CCSUD WATER DISTRIBUTION DESIGN CRITERIA

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PART 1 - GENERAL

The following information is intended to assist engineers and the public with the requirements to receive water service and connect to the Crystal Clear Special Utility District (CCSUD/District) water system, including the design and construction of water facilities within the service area. Information herein is to provide minimum requirements only. Additional requirements may be imposed by the CCSUD if warranted.

1.1 WATER POINT OF DELIVERY

A. The point where water leaves the line or apparatus owned by CCSUD and enters the line or apparatus owned by the customer. Typical points of delivery include domestic and irrigation water meters, fire line up to the containment backflow device, and hydrant meters.

B. The point of delivery for CCSUD's owned and maintained water service lateral is the line side from the water main to the water meter. The customer is responsible for the line from the meter to the private plumbing which includes, but may not always be the case, a customer yard cut-off.

C. The customer is responsible for the construction, operation, and maintenance of the customer's installation beyond the point of delivery and has sole control and supervision over customer's installation, including compliance with plumbing codes.

1.2 STANDARD PRODUCTS LIST PROCEDURES

A. Introduction:

1. Through previous investigation, testing and usage by CCSUD, certain types, brands and models of some products and materials have established a satisfactory record for certain services. These products have been tabulated by manufacturer's names on the Approved Equipment List (AEL). The AEL should not be interpreted as being pre-approved lists of products necessarily meeting the requirements for a given construction project and products included in the lists shall not be substituted unless they are approved by CCSUD and/or the District's engineer. Contractors electing to use products from the AEL shall submit a list of products for approvals for their use.

2. Products in use by CCSUD are subject to ongoing consideration and evaluation by staff. When changes, deletions, or additions become necessary and are approved, the product list will be revised and included in updates to the AEL.

3. Questions concerning the AEL may be addressed to CCSUD and/or the District's engineer.

PART 2 - DESIGN REQUIREMENTS FOR WATER DISTRIBUTION

2.1 INTRODUCTION

A. These guidelines are intended to establish the minimum basic design requirements for water distribution infrastructure within CCSUD's service area but do not address major facilities such as water plants, booster stations and storage tanks. Sound engineering judgment shall be utilized to determine if these minimum requirements are suitable for each engineering design.

B. All projects are required to be built in accordance with CCSUD's technical specifications and details (design standards). Any variation from CCSUD's design standards is subject to the district's approval.

C. All plans for such facilities shall be prepared by or under the supervision of a Professional Engineer, licensed in the State of Texas. It will be the responsibility of the design engineer to ensure that the plans are in compliance with the latest versions of all applicable federal, state, and local ordinances, rules, and regulations. These include, but are not limited to, the following:

1. Rules and Regulations for Public Water System – Texas Commission on Environmental Quality (TCEQ)
2. CCSUD Technical Specifications and Standard Details
3. CCSUD Water Design Criteria
4. CCSUD Electrical Design Criteria
5. CCSUD Wastewater Design Criteria

CCSUD listed items can be found on CCSUD's website.

2.2 WATER SYSTEMS

A. Size and Capacity Determination

1. Calculations
   a. Hazen Williams Friction Coefficient C = 100, higher C coefficient may be used for new mains only upon approval by CCSUD with sufficient documentation to show effects of long-term use.
   b. Average day demand = 300 gal/connection/day
   c. 1 standard residential connection = 1 LUE
   d. An LUE calculator is available for determining LUE counts and water usage for non-standard service. The LUE calculator can be found on CCSUD's website.
2. Peak Hour Demand Requirements
   a. The maximum allowable velocity shall not exceed 5 feet per second (fps).
   b. The minimum pressure at any point in the affected pressure zone must not be less than 35 psi.

3. Emergency Demand (Fire Flow) Requirements

   a. The maximum allowable velocity shall not exceed 10 fps.

   b. Fire flow requirements will be by the applicable city and extra-territorial jurisdiction fire codes and fire marshal requirements.

   c. The minimum residual pressure at any point in the affected pressure zone at peak day plus fire flow must not be less than 20 psi.

