

# Utility Relocation Design Criteria

## City of Columbia

### Carolina Crossroads, Phase 2

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## General

All submittals and information noted herein as being “to the City” are to be provided to SCDOT who will then coordinate with the City of Columbia.

The following design guidelines and standards have been developed by the City of Columbia (City) for use on the Carolina Crossroads Project. Deviations from these guidelines will require approval from the City of Columbia. These guidelines are not intended to cover every eventuality. Additional content and resources may be required. In the event of a conflict between these documents or other governing criteria, the most stringent shall prevail.

- It is assumed that the work performed under this project will be a relocation project consisting of relocating existing utilities and constructing new, similar sized or equivalent facilities, in an adjacent location. Design-Build Contractor shall obtain all necessary permits to accomplish the work.
- All work performed under this project shall have a warranty of 2 years after final acceptance by the City. Design documents should clearly state the warranty period.
- Staff performing work on the sanitary sewer system shall be trained by City staff on the Sewer Overflow Response Program and shall follow all requirements. Contact Stephen Sealey, Wastewater Compliance Manager (803.545.0208). The Wastewater Compliance Department’s Administrative Professional can also be reached at 803.467.0882.
- A template “Scope of Services” has been included in the provided information. At a minimum, work by the Design-Build Contractor is required to meet the level of effort in the scope template.
- Other information has been included by the City in SCDOT’s Agreement for Carolina Crossroads Phase 2 – US 76 (Broad River Road) at I-20 Interchange Improvement and I-20 Widening Project (Project ID P039719) to establish minimum specifications and requirements for materials, specifications, details, and other items necessary to design the relocations. The Design Build Contractor shall follow these unless approved by the City Engineer.
- Sediment and erosion control is not addressed in these criteria. All permitting and requirements will be the responsibility of the Design-Build Contractor.
- Property acquisition of sufficient SCDOT rights-of-way to relocate or retain City water/sewer infrastructure in the right-of-way to meet these standards, or the acquisition of easements, shall be the responsibility of either the SCDOT or the Design Build Contractor (responsibility to be as set forth in the SCDOT’s Agreement for Carolina Crossroads Phase 2 – US 76 (Broad River Road) at I-20 Interchange Improvement and I-20 Widening Project, Project ID P039719).
- Record Drawings must meet all applicable City standards for record drawing submittal which can be found here:
  - <https://www.columbiasc.net/property-services/record-drawings>

- Record Drawings should also include a submittal in AutoCAD 2017 (or a more current version) format of a survey (X,Y and elevation) of all pipe bends (horizontal and vertical), fittings, valves, and at points along the pipeline no further than 100-feet apart.
  - Survey standards should meet the standard described in the City's template utility relocation design scope template.
- The information provided by the City and included in the SCDOT's Agreement for Carolina Crossroads Phase 2 – US 76 (Broad River Road) at I-20 Interchange Improvement and I-20 Widening Project (Project ID P039719) should address the appropriate design criteria, design standards, specifications, design details, plan requirements, other requirements, and direction. Only in an event where an item is not addressed in the materials provided, should the City's Engineering and Regulations Manual be used.
- Design Review – Design Build Contractor shall submit for design review to the City of Columbia for comments at the 30%, 60%, and 100% design milestones as detailed below. Design Build Contractor must resolve City of Columbia comments before advancing the design plans. Plans for Utility Work shall be independent plans under separate cover from roadway plans, but utility design shall be fully coordinated with the roadway design shown in the roadway plans. Plans must meet the requirements of the City's Scope of Services document included in the SCDOT's Agreement for Carolina Crossroads Phase 2 – US 76 (Broad River Road) at I-20 Interchange Improvement and I-20 Widening Project (Project ID P039719). The 100% review stage shall be a 'draft final' review set for City comment. Once those comments are resolved the project can be submitted for any applicable permitting. Any changes to the design plans beyond the 100% review shall require the approval of the City. The 30%, 60 %, and 100% submittal must meet the following minimum content:
  - 30-percent Utility plans shall include the following:
    - Plan set with complete horizontal alignment of proposed utility work in relation to existing and proposed roadway features, other utilities, and SCDOT right-of-way.
  - 60-percent Utility plans shall include the following:
    - Plan set with complete horizontal and vertical alignment of proposed Utility Work in relation to existing and proposed roadway and storm drainage features, other utilities, and SCDOT right-of-way. Includes corrections to 30-percent plans required by Utility.
    - Plan view and profile sheets with cross sections as necessary including temporary and final grades
    - Design calculations, general notes, water and sewer notes, table of contents for specifications, and details
  - 100-percent 'Draft Final' Utility plans shall include the following:

