street name".
- In general, the depth of the proposed water taps should be 42" with curb and 72" without curb. The consultant should verify that water taps are not in conflict with other utilities.

## Restoration

- Trench width shall be D+2 ft for water mains less than 36-inches in diameter and D+4 ft for water mains 36-inches and larger in diameter.
- Designer shall provide a separate restoration plan (roadway, driveways, sidewalk) within the documents. Restoration areas shall NOT be shown on the water main plan and profile sheets. Display all existing pavement markings. Utilize a scale of 1-inch = 40 feet for these sheets.
- Restoration standards – The plan must clearly delineate final restoration on the “Restoration Plan” sheets. The restoration limits are as follows:
  - Asphalt - 1 lane should be resurfaced for water main trenches within the limits of pavement that are 100-ft long or greater. The width of pavement restoration should be from the edge of pavement (including the edge line) or face of curb/gutter to the width of the lane. At locations where the water main crosses the centerline, the milling and resurfacing should end where the edge of trench (D+2 ft) intersects the centerline. (D+4 ft for water mains greater than or equal to 36-inches in diameter).  
For areas < 100-ft, the restoration should be shown as D+2 ft with Heat Welding (separate quantity). (D+4 ft for water mains greater than or equal to 36-inches in diameter)
  - Gravel - Replace D+2 ft only (D+4 ft for water mains greater than or equal to 36-inches in diameter)
  - Concrete - Replace to nearest joint
  - Brick - Replace D+2 ft only. (D+4 ft for water mains greater than or equal to 36-inches in diameter) For brick with asphalt overlay, the Engineer should contact the Division of Design and Construction for a recommendation on restoration
- Driveway restoration standards
  - Asphalt - D+2 ft to edge of pavement (D+4 ft for water mains greater than or equal to 36-inches in diameter)
  - Gravel - D+2 ft only (D+4 ft for water mains greater than or equal to 36-inches in diameter)
  - Concrete - D+2 ft to Nearest joint (TBD by consultant) (D+4 ft for water mains greater than or equal to 36-inches in diameter)
- Valve Box Removal – 5-ft x 5-ft area
- Fire Hydrant Removal – 5-ft x 5-ft area
- Cut and Plug of Existing Water main – 5 ft. x 5 ft. area
- Short Water Tap Trench Installation
  - (D+2)-ft for asphalt, gravel, and brick/pavers (pavement and driveway repair)
  - (D+2)-ft for grass areas
  - Nearest joint (TBD by Engineer) for concrete pavement and driveway repair
  - Assume 5-ft x 5-ft panel area for sidewalk repair. Payment to be made at actual panel dimensions.
- Existing Curb Box Removal (When location is different than tie-in location)
  - 5-ft x 5-ft for Asphalt, Gravel, Brick/Pavers
  - Nearest joint (TBD by Engineer) for concrete pavement and driveway repair

- Assume 5-ft x 5-ft panel area for sidewalk repair. Payment to be made at actual panel dimensions.
  - 5-ft x 5-ft area for grass areas
- Long Water Tap Bore Pits – 5-ft X 5-ft area
- No walk restoration will be paid for water taps constructed in the curb lawn, unless the existing curb box is located within the sidewalk. The division will not pay for curb replacement when constructing water taps.
- The designer should clearly delineate and quantify the location of bus pads & speed humps to be replaced.
- The designer shall adhere to the *“City of Columbus, Ohio, ADA Rules and Regulations”* in the design of the water main improvements.
- The designer should clearly delineate and quantify the location of curb ramps to be replaced.
- If water main trench is within 2 feet of the curb/edge of pavement and will require additional pavement replacement outside of the trench limits, the designer shall call this out on the plan sheet and clearly identify the limits of where this will occur.