4. Sizing of Water Mains - Computer modeling is preferred for sizing water mains. However, for water mains less than 12 inches in diameter other engineering calculation methods may be accepted. The largest size, as determined by comparing the service area's peak hour demand and peak day plus fire flow demand, shall be used.

B. Water Mains

1. Water mains shall be a minimum of 8 inches. However, the minimum main size will be governed by various factors which include fire protection requirements, high density land usage, and the designer's consideration of general system gridding, future transmission mains, neighboring developments, and area configuration.

2. Water main velocities under typical system operations (non-fire flow events) shall be under 5 fps. During fire flow events, velocities shall not exceed 10 fps.

3. Water mains installed under existing or proposed roadways must be positioned perpendicular to the roadway. Materials for water mains under roadways shall be ductile iron or PVC encased with steel pipe. The ductile iron pipe or steel casing shall extend a minimum of 5 feet past each end of road pavement or from the end of the sidewalk for residential roads. For county or TxDOT crossings, the water main must be cased and adhere to the Roadway Casing Detail.

4. Water mains installed across a creek bed or downstream from a culvert shall be ductile iron pipe with a concrete cap over the top of the pipe per CCSUD standards.

5. Water mains should be located where maintenance can be accomplished with the least interference with traffic, structures, and other utilities.

6. Spacing requirements for CCSUD water mains must adhere to the following:

   a. Water and wastewater mains must comply with TCEQ rules [30 TAC §217.53 (d) (3) and 30 TAC §290.44 (E)] or have a variance approved by TCEQ before submittal to CCSUD.

   b. Water mains crossing under a storm pipe or concrete channel crossing shall be Certa-Lok C900/RJIB (DR 18) and encased in steel casing. The casing shall extend 5 feet from the edge of the channel on both sides horizontally. The diameter size of the steel casing shall be based on the District's Casing Detail. A minimum

spacing of 2.5 feet shall be provided from the bottom of the storm pipe or concrete channel to the top of water main casing.

c. Water mains crossing under a proposed manmade earthen channel must be installed with a minimum spacing of 2.5 feet from the bottom of the channel to the top of water main. Casing is not required under earthen channels.

C. TxDOT Roadway Crossing

1. The design engineer of the roadway crossing shall submit a TxDOT permit using RULIS and coordinate with CCSUD to process the TxDOT permit.

2. The design engineer shall make sure the roadway crossing design meets all TxDOT and CCSUD requirements and design standards. Refer to CCSUD's Casing Detail.

3. The design engineer must coordinate with CCSUD to acquire easements and temporary workspace on the opposite side of the main extension for bore pit location and tie-in to the system's distribution water main. Costs associated with easement acquisition and temporary workspace will be the responsibility of the developer.

D. Joint Restraints

1. No water line shall be deflected either vertically or horizontally, more than that recommended by the manufacturer of the pipe or coupling without the appropriate use of bends or offsets. Fittings shall be required where more than two pipe lengths are deflected.

2. Restraint Length Calculations

a. Restraint lengths shall be calculated per the EBBA calculator found at https://ebaa.com/calculator/. Show restraint lengths of fittings in one of the following formats:

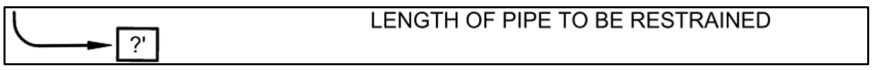
b. A minimum safety factor of 1.5 shall be used when calculating restrained water line lengths.

c. A test pressure of 250 psi shall be used when calculating the water line restrained line lengths.

d. The USDA NRCS Web Soil Survey website found at Getting Started With Web Soil Survey | Natural Resources Conservation Service (usda.gov) is recommended to be used to determine the soil type. Select proposed area, and follow the tabs below:

