



**Manual for
General Procedures for
The Design of
Water and Sewer Lines
In the
City of Richardson, Texas**

**Public Services Department
Revised August 2008**

**MANUAL FOR GENERAL PROCEDURES
FOR THE DESIGN OF
WATER AND SEWER LINES**

City of Richardson, Texas

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To be used in compliance with;
Chapter 21 Subdivision and Development
of the Richardson Code

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I. **General**

- A. All materials, construction and workmanship will conform to the requirements of the City of Richardson.
- B. All water and sewer system design and construction will be done in accordance with:
1. The special requirements of the Director of Public Services.
 2. The Approved Plan, including: Standard Detail Drawings and Trench Safety Plans.
 3. This manual and its attachments.
 4. "Standard Specifications for Public Works Construction - North Central Texas", NCTCOG October 2004 and amendments thereto. (to be known as the 'Standard Specifications').
 5. The materials manufacturers' recommended guidelines.
- C. In the case of a conflict between items in Part B above, the priority of interpretation shall be in the same order as they are listed in Part B.

II. **Design**

A. **Water System Placement**

1. **Water Mains** shall always be located in a dedicated easement or public right-of-way or as approved by the Director of Public Services.
 - (a) In roadways, mains shall be located approximately one-third of the width of the street right-of-way, measured from the north or east right-of-way line.
 - (b) In utility easements, mains shall be located approximately one-third of the width of the easements' north or east edge and no less than five (5) feet from the edge.
 - (c) In a dedicated water main easement, the main should be placed in the center of the easement.
 - (d) In no case should a water main be placed in an easement less than 10 feet in width.
 - (e) Minimum cover over water mains shall be as follows:
 - 3.5 feet for 6-inch mains
 - 4.0 feet for 8-inch mains
 - 5.0 feet for 12-inch mains
 - As approved on the plans for 14-inch and larger mains
 - (f) Blow off lines will be required at all low points in the pipeline. Fire hydrants located at these points may be acceptable substitute; if approved on the plan.
 - (g) Air release valves (automatic type) will be required at all high points. An active metered service at these points will be acceptable substitute.

- (h) Cross-feed mains shall be installed to avoid dead-end mains and to provide proper system circulation. Cross-feed mains shall be sized 6-inch or larger in residential districts and 8-inch or larger in commercial districts. Cross-feed lines shall be placed a maximum of 2,000 feet apart or as approved by the Director of Public Services.
- (i) An 8-inch or larger main will be required to serve more than one fire hydrant.
- (j) Mains serving residential districts may have 6-inch mains; if only one fire hydrant is served and if less than 1,000 feet in length.
- (k) Mains in non-single family residential districts shall be 8-inch minimum.
- (l) All mains shall be constructed in accordance with the Master Distribution Plan.
- (m) Embedment will conform to the conditions approved on the plan and the standard detail sheet. Materials are covered in IV.A.1. see pg. 9. Trench backfill will conform to Item 504.2.2 of the Standard Specifications.

2. Valves

- (a) Generally are placed at street intersections at the radius return.
- (b) Main line valves shall be located no further than 1,000 feet apart in residential, duplex, and apartment districts and no further than 500 feet apart in commercial and industrial districts.
- (c) Valves will be required on all fire hydrant leads. If the lead exceeds 50 feet, additional valves may be required.
- (d) Valves shall be placed so that, preferably, two valves, but no more than three valves, will need to be operated in order to isolate a main line section and place no more than one fire hydrant out of service.
- (e) In the case of a dead-end main, a valve will be installed two pipe sections from the end of the line or as approved by the plan.

3. Fire Hydrants

- (a) Fire hydrants will always be placed in a dedicated easement or right-of-way.
- (b) Fire hydrants shall always be placed in an area protected from normal traffic flow.
- (c) Fire hydrants will always be located no more than five (5) feet nor less than two (2) feet from a street, fire lane, or parking lot, measured from the back of the curb, that is accessible by fire department equipment. Fire hydrants shall never be allowed in a sidewalk or walkway.
- (d) All fire hydrant locations must be approved by the Director of Public Services, on the plan.