## **Maintenance of Traffic**

- Proper maintenance of traffic plans, including notes, phasing, detours, closures, signage, existing and temporary striping, and hour restrictions are to be developed to the satisfaction of the Division of Design and Construction.
- Evaluation and consultation with the Division of Design and Construction and/or County shall be conducted by the Engineer prior to the Department/Utility Review Stage.
- Maintenance of traffic plan shall include temporary traffic control drawings, notes, and phasing for all portions of the project. The plan shall also show the existing right-of-way limits, curb lines (edge of pavement), curb cuts, sidewalks, all above ground utilities (poles, lights, fire hydrants, etc.), traffic signals, traffic signs (ground mounted and overhead), pavement markings, raised pavement markers (RPM's), etc. All existing items shall be shown by using dashed and lighter weight lines.
- Plans shall extend a minimum of 250-ft past the work limits on the main line street and a minimum of 100-ft on side streets. The proposed or temporary traffic control shall be shown as bold lines along with the existing traffic control.
- All temporary traffic control signs, drums, flashing arrow panels (FAP's), portable changeable message signs (PCMS's), etc., shall be shown at appropriate locations (stations, sign legends, sign codes, sign sizes shall be included), lane widths, pavement words dimensioned, temporary signal poles, signal heads, and overhead sign locations.
- If total closure (short term or long term) of the roadway and/or intersection is warranted, a complete detour plan shall be included. Detour shall consist of a schematic of the street system, surrounding and approaching detour route and project area. Sign, barricades, FAP's, PCMS's, etc. locations shall be identified by a ballooning-numbering system.

## Quantities

- The “Estimate of Quantities” table should have a column summarizing each sheet and a column which totals all the sheets.
- All quantities in the table are to be rounded up to the nearest whole number.
- The contingency quantity to be assumed for “Fittings, Increase or Decrease” should be assumed as 1 fitting per 1,000 linear feet of water main as per the chart below (Minimum of 4 fittings per each size of water main). Quantity should then be converted to pounds.

Size of Water Main (Inches)	Weight Per Fitting (Pounds)
4	25
6	40
8	60
12	115
16	205
20	350
24	475

- The contingency quantity to be assumed for “Concrete Blocking Class C, Increase or Decrease” should be 0.40 cubic feet of blocking per 1 pound of contingency fittings. Quantity should then be converted to cubic yards.
- The contingency quantity of “Increase or Decrease in Excavation and Backfill” should be estimated as follows: (D+2 ft) width x (1-ft x number of fittings) depth x (20-ft) length. Quantity should then be converted to cubic yards.
- The quantity for Item 407 tack coat shall be calculated by assuming 0.15 gallons applied per square yard of pavement resurfacing area
- In grass areas, the limits of the seeding and mulching area should be 10-ft on each side of the main, but should not exceed the right-of-way or edge of pavement.
- A contingency quantity of “Curb Box” should be provided. One (1) curb box contingency quantity should be provided for each service line transferred.
- Limiting lines for the measurement of temporary pavement shall be the diameter of the water main plus two feet (D+2 ft). Temporary pavement for private driveways should include 8-in of crushed stone or gravel per Item 815. All other areas in pavement shall be per Item 615. A quantity of Item 615 and Item 815 should be provided in the “Estimate of Quantities” and should be itemized separately.
- A separate quantity of permanent pavement restoration should be provided for each different type of material being replaced in the plans. See Item 259 for types.
- A lump sum quantity should be included to locate northing and easting coordinates for all tees, valves, fittings, hydrants and other water main structures. The quantity should be listed under Item Special – Survey Coordinates and a specification should be provided in the General Notes section to specify the applicable requirements. All survey coordinates shall be referenced to the applicable County Engineer’s Monuments, and shall be based on the North American Datum of 1983 (NAD 83) with the (NSRS2007) adjustment, with further reference made to the Ohio State Plane South

Coordinate System, South Zone, with elevations based on NAVD 88 datum. All coordinates (Northing, Easting, Elevation) shall be referenced to the nearest hundredth (N xxxxxx.xx, E xxxxxx.xx, Elev. xxx.xx). All survey coordinates shall be accurate to within 1.0 foot horizontal and a tenth of a foot (0.10) or less vertical.

- When a water main is proposed to be constructed under an existing bus pad, the pad must be completely removed and replaced. The thickness of pavement replacement will be determined by the Division of Design and Construction.
- Loop detectors that are expected to be damaged during construction should be called out for removal and replacement. An “each” quantity of Item 632 – Detector Loop shall be provided.
- Notes should provide for temporary traffic signals as required by the Division of Design and Construction. Separate quantities should be indicated on the plan as applicable.