3. Joint Restraint Labels on Construction Drawings

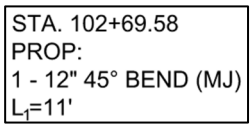
a. Call out restraint length and direction at each fitting, valve and dead end main.



b. Restraint length and direction arrow shall be included on each plan sheet at each required restraint location (i.e., tee, bend, valve, dead end). An example of a horizontal restraint callout is provided in the images below.

c. If the location of multiple fittings near one another, warrants the pipe to be fully restrained, include a symbol and note that states “ENTIRE LENGTH OF PIPE SHALL BE RESTRAINED” as shown in the image below.

d. Restraint lengths shall be included on each profile sheet at each required restraint location (i.e., upper bend, lower bend) by including a callout written as L = ?’. An example of a vertical restraint callout is provided in the image below.



E. Gate Valves

1. There shall be a valve on each fire hydrant service lateral restrained to the main.

2. Valves shall be located at the following design scenarios:

   a. Add one (1) in-line gate valve on each side of tee to the fire hydrant. These valves are in addition to the 6-inch gate valve to be installed on the fire hydrant service lateral.

   b. At the intersection of two or more mains, wherever there is a tee, a gate valve is required to be installed on each side of the tee.

   c. At the intersection of two or more mains, wherever there is a cross, a gate valve is required to be installed on each side of the cross.

   d. On both sides of a bore under roadways, railroads, or large creeks/rivers.

3. If an existing main is tapped to make a service connection, only one valve at the tap is required.

4. Gate valves cannot be located within paved roadways, sidewalks, driveways, or curbs.

5. No concrete or pavement may be placed above the gate valves.

6. At dead ends, gate valves shall be located one (1) pipe length (10-ft. minimum) from the end points of the main. The design engineer shall provide (and show on drawings) complete restraint for all such valves, pipe extensions, and end caps.

7. Valves having “push on” joints are not permitted for fire hydrant leads and laterals.

F. Air Release Valves

1. On water mains 12 inches in diameter and larger, combination air valves will be placed at all high points, long ascents, decreased upslope, both sides of a roadway or large creek crossing; and, at horizontal runs placed at intervals every ¼ to ½ mile. Air/vacuum and vacuum release valves may be approved on a case-by-case basis.

2. Air release valves can be sized per “Manual of Water Supply Practices, M51: Air-Release, Air/Vacuum & Combination Air Valve by AWWA, latest edition” or other applicable methods.

G. Pressure Reducing Valves

1. Pressure reducing valves shall be installed on water mains at CCSUD’s discretion and per the Pressure Reducing Valve Piping Plan and Concrete Enclosure Details.

H. System Flow Meters in Subdivisions

1. At CCSUD’s discretion, a flow meter shall be installed on distribution mains at the entry point to new subdivisions.

2. The flow meter and vault shall be furnished and installed per the Ultrasonic Flow Meter Detail.

I. Fire Hydrants

1. Hydrants shall be spaced and installed as required by the local city having jurisdiction and/or the current adopted fire code.

2. For those areas outside of a local city jurisdiction, hydrants shall be spaced and installed as required by the local fire marshal or a minimum of every 1,000 feet, whichever is more stringent.

3. Only the applicable fire hydrant detail shall be included in the plan set.

   a. If the property is located within the City of New Braunfels ETJ, only the CCSUD Fire Hydrant Detail (New Braunfels) shall be used.

   b. If the property is located within the San Marcos ETJ, only the CCSUD Fire Hydrant Detail (San Marcos) shall be used.

   c. If the property is not located within any of the surrounding ETJs, the standard CCSUD Fire Hydrant detail shall be used.