- All information included in 60-percent plans with proposed utility location fully coordinated with proposed roadway and drainage features and any other proposed Utility Work for other utility owners within the project limits. Includes corrections to 60-percent plans required by Utility.
- Service line tie-in locations
- Details for all work items
- Final Design Calculations
- Final Specifications

### **Design Criteria for Drinking Water Pipelines and Infrastructure**

The following water system design standards for City of Columbia are based on Federal, State, and local health requirements and engineering design criteria. “Ten States Standards” shall apply where applicable. All installations are to deliver water to the consumer which meets the bacteriological and chemical quality standards of the S.C. Department of Health and Environmental Control. Design of water and sewer infrastructure located within the SCDOT’s right of way shall comply with the SCDOT Utilities Accommodation Manual (latest version).

- Water mains shall not be installed in contaminated soils or in the vicinity of contaminated waters or in an area where contaminated materials are stored. As soon as the existence of these circumstances comes to the attention of the Design Build Contractor work shall be halted, and the City Engineer informed. The Design Build Contractor shall recommend design changes to include, but not be limited to, re-routing and the use of alternate pipe and joint materials. This includes water mains that are to be located within 10 feet of a septic tank or tile field. In every event, prior written approval must be obtained from the City Engineer in advance of making design changes and proceeding with design or installation.
- Pipe diameters for relocated pipelines shall be the same diameter and retain similar or greater capacity as the original pipeline that is being relocated, unless the existing pipeline is of a diameter no longer available or is inconsistent with current City standards. In which case the next larger diameter pipe which is consistent with current City standards shall be used.
- Where multiple existing smaller water mains parallel to one another must be relocated and are approved by the City and SCDOT to be consolidated into a single larger main consistent with current City standards which provides equal or greater capacity, the Design Build Contractor’s Engineer-of-record will be responsible for sizing calculations required for submission to SCDHEC and to ensure the consolidated main provides equal or greater capacity. The CITY will provide the hydrant test results needed for performing the calculations.

- In the event of a new pipeline or consolidated pipeline, design shall be performed as required by SCDHEC, described in the included scope of services, and as described in the City's Engineering Regulation Manual.
- All water and sewer infrastructure (pipelines, mains, etc.) must meet standards established by South Carolina Department of Health and Environmental Control; Regulation 61-58 State Primary Drinking Water Regulations and Regulation 61-67 Standards for Wastewater facility Construction.
- Trenchless crossings of roadways or other features shall result in steel-cased crossings meeting the requirements of the Owner's Standard Specifications Section 02590 and other specification sections. The design of the crossing installation is the responsibility of the Design Build Contractor's Engineer-of-record.
- Flushing, Testing, and Disinfection of Water Mains – All water main designs shall include the appurtenances necessary to allow the Design Build Contractor to perform flushing, pressure testing, leakage testing, disinfection, and bacteriological sampling in accordance with AWWA, SCDHEC, and City Standards.

#### Materials

- Water Transmission Mains (16-inches in diameter and larger)
  - Pipe Materials
    - Water transmission mains shall be 16-inch or larger ductile iron pipe (DIP) meeting the provided standard specifications.
    - The City does not accept 14-inch, 18-inch, or 20-inch pipe diameters for use in its water system.
    - Wall thickness of ductile iron pipe will be selected in accordance with ANSI/AWWA C150/A21.50. Calculations signed & sealed by the Engineer-of-record shall be included with the 60-percent design submittal.
    - The City does not accept PVC, PCCP, or RCP pipe for use as transmission mains. Where special conditions exist which require the consideration of alternate pipe materials such as HDPE, the Design Build Contractor must submit a written request for consideration to the City Engineer with justification of why DIP cannot be used, why the alternate pipe material is appropriate, and specifications of the proposed pipe and installation. The Design Build Contractor will not proceed with design using alternate pipe materials without written approval of the City Engineer.
    - Pipe trench installation shall include a "clay bulkhead" every 300-feet to prevent water from moving along the stone bedding and backfill.
- Water Distribution Mains (12-inches in diameter and smaller)
  - Pipe Materials

- Water distribution mains shall be 4-inch, 6-inch, 8-inch, or 12-inch Class 350 ductile iron pipe per the provided standard specifications.
- The City of Columbia does not accept 1-inch, 1.25-inch, 2-inch, 2.5-inch, 3-inch, or 10-inch pipe for use in its water distribution system.
- In no case will water distribution main piping be less than 6-inch diameter except that 4-inch diameter ductile iron pipe may be used, when properly sized, for court and cul-de-sac streets that do not require a fire hydrant or extensions to adjacent properties. 4-inch pipe will only be allowed if specifically approved in writing by the City.
- The City does not accept PVC pipe for use in SCDOT, County, or City rights-of-way.
- The City does not accept asbestos-cement, RCP, or fiberglass for use in its water system. Where special conditions exist which require the consideration of alternate pipe materials such as HDPE, the Design Build Contractor must submit a written request for consideration to the City Engineer with justification of why DIP cannot be used, why the alternate pipe material is appropriate, and specifications of the proposed pipe and installation. The Design Build Contractor will not proceed with design using alternate pipe materials without written approval of the City Engineer.
- Pipe trench installation shall include a “clay bulkhead” every 300-feet to prevent water from moving along the stone bedding and backfill.