- (e) Fire hydrants will be spaced along main lines so that every habitable structure is within a given radius of a fire hydrant. This radius will be:
- 500 feet for residential and duplex districts, with a maximum distance between hydrants of 500 feet.
 - 400 feet for apartment districts with a maximum distance between hydrants of 400 feet.
 - 300 feet for commercial and industrial districts with a maximum distance between hydrants of 300 feet.
- (f) Additional fire hydrants may be required, by the Director of Public Services, where free movement of emergency equipment is inhibited or prohibited because of the location of railroads, highways, structures and barriers (both natural and human made).
- (g) All fire hydrants will be served by a 6-inch feed line, minimum.
- (h) Fire hydrants along divided streets will only be used to calculate coverage for the side of the street for which they are located.

4. Water Services

- (a) Water services will be located 10 feet north or east of the front center for residential lots.
- (b) Owners will be responsible for specifying service sizes.
- (c) In all cases, services will be located in such a manner that the meter will be in an easement or right-of-way, protected from vehicle and pedestrian traffic (never in sidewalks, walkways, driveways, or paved surface).
- (d) Services will be labeled either as a domestic or irrigation service, on the water and sewer plan, for all commercial, apartment and industrial developments.
- (e) Standard meter sizes available from the City will be: 3/4 inch, and 1-inch for all types of use; 1 1/2 -inch, 2-inch, 4-inch, 6-inch, 8-inch, and 10-inch will normally be reserved for irrigation, commercial, and industrial use.
- (f) No water service will be allowed off a fire hydrant lead or fire line.
- (g) Irrigation service will be for the irrigation of outdoor plants and turf only. No other use of these connections shall be allowed.
- (h) Private (Non-City) Irrigation System backflow prevention assemblies will not be located inside of any City right-of-way or easement.

5. Fire Lines

- (a) Fire protection lines and systems must conform to the requirements of the applicable Fire and Building Codes. Additional requirements are shown in Appendix "A".

- (b) Fire lines shall be labeled as such on the water and sewer plan and shown in their exact location.
- (c) A gate valve will be required to be located at the edge of the right-of-way or easement, as shown on the plan.
- (d) All parts of the fire line between the main line connection and the outlet side of the valve shall be in an easement or the right-of-way and become part of the City water system.
- (e) All fire lines will be at least one pipe size diameter smaller than the main line that it connects to, unless otherwise approved by the Director of Public Services.

B. Sewer System Placement

1. Mains will always be located in public rights-of-way or easements. The City prefers mains to be located in alleys, when possible.
 - (a) When in a road or alley, mains shall be located in the center of the right-of-way. In divided street, mains should be located in the center of the south-most or west-most lane.
 - (b) When in an easement that is shared with other underground utilities, mains shall be located in an area selected by the owner's engineer and approved by the Director of Public Services.
 - (c) When in a dedicated sanitary sewer easement, mains shall be located in the center of the easement.
 - (d) In no case should a sewer main be placed in an easement less than ten (10) feet in width.
 - (e) Pipe embedment for sewer pipe will be as specified on the standard detail drawings or as approved on the plans. Materials are covered in IV.B.1 See page 10. Trench backfill shall conform to Item 504.2.2 of the Standard Specifications.
 - (f) Minimum depth of cover for all sewer mains will be 3.5 feet.
 - (g) Sizes for sanitary sewers shall be as required by the Director of Public Services with consideration being given to possible extensions for future development.
 - (h) Minimum grades will be sufficient to provide for the gravity flow of sewage at a velocity of not less than 2 feet per second.
 - (i) Maximum grades will be sufficient to provide for the gravity flow of sewage at a velocity of not more than 8 feet per second.
 - (j) All grades will be subject to review by the Director of Public Services prior to approval.
 - (k) Profiles of all sewers to be constructed shall be shown on the plans.