4. Fire Hydrants located at the end of dead-end mains and cul-de-sacs will be required in place of a permanent blow-off. The following configurations are acceptable:

   a. Provide (1) 8” 90-degree bend (MJ); (1) 8”X6” reducer (MJ); and then the fire hydrant assembly.

   b. Provide (1) 8”x6” reducer (MJ); (1) 6” 90-degree bend (MJ); and then the fire hydrant assembly.

   c. The Fire Hydrant Assembly Detail per CCSUD details includes the hydrant, 6” gate valve, 6” valve box, anchor tee, and the DI pipe.

5. The District does not allow private fire hydrants. All fire hydrants, regardless of location (private property or public right-of-way) are the property of the District and shall require an easement if installed on private property. The entire fire hydrant assembly shall have restrained joints.

J. Fire Lines

1. Fire lines shall have a gate valve on the line at the connection to the

water main.

2. All fire lines shall have an approved backflow device. Additional backflow prevention requirements can be found on CCSUD's website. Refer to the District's Cross-Connection Control and Backflow Prevention Program.

K. Looping and Dead-End Mains

1. Looped systems are required for service reliability. Where feasible, all pipelines other than those in cul-de-sacs, shall be connected to other distribution pipelines to allow all services to receive water from two directions.

2. If an installed dead end is temporary and will later be extended to another subdivision phase or unit, then a temporary flush valve can be installed instead.

3. Water mains in cul-de-sacs can be 2-inches in diameter around the cul-de-sac circle.

4. Temporary dead end mains may be allowed under the following conditions:

   a. The extension is shown on the overall development plans.

   b. A temporary 2-inch flush valve is installed per CCSUD details.

   c. Fire flow and daily demand can be met with the dead end main.

L. Services

1. Water services shall be installed according to CCSUD's technical specifications and standard water details.

2. Service connections are only allowed on distribution mains. Service connections are not allowed on transmission mains without approval by CCSUD.

3. Service taps cannot be located under roadway pavement or sidewalks.

4. All short services shall have their own individual saddle taps.

5. In short service connections, the house side of the meter box shall be located 2 feet behind the proposed distribution main inside private property between the water main and the house or building that is being serviced by that meter.

6. In long service connections, the house side of the meter box shall be 2 feet inside the easement in private property.

7. Meters shall be horizontally placed 5 feet from the lot line at the front of the lot.

8. Field coordination for meter placement on a case-by-case scenario will need to be discussed with CCSUD and the District's engineer prior to any construction.

M. Connection to Existing Water Mains

1. Use cut-in tees when water service interruption is permissible *(preferred option).*

2. Use tapping sleeves when water service cannot be interrupted.

    a. Size on size tapping sleeves is NOT PERMITTED without approval by CCSUD or engineer. For example, tapping a 6-inch sleeve into a 6-inch diameter water main would not be permitted.

PART 3 - CONSTRUCTION PLAN INFORMATION AND SUBMITTAL REQUIREMENTS

3.1 GENERAL

A. Utility Coordination:

1. The design engineer must request a utility coordination meeting with CCSUD and the District's engineer to discuss the proposed placement of the CCSUD water mains, meters, and appurtenances in relation to the right-of-way and other utilities.

B. Easements:

1. Water mains shall be placed in a CCSUD exclusive easement or public utility easement (PUE). CCSUD will not accept water mains located within public right-of-way.

2. If the proposed CCSUD water mains are placed in an exclusive easement, the easement shall be within private property and 20-foot in width.

3. If the proposed CCSUD water mains are placed in a shared easement, CCSUD prefers that wet utilities are placed closer to the edge of right-of-way and dry utilities are placed in the back of the easement.

4. Meters shall also be placed in easements and be located per CCSUD's Service Connection Details.

5. Once easements have been verified and acquired, the District will accept construction drawings from the design engineer. Submit construction drawings to CCSUD and the District's engineer for review and verification of conformance to CCSUD's technical specifications and standard water details.