## Survey

- Prior to any field survey, the Engineer shall acquire all available records (i.e. plans, tap cards, etc.) pertaining to the project.
- The Engineer must obtain a permit from the City of Columbus for their surveyors to work in the right-of-way. There is no charge for this permit; however the Division of Design and Construction may require police officers for traffic control. The cost associated with providing police officers, where required, shall be at the Engineer's expense.
- A survey shall be conducted to locate topographic features, such as, but not limited to: pavement, curbs, fence, culvert pipes, water valves, water service boxes, gas service boxes, manholes, vaults, utility poles, trees, and landscaping amenities within the project limits. The field survey should include the area inside the right-of-way and 10' outside the right-of-way limits. The survey should extend 100' past the project limits as well as at each side street. For those areas where the water main is planned to be outside the right-of-way, the area of survey should be agreed upon with the DOW Engineer prior to the start of survey.
- Buildings shall be indicated per the current Franklin County Auditor's GIS and verified in the field. Vacant lots shall be indicated as such on the plans.
- Establishment of location of all existing water mains and structures shall be collected by means of field survey and Division of Water records. The Engineer shall make diligent efforts to locate all valves, fire hydrants, curb boxes, etc. If a conflict between the field survey and records exist, the field survey shall govern. If necessary, the Engineer should also use underground pipe detectors and exploratory excavation if authorized by the Division of Water.
- All work should be designed on the Ohio State Plane Coordinate System (South).
- Benchmarks shall be referenced to the applicable County Engineer's Monuments. Elevations shall be based on the NAVD 88 datum and specified on the plans. The plans should show northing and easting information on all benchmarks & control.
- The Engineer shall set two permanent survey control monuments (iron pins) at the beginning and end of each section of water main. The survey control monuments shall be visible between each other. If visibility is restricted between the two, then additional monuments shall be installed. The plans should show northing and easting information on all survey control monuments.
- The establishment of existing right-of-way lines is a critical task of the consultant. The use of the Franklin County Auditor's GIS should only be utilized as a tool in depicting the existing right-of-way. It is the responsibility of the consultant to research State, County, and local right-of-way records and property records to establish the current existing right-of-way for the project limits.
- Provide a chart which includes the applicable water main feature; water main station information and blank boxes for northing, easting and centerline elevation record information. The chart should provide the information for all bends, tees, deflections, valves, crosses, water taps, air release valves, fire hydrants, etc. from both the plan and profile views. Water taps shall include the size and address listed in the description, and the coordinate shall be for the curb box itself. Fire hydrants shall include separate items for the tee, watch valve(s), and the hydrant itself. Refer to Appendix B for an example of the required coordinate table.
- Show and label corporate boundaries.
- Show the address ONLY for each property adjacent and/or affected by project. Do not show the parcel ID number or resident names.

- Contact all utility companies, both public and privately owned, for the purpose of obtaining the location and extent of utility lines (both existing and proposed), and take such information into account in the survey, design, and preparation of the detailed plans. Such information should be shown on the plans.
- All infrastructure data requests regarding city owned utilities shall be requested through a general email address or phone number. The email address is [DPU\\_GIS\\_MAPPING@COLUMBUS.GOV](mailto:DPU_GIS_MAPPING@COLUMBUS.GOV) and the phone number is 614-645-5825. All requests shall include the type of data being requested (Water, Sewer, Electric, or All) and a summarized purpose of the data request.
- Fire hydrants that are designated to be removed with the project are NOT permitted to be used as Benchmarks.



## Constructability

- The consultant shall review the plans for constructability.
- Ensure that tees, bends, crosses and valves are not located below existing utilities.
- Verify blocking has sufficient space to be constructed at the applicable locations.
- When calling for tees to be rotated, a callout shall be provided at the tee noting that the concrete blocking shall be installed as per Standard Drawing L-6310 or L-6311 (depending on the direction of rotation), as the forces acting on the tee are now the same as a vertical bend.
- Verify the locations of fire hydrants relative to driveways, slopes of ground, guard rails, etc.
- Review clearances – overhead, horizontal and vertical. Determine if any notes need to be added for those areas where the work will be hindered during construction or maintenance.
- In no case shall a customer be without service for more than two times during any project. The Engineer should prepare a suggested sequencing of construction (not to be included on the plans). The sequence should be provided to the Division to minimize the number of shutdowns to customers. The length of time to construct the improvements shall also be considered in the design of the improvements. In any case, the length of time to construct the improvements shall be held to a minimum. If any customer is expected to be out of water longer than 8 hours, the design engineer shall include in the plans a method of providing temporary water service to the affected customer.
- Verify that the distance from the water main to the curb is adequate and can be installed without disturbing the curb and/or curb and gutter.
- Verify that trench limits will, when possible, remain within one travel lane. Avoid crossing lane lines or the centerline to minimize the limits for pavement resurfacing.
- Verify that valves are not located under existing or proposed curbs. Review the distance of the valves from the curb.
- Verify that valves are located on flat (0-2%) water main slopes.
- Review construction methods during design to reduce the impact on trees. The impact on existing trees shall be held to a minimum. Place fire hydrants away from trees.
- Ensure that the size of the proposed tapping sleeve does not exceed the size of the existing water main. If possible, avoid the use of size on size tapping sleeves (i.e. 6" x 6") unless no other option is available.