- (l) All elevations shall be shown to the nearest 0.01-foot (one hundredth of a foot).
 - (m) Manholes will be required at all grade breaks.
 - (n) No public sewer will be less than 6-inch diameter for residential districts or 8-inch for all other districts.
2. Manholes will be placed at all intersections, wyes, bends, and at service connections 6-inch and larger as required by the Director of Public Services.
- (a) Manholes will be placed at all three-way and four-way main line intersections.
 - (b) Manholes will be required at all main line bends.
 - (c) Manhole diameters will be determined by the size of the largest main served. Sizes will be:
 - 4.0-foot diameter for mains 6, 8, and 10-inch
 - 5.0-foot diameter for mains 12, 15, 18, 21, 24, and 27-inch
 - 6.0-foot diameter for mains 30-inch and larger
 - (d) Sealed manholes will be required in areas subject to flooding.
 - (e) On main lines sizes 12-inch and smaller, manholes will be spaced no more than 500 feet apart, except where the main line terminates with a cleanout. In that case, the cleanout will be no further than 500 feet from the connecting manhole.
 - (f) On main lines larger than 12-inch, manhole spacing will be determined by the Director of Public Services.
 - (g) A drop pipe shall be provided for a sewer entering a manhole more than 30 inches above the invert. All drops will be outside of the manhole.
3. Cleanouts on sewer mains may only be allowed at the upstream end of the main.
4. Service sizes and locations will be subject to approval by the Director of Public Services.
- (a) No sanitary sewer service shall be less than 4-inch diameter.
 - (b) Sewer service sizes shall be shown on the plan.
 - (c) In general, sewer service sizes are as follows:
 - 4-inch diameter for single-family and small office operations
 - 6-inch diameter or larger for multi-family, commercial, or industrial operations.
5. Lift Station, if required, shall be located in an area approved by the Director of Public Services. Lift stations will not be approved for installation unless no other means of sewage removal from the site can be found.

- (a) Lift stations will be sized to accommodate both current and future service demands.
- (b) The City may require special structures and screening to be provided with the lift station installation to properly blend the facility with the surrounding environment.

III. Installation

A. Water System Construction, Testing, and Acceptance

- 1. Installation shall conform to Item 506.3-506.4 of the Standard Specifications.
- 2. Hydrostatic testing will be performed by the contractor and will conform to Item 506.5 of the Standard Specifications.
- 3. Purging and Sterilization will be performed by the contractor and shall conform to item 506.7 of the Standard Specifications.
- 4. Sampling will be performed by City personnel.
- 5. Satisfactory sample results will be required before the water line will be accepted by the City.

B. Sewer System Construction, Testing, and Acceptance

- 1. Installation shall conform to Item 507 of the Standard Specifications.
- 2. Television inspection of newly constructed sewer mains shall be required for final acceptance. Inspections shall be performed by the contractor in accordance with Appendix B of this document and Item 507.5.2 of the Standard Specifications.
- 3. Pipe testing will be performed by the contractor and will conform to Item 507.5 of the Standard Specifications.

IV. Materials

A. Water System

1. Pipe

- (a) Water mains sizes from 6-inch up to 12-inch shall be, "class 50, or better, ductile iron", conforming to Item 501.7 or Polyvinyl Chloride (PVC) C-900, DR-14 Class 200 only, conforming to Item 501.14 of the Standard Specifications. PVC pipe will not be direct tapped, but saddle tapped only, using approved, double-strap water tapping saddles - brass only. Saddle torque shall not exceed 35 ft. lbs.
- (b) Water main sizes larger than 12-inch shall be, "reinforced concrete pressure pipe, steel cylinder type-pretensioned", conforming to Item 501.4.5 of the Standard Specification; or, as an alternate to the above, "class 50, or better, ductile iron", conforming with Item 501.7 of the Standard Specifications.