3.2 WATER SYSTEM PLANS

A. Plans submitted to CCSUD must show approved easements and/or permits on highway and/or railroad crossings, including the volume and page number of recorded easement(s) and permit numbers if applicable. Show and label all existing, proposed, and temporary workspace easements on the plat and/or plan set.

B. All water plans will include the following items:

1. Engineer's dated signature and seal of a Professional Engineer licensed in the State of Texas on each plan sheet.

2. Engineering firm name and registered number (format F-xxxxx) on

each plan sheet.

3. Date of plans and revisions.
4. North arrow and scale must be shown. The standard horizontal scale for plan and profile sheets shall be 1” = 50’, 40’ or 20’ for the plan view. The vertical scale shall be 1” = 5’, 4’ or 2’. The same scale shall be used on all plan and profile sheets. For sheets other than plan and profile, horizontal scales of 1" = 50', 40' or 20' may be used as appropriate.
5. A general location map.
6. CCSUD water main notes, available on CCSUD’s website.
7. Size, pipe material and location of main with respect to the easements and rights-of-way.
8. Property lines and dimensions, legal description, lot and block numbers, rights-of-way dimensions, and curb and sidewalk locations and street names.
9. Location, size, and material of all existing water and wastewater mains, lines, and services. The direction of flow in the wastewater mains shall be indicated.
10. Location, size, and description of other utilities where they may conflict with water or wastewater mains or other service lines.
11. Curve data for roads, property lines, and water and wastewater lines.
12. Final plat recording or land status report.

C. Final plan approval may require additional authorizations, including, but not limited to the following:

1. Texas Department of Transportation permit (TxDOT)
2. Railroad permit (ex: UPRR)
3. Gas Company permit
4. Easement acquisition (Volume and Page listed on plans)
5. City approval
6. County approval
7. Texas Commission on Environmental Quality approval (TCEQ)

D. All plan view drawings shall include all applicable items listed in the General Requirements mentioned above plus the following items.

1. The location of all existing and proposed water services, water mains, valves and fire hydrants shall be identified.
2. Station numbers for mains shall be identified for beginning points, ending points, points of curvature, points of tangent, points of reverse cure, points of intersection, valves, fire hydrants, other appurtenances, grade breaks and at all proposed connections to existing or proposed water mains.
3. Station numbers shall be identified for the water mains where they cross any other utility.

4. Appurtenances shall be shown, and details of all required appurtenances shall be included in the plans.

5. Joint restraint lengths (when required) shall be shown in the plan view.

6. Culverts, bridges, and other drainage structures.

7. One-hundred-year flood plain limits shall be shown.

8. Include or provide table with designed living unit equivalents (LUEs) per phase/unit of the project.

E. A profile view shall be provided where water mains cross or intersect with roads, drainage structures, ditches, creek crossings, sewer, gas, electric, railroad or other utilities. It shall show all applicable items listed in the General Requirements plus the following items:

1. The existing ground profile and proposed street finish grade or subgrade.

2. Station numbers and elevations of all utility crossings.

PART 4 - CONSTRUCTION INSPECTION, ACCEPTANCE AND WARRANTY

4.1 CONSTRUCTION INSPECTION PROCEDURE

A. CCSUD will provide a “Start of Construction” checklist. The checklist items shall be submitted and coordinated with CCSUD personnel before starting construction.

B. All contractors working on the District’s distribution system shall meet or exceed the District’s insurance requirements. The contractor shall provide liability insurance coverage from an insurance company licensed to do business in Texas by an amount acceptable to the District, prior to the commencement of construction and must receive, in writing from the District, approval of said insurance company and coverage.

4.2 CCSUD FINAL ACCEPTANCE

A. The design engineer and contractor must contact CCSUD to schedule a final walkthrough. The following shall be provided to CCSUD for record keeping:

1. Punch list of remaining action items.

2. Final punch list of completed action items.

B. Once a final walkthrough has been completed, the developer or design engineer must submit the items per the “Project Close Out” checklist provided by CCSUD.

END OF SECTION