## Utilities

- When available, reference all existing water mains with the plan by which they were installed, material type, year of installation, and dimension from right-of way. The information should be labeled on the pipe and a minimum of one location per sheet.
- Show all existing and proposed utilities (public and private) in the plan view and profile. Label the size and type of all utilities. The plan should include record plan information for all sewers. The type of material should be called out if the existing sewer line is brick material type. The information should be labeled on the pipe and a minimum of one location per sheet.
- For those sewers that are found to be brick material, the consultant should evaluate the constructability methods to ensure work will not affect the integrity of the sewer. The consultant should note the brick sewers and proposed methods of construction in the preliminary design report so adequate time is available to address the issue prior to construction.
- Do not call out existing utility crossings to be exposed on the plan or profile view.
- In the plan view, all existing utilities greater than 24-in should be shown with two lines to delineate the actual size. In the profile, all utility crossings should be shown as actual size.
- Show existing water taps that are 3-inches or larger in the profile view. All existing water taps shall be shown in the plan view.
- The symbol to be used for a gas valve in the plan view should be a circle with a single diagonal line through the center. Gas valves should be labeled with the letters "GV" above the symbol.
- Do not show gas services in the plan view or profile view. Gas service boxes may be shown in the plan view.
- The Engineer should ensure that construction of the water main and all other applicable construction is an adequate distance away from utility poles and other above ground structures.
- Sanitary sewer records should be researched and a copy obtained at the Division of Sewerage and Drainage permit office. These records should be reviewed to ensure that the sanitary sewer services are not in conflict with the proposed water main.
- Existing utilities that are critical to the horizontal and vertical alignment should be located via non-destructive vacuum utility investigation (i.e. pothole) or other method approved by the DOW. The locations should be identified by the consultant and the DOW Engineer shall review and approve the locations prior to the start of this work.

## Miscellaneous

- Construction drawings shall be prepared on 12-in x 36-in sheets. Plan and Profile sheets shall be shown at 1-in = 30-ft horizontal and 1-in = 5-ft vertical, unless otherwise approved by the Division.
- Plans shall be prepared according to the current version of the Division of Water's "Plan Presentation Standards for Capital Improvement Projects".
- The plans shall contain, but are not limited to, the following items:
  - Title Sheet
  - General Notes & Quantities
  - Miscellaneous Details
  - Survey Coordinate Chart & layout information
  - Plan and Profile sheets
  - Restoration Plan (Roadway, Driveways, Sidewalk) that includes existing pavement markings
  - Maintenance of Traffic
- Place match lines at 25-ft station intervals.
- Do NOT call out minimum cover required for the waterline in the profile view.
- A current set of notes to be placed on the plans will be provided during back check review. The general notes supplied by the City should be shown in the same order as provided. Additional notes required to construct the improvements should be included at the end of the notes. Any "Item Special" quantity shall include a note on the plans to explain the requirements of that item.
- It is the Engineer's responsibility to show or reference all details required to construct the project improvements.
- It is the Engineer's responsibility to show or reference any additional details on the plans beyond the standard drawings indicated above.
- Only the proposed water main should be shown as bold. Water mains that are proposed as part of same project, but with detailed design information shown on different sheet(s), should be labeled "Proposed \_\_" W.M. See sheet \_\_\_\_".
- Label surface features (i.e. EP, C&G, Ex. Curb, etc.) on each sheet and a minimum of one location per sheet.
- Any void spaces on a construction drawing shall be kept to the left side of the drawing adjacent to the binding edge.
- The Engineer is responsible for securing all signatures on the plans outside of the City of Columbus.
- The Engineer should submit an updated cost estimate with each submittal.