- (c) Water main fittings shall be ductile iron for ductile iron pipe and PVC pipe, conforming to Item 501.7.4 of the Standard Specifications; or for concrete pipe, fittings conforming to Item 501.4.2 of the Standard Specifications.

2. Valves

- (a) Main sizes 12-inch and smaller, approved gate valves shall be used.
- (b) Mains larger than 12-inch, approved horizontal gate valves shall be used, unless otherwise approved by the Director of Public Services.

3. Fire Hydrants

- (a) Only approved brands and models will be installed.

4. Services

- (a) All services 2-inch and smaller will be Type K, Class 1, annealed (soft) copper tubing.

*All fittings shall be approved brass-type fitting with compression fittings for copper tubing, 3/4" through 2" with the Buna-N beveled gasket and restraining device conforming to Item 502.5 of the Standard Specifications.

- (b) All services 4-inch and larger shall be ductile iron or PVC C-900, DR-14 Class 200, no exceptions are allowed.

- (c) Unions or couplings in service laterals under paving are prohibited.

5. Air Release Valves - Only approved brands and models will be installed.

B. Sewer System

1. Pipe

- (a) Sewer mains sizes 6-inch up to 15 inch shall be Polyvinyl Chloride (PVC) SDR 35 or ultra-rib (PVC) SDR 26 sewer pipe. Pipe shall conform to Item 501.17, or Item 501.22 of the Standard Specifications.

No other pipe will be used unless approved by the Director of Public Services.

- (b) Sewer mains larger than 15-inch will be constructed with pipe to be specified by the Director of Public Services.

2. Manholes- Two types of manholes will be allowed for installation in the sanitary sewer system. The two types are (1) Precast concrete reinforced sections and (2) Cast-In-Place concrete.

- (a) Both types will conform to Item 502.1 of the Standard Specifications.

- (b) Manholes that are located in an area pressure type subject to flooding will be conforming to Item 502.1.4.6 of the Standard Specifications.

3. Cleanouts will be installed in accordance with the Item 502.2 of the Standard Specifications and the Detail Specification.

4. Services will be constructed of PVC pipe conforming to Item 502.10.4 of the Standard Specifications.
 - (a) All services will terminate at the property line and be plugged for testing.
 - (b) Services will remain plugged until service tie-in is performed by the property owner's contractor.

5. Lift Station design and installation must be approved by the City.
 - (a) Complete construction drawings will be required to be included in the approved construction plan.
 - (b) The contractor will be required to submit two complete sets of "Operation and Maintenance" manuals to the City Inspector, prior to final acceptance.
 - (c) Written manufacturers warranties will be transmitted to the City Inspector prior to final acceptance.

APPENDIX A

General Requirements for Fire Lines In the City of Richardson

Requirements for fire lines and fire sprinkler systems are:

1. Plans must show exact location and name of occupant.
2. Closed systems only. (Fire lines shall be on separate lines from domestic water lines.)
3. Fire lines must be one size smaller than the serving lines.
4. Sprinkler systems and fire lines are to be installed by State Licensed Installers.
5. Gate valve must be installed at property line.
6. An approved Backflow Prevention assembly device must be installed below the Fire Department connection.
7. The Backflow Device must be tested by a certified Backflow Tester with results placed on City-provided form before acceptance.
8. A water flow alarm must be installed above the O, S, and Y valves.
9. A shut-off valve must be installed. Installation inside the building is preferred.
10. 200 lb. static pressure tests of fire lines and sprinkler systems are required.
11. Upon adding over 20 sprinkler heads, a 200 lb. static pressure test is required. All sprinkler systems with more than 20 heads will require water flow switch and tamper switch on water valves supervised by an approved alarm company.
12. Sprinkler systems must provide a supervisory control.
13. Sprinkler plans submitted to the City of Richardson for review must be submitted to the Richardson Fire Marshal's Office (136 N. Greenville). At least three (3) copies of the plans with the permit application must be submitted. Final acceptance is subject to field inspection and testing by the Fire Marshal's Office.
14. All approved sprinkler drawings shall include the State License Number of sprinkler system company. License shall be verified upon submittal of drawings.
15. All valves must have tamper switches.
16. Permits and approval of that part of the system that lies within private property does fall under the jurisdiction of the Fire Marshal's Office.
17. All sprinkler underground mains and above ground risers will be inspected and tested by the Richardson Fire Marshal's Office.