- Valves

- Line valves in water transmission mains shall be butterfly valves which meet the requirements set forth in the attached standard specification.
- Line valves in water distribution mains shall be gate valves which meet the requirements of the attached standard specifications.
- Line valves shall be located at each intersection with other water mains. Minimum requirements will be two valves for a tee intersection and three for a cross intersection (crosses should be avoided if possible). Valve spacing shall not exceed 1,000 feet in any case unless approved by City.
- Air Release Valves (ARV) shall be installed at each high point along the water transmission and distribution mains. Acceptable ARV models are listed in the standard specifications. ARVs shall be installed in H20 rated manholes and shall be as specified in the attached standard specification.
- The sizing of ARVs shall be in accordance with AWWA M51. Calculations signed & sealed by the Engineer-of-record shall be included with the 60-percent design submittal.

- Fire Hydrants
  - All fire hydrants shall be as specified in the attached standard specification.
  - Fire Hydrants shall be located at each road intersection and shall be spaced no greater than every 1,000 feet.
  - Fire hydrants shall be installed on all dead-end mains greater than 200 feet in length.
- Thrust Restraint
  - Thrust restraint for all water mains shall be provided by use of restrained joint pipe, except where water main connections require the use of concrete thrust blocking (these instances must be approved in writing by City Engineer). Locations where restrained joints are required will be indicated on the plans and profiles including the minimum lengths necessary, the beginning and ending locations, and other pertinent information.
  - In restrained sections of pipe joints shall be locking ring type restrained joints per the pipe manufacturer's standard or approved gripper gaskets as detailed in the Owner's Standard Specifications Section 02509.
  - Fitting joints shall be locking ring type restrained joints per the manufacturer's standard. Mechanical joint restraint systems that utilize a wedge style gripping system or a gland/ring positive restraint system will be considered acceptable on a case by case basis as approved by the City as detailed in the Owner's Standard Specifications Section 02509.
  - Restrained joint lengths shall be determined by use of a thrust restraint calculator. The Ductile Iron Pipe Research Association's (DIPRA) on-line calculator is recommended. The Design Build Contractor's Engineer-of-record shall submit a signed and sealed summary of these thrust restraint calculations to include all assumptions and results with the 60-percent design submittal.
- Polyethylene Wrapping of Ductile Iron Pipe
  - All ductile iron pipe located within 100 LF of an active cathodic protection system, such as that on steel gas lines, shall be protected by installing polyethylene encasement. When used polyethylene encasement shall be V-Bio and meet all the requirements for ANSI/AWWA C105/A21.5, Polyethylene Encasement for Ductile Iron Pipe Systems as detailed in the Owner's Standard Specifications Section 02509.

### **Design Criteria for Wastewater Pipelines and Infrastructure**

The following water system design standards for City of Columbia are based on Federal, State, and local health requirements and engineering design criteria. "Ten States Standards" shall apply where applicable. All installations are to meet the requirements and standards of the S.C. Department of Health and Environmental Control. Design of wastewater infrastructure located within the SCDOT right of way shall comply with the SCDOT Utilities Accommodation Manual (latest version).



## Alignments

- Gravity sewers shall be laid with straight alignment between manholes.

## Increasing Size

- When a smaller sewer joins a larger one, the crown of the larger sewer shall match the crown of the smaller sewer.

## High Velocity Protection

- Design Build Contractor shall design the system to prevent velocities from exceeding 10-feet per second in the pipelines.

## Materials

- Gravity sewer pipes shall be PVC (SDR 26) as specified in the standard specifications unless depth of the installed line exceeds the manufacturer's recommendation or the pipe diameter exceeds 27-inches. In either event, the City will require Protecto 401 lined DIP (as specified in the provided standard specifications).
- Force Main pipes shall be Protecto 401 lined DIP as specified in the provided standard specifications.
- Requirements shall be set forth in the final specifications for the pipe and method of bedding and backfilling thereof so as not to damage the pipe nor its joints, impede internal cleaning operations and future tapping, nor create excessive side fill pressures nor **evulation ovalization** of the pipe, nor seriously impair