## Record Plan Preparation

### General

- Record drawings should be prepared using AutoCAD, construction drawing images in .TIF Group 4 format, field book notes, and progress plan data furnished by the City. All record plan drawings shall be created in accordance with “CAD Standards for Creation and Submittal of Digital Drawing”. All revisions to the plans shall also be made in accordance with the Submittal manual.
- All survey information to be used for record plan purposes shall be provided by construction inspectors, DOW’s notes and records, and contractor supplied survey coordinates.
- Incorporate the As-Built Plan stationing into the original design stationing. Use station equations where the alignment differs.
- Record Drawing information shall first be incorporated from the As-Built Plans and Construction Inspection Reports. Coordinates, with the exception of curb box locations, shall only be used as a check against this information. Do not develop record plans solely from coordinates.
- Curb box locations shall be shown on the plan using the survey coordinates. If the location appears unreasonable, refer to the dimensions on the water service reports, as well as any inspection reports or field sketches, to determine the actual location.
- Provide a full, complete set of record drawings with all sheets included, with the exception of the maintenance of traffic (MOT) sheets. Remove all sheets pertaining to maintenance of traffic and re-number the plan set accordingly.
- Provide a CD with a complete set of drawing images in .TIF Group 4 format, a final AutoCAD base drawing of the plans in .DWG format, and a final complete coordinate table in Microsoft Excel format. Include all of the files on one (1) CD.
- Add a bold box with the following information. This box should be shown on each sheet.

<p style="text-align: center;"><b>RECORD PLAN</b> <b>Prepared by (Add Company Name) from field inspection notes.</b> <b>Dates of Construction: From (month/year) to (month/year)</b> <b>Contractor: (Add Contractor)</b> <b>Inspector: (Add Inspection Company/Group)</b> <b>Material Types: Size – Material (List each size and material type)</b></p>
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- On the location maps, if limits of project changed, revise old limits and add the stations of the final limits.
- Add the as-built state plane coordinate information and centerline of pipe elevations on the Survey Coordinate Chart under the “As-built” heading. Include any additional bends, tees, fittings, water taps, etc. that were constructed as part of the project. Survey coordinates shall be provided by the City and/or contractor.
- Additional sheets may be added to clarify the as-built condition. The sheet should be labeled accordingly (i.e. Sheet 7A, 7B, etc.)

## Plan View Information

- Refer to the Division of Water “RECORD PLAN TEMPLATE” Sheet for general reference as to how the plan and profiles shall be shown.
- Revise the plan and add revised station and location information on bends, tees, fittings, etc. that have changed.
  - In areas where the as-built location differs by more than 18-inches from the design, the pipes should be redrawn to show actual location.
  - In areas where the as-built location differs by 18-inches or less from the design, then the design stations and locations shall remain as shown.
- For those areas that have changed, add adequate dimensions from the right of way.
- Cross out those fire hydrants that were abandoned.
- Revise the “To be Abandoned/Removed” callout/label for the existing items that were abandoned/removed to now say “Abandoned/Removed” to reflect the current condition.
- Add the station and location where the contractor cut and plugged water mains to be abandoned. Include the elevation at this location.
- For work that was non-performed, remove any original design information and associated notes/callouts.
- Add updated water tap and water service line transfer information to the plans. Show the location and size of all water taps.
- Add station, location, size, and material type for existing utilities affected by construction.
  - Label information to be modified and then add the updated information.
  - Add any new information discovered during construction.
  - In areas where the as-built location differs by more than 18-inches from the elevation listed on the plan, the utility should be redrawn to show the actual location.
  - For those areas where the location differs by 18-inches or less from the location listed on the plans, then the original location shall remain as shown.
- Cross out those utilities that are found to be abandoned during construction. Add contact information for the utility that verified its abandonment, if available.
- Verify the additional information that was added to the profile is shown in the plan view.
- Where requested by the Engineer, show enlarged details of hydrant leads labeling bends, fittings, and utility crossings. Show dimensions where necessary.
- Remove all pavement/sidewalk/driveway replacement hatching and callouts/labels relating to proposed pavement/sidewalk/driveway work.
- Do not show chlorination taps or blowoffs
- Do not show installation dates on the plans

## Profile View Information

- Remove all slope information
- Show locations and elevations where rock was encountered during excavation, if available.
- Where applicable, show restrained joint lengths.
- All water main elevations provided shall be to the centerline of the pipe
- Revise all elevation information on grade breaks, bends, tees, fittings, etc.
  - In those areas where as-built elevations differ by more than 12-inches from design

elevations, the pipes should be redrawn to show actual elevation, and the profile elevation shall be updated.