APPENDIX B

Requirement for Television Inspection of Sewer Mains

- I. AUTHORITY - The Director of Public Services has determined that in order to assure the highest standards are maintained regarding the installation of sanitary sewage systems, closed circuit television inspection will be required prior to final acceptance of new sewer mains.
- II. CONTRACTORS' RESPONSIBILITY - The contractor is responsible for installation of any sanitary sewer conduit and shall also be responsible for conformance to this specification. Compliance with this specification shall be a condition of final acceptance.
- III. SCOPE OF WORK
 - A. The contractor will be required to furnish all labor, equipment, materials and supervision necessary to inspect the completed sewer main with a closed circuit television (CCTV) system. The CCTV system shall be specifically designed and constructed for such inspections. The CCTV system shall be capable of producing high-resolution color picture quality to the satisfaction of the City representative.
 - B. The camera shall be moved through the line in either direction at a rate not to exceed 30 feet per minute. The camera shall be stopped when necessary to document problems with the sewer's condition.
 - C. The system shall be capable of operating within main sections (manhole to manhole or manhole to cleanout) without the need to be reset to complete the line section.
 - D. The CCTV system shall be equipped to produce a video record of the main being inspected. The video record shall be provided on DVD disk media.
- IV. QUALITY CONTROL
 - A. The actual CCTV inspection shall be done at a time convenient to the City representative.
 - B. No inspection shall be performed unless witnessed by the City representative.
 - C. All work shall conform to the National Association of Sewer Service Companies (NASSCO), "Recommended Specifications for Sewer Collection System Rehabilitation". All operators of the CCTV system shall be familiar with this document.
 - D. All work found to be unacceptable by the City representative shall be redone, by the contractor, until accepted by the City representative.
- V. DOCUMENTATION AND SUBMITTALS
 - A. The original DVD disc media shall be given to the City representative upon completion of the CCTV inspection.
 - B. Copies may be provided to the contractor upon request. There will be no charge for this service.

- C. The disc shall be clearly marked with the name of the project, name of the contractor, name of the CCTV operator, City Inspector's name, and date.
- D. The CCTV equipment shall have the ability to provide on-screen digital display of relevant inspection data (i.e. job name or code, location, date, and footage). Also, the CCTV unit shall have voice-over capability and the operator shall narrate the above information as well as any problems located, directly on the disc.
- E. An operator's written log shall be kept reflecting all of the inspection activities. At a minimum, this log shall reflect the following information:
 - Job name or code
 - Main section identification and location
 - Date
 - Operator and vendor name
 - City representative's name
 - Log of observations listed by footage markings
 - Operator's signature
 - City representative's signature
- F. The original inspection log shall be provided to the City representative at the end of the inspection.

VI. ADDITIONAL INSPECTIONS REQUIRED

- A. At the option of the City, during the warranty period, the City, with its own equipment, may re-inspect the sewer system in part or in whole.
- B. Any deficiency found during this inspection will be corrected under the provisions of the contract warranty.
- C. The contractor will be responsible for having main sections re-televised after corrections of deficiencies have been completed. This re-inspection shall be in compliance with this specification.

VII. LIABILITY - The City nor the City representative shall in any way be responsible or liable for any property damage or injury resulting from this inspection activity.