- For those areas where as-built elevations differ by 12-inches or less from the design elevations, then the design elevations shall be revised.
- Add station and elevation information for existing utilities affected by construction.
  - Add any new information discovered during construction.
  - In those areas where the elevation differs by more than 12-inches from the elevation listed on the plan, the utility should be redrawn to show the actual elevation, and the profile elevation shall be updated.
  - For those areas where the elevation differs by 12-inches or less from the elevation listed on the plans, then the original elevation should be revised.
- For the information on the datum line (station, surface, centerline, cut) at the bottom of the sheet, provide the following revisions:
  - Remove all “cut” elevations. This information is not necessary for the record plans.
  - Update all “centerline of pipe” elevations or cross out elevations if they have not been verified.
- Verify the additional information that was added to the plan view is shown in the profile.
- Do not show chlorination taps or blowoffs
- Do not show the installation dates for the water main in the profiles

## Submittals and Schedule

The Engineer is responsible to meet the amount of time proposed for design as stipulated in their proposal regardless of the length of time taken for review by the Division of Water and/or other City Departments/Utilities. The submittal stages and their requirements are shown below. An updated schedule should be provided with each submittal. Any revisions to the schedule should be noted. Digital submittals shall be provided at each submission in accordance with the current version of the "CAD Standards for Creation and Submittal of Digital Drawings." Multiple submittals will be required if plans are not to the satisfaction of the City.

### 1. Preliminary Water Main Design Summary/Preliminary Alignment Stage

- Preliminary Water Main Design Summary. Template will be supplied by DOW. Refer to Request for Proposal (RFP) for requirements.
- 2 full size sets of plan sheets containing the following:
  - All existing survey information
  - All existing and proposed utilities and any substantial impacts to the design
  - Water main alignments, including any recommended alternative alignments and/or construction methods
  - Vertical alignment information at critical locations and/or major utility crossings. Full profiles are not required at this stage
  - Fire hydrant, water tap, and branch/cross connection locations are not required at this stage
  - Easement recommendations, if applicable
- Standard general notes will be provided at this stage
- Updated schedule & reasons for discrepancies (if any)

### 2. Final Water Main Design Summary/Revised Alignment Stage - 30% Submittal

- Final Water Main Design Summary with all comments addressed
- 2 full size sets of plans with revised preliminary alignments with all comments addressed
- CD containing combined PDF of plans, as required and directed by the DOW Engineer, for Electronic Bluebeam Reviews.
- Fire hydrant, water tap, and branch/cross connection locations are not required at this stage
- CD containing TIFF images and CAD basemap following DPU CAD Digital Submission Standards. The CAD basemap should be in AutoCAD (.DWG or .DWX) Release 14 format or any more recent version. TIFF images should be Group 4 at a minimum resolution of 300 dpi. **Please note that the only layers required for submission on the CAD basemap are the existing and proposed water main infrastructure layers. Please contact the Division of Water Project Manager with any questions.**
- Updated schedule & reasons for discrepancies (if any)
- Cost estimate of construction

### 3. Departmental/Utility Review Stage - 75% Submittal

- Submit 1 Full Size Set of Plans to DOW for review prior to submitting for Departmental/Utility review. Address any comments from DOW prior to submitting for Departmental/Utility review

- Consultant shall provide written responses (directly on plan sheets is acceptable) acknowledging either compliance with the comment or a reason for exception/noncompliance.
- All information is expected to be complete and accurate on the plans. The survey coordinate table is not required to be completed for this submittal.
- Hard copy of Division of Water Project Manager's previous comments from 30% stage
- CD containing combined PDF of plans, as required and directed by the DOW Engineer, for Electronic Bluebeam Reviews.
- This submittal should attempt to have no comments from the DOW
- Provide the construction sequencing for the project, if applicable and requested by DOW
- Includes review of quantities
- Updated cost estimate
- Updated schedule & reasons for discrepancies (if any)
- List of utility companies and respective contacts that are to receive 75% documents
- Copy of transmittals submitted to utility companies
- This step may be repeated until all comments are completed by the DOW

**4. Departmental/Utility Backcheck Review Stage -90% Submittal**

- Back check of Division of Water's review comments
- Consultant shall provide written responses (directly on plan sheets is acceptable) acknowledging either compliance with the comment or a reason for exception/noncompliance.
- Hard copy of Division of Water Project Manager's previous comments from 75% stage
- CD containing combined PDF of plans, as required and directed by the DOW Engineer, for Electronic Bluebeam Reviews.
- Updated cost estimate
- Updated schedule & reasons for discrepancies (if any)
- Plan should be a full biddable set (i.e. attempt to be 100% complete)
- This submittal should attempt to have no Departmental or Utility comments
- List of utility companies and respective contacts that are to receive 90% documents
- Copy of transmittals sent to utility companies
- This step may be repeated until all comments are completed

**5. Departmental/Utility Backcheck Review Stage -100% Submittal**

- Back check of Division of Water's review comments
- Consultant shall provide written responses (directly on plan sheets is acceptable) acknowledging either compliance with the comment or a reason for exception/noncompliance.
- Hard copy of Division of Water Project Manager's previous comments from 90% stage
- CD containing combined PDF of plans, as required and directed by the DOW Engineer, for Electronic Bluebeam Reviews.
- Updated cost estimate
- Updated schedule & reasons for discrepancies (if any)
- Plan should be a full biddable set (i.e. attempt to be 100% complete)
- This submittal should attempt to have no Departmental or Utility comments
- This step may be repeated until all comments are completed



**6. Signature Stage – Final Plans**

- Back check of Departmental / Utility review comments
- CD containing combined PDF of plans, as required and directed by the DOW Engineer, for Electronic Bluebeam Reviews.
- Final check of quantities
- Final cost estimate
- Plan should be a complete with no comments
- Plans are routed for signature at this time
- Hard copy of Division of Water Project Manager’s previous comments from 100% stage
- CD containing TIFF images and CAD basemap following DPU CAD Digital Submission Standards. The CAD basemap should be in AutoCAD (.DWG or .DWX) Release 14 format or any more recent version. TIFF images should be Group 4 at a minimum resolution of 300 dpi. **Please note that the only layers required for submission on the CAD basemap are the existing and proposed water main infrastructure layers. Please contact the Division of Water Project Manager with any questions.**

**7. Construction Stage**

- Submission of prints as required for inspection and contractors.

**8. Record Plan Stage**

- Back check of Inspector’s comments
- Final check of plans
- Digital submission (upon addressing all comments and plans are considered approved)
- This step may be repeated until all comments are completed

### Appendix A – Survey Coordinates Table Example

SHEET	DESCRIPTION	STREET	STATION	OFFSET	AS-BUILT NORTHING	AS-BUILT EASTING	C/L ELEV.
8	8-INCH TEE	MAIN STREET	10+00	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
8	8-INCH VALVE	MAIN STREET	10+50	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
8	8-INCH 45° HORZ. BEND	MAIN STREET	11+00	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
8	8-INCH 45° VERT. BEND	MAIN STREET	11+50	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
9	8-INCH HORZ. DEFLECTION	MAIN STREET	20+00	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
9	8-INCH X 6-INCH ANCHOR TEE	MAIN STREET	20+25	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
9	6-INCH VALVE	MAIN STREET	20+25	2'	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
9	FIRE HYDRANT	MAIN STREET	20+25	8'	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
10	12-INCH X 8-INCH TEE	MAIN STREET	30+00	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
11	3/4-INCH CURB BOX (500 MAIN ST.)	MAIN STREET	-	-	XXXXXXXX.XX	XXXXXXXX.XX	N/A
12	12-INCH X 8-INCH TAPPING SLEEVE	MAIN STREET	-	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX
12	8-INCH VALVE	MAIN STREET	-	-	XXXXXXXX.XX	XXXXXXXX.XX	XXX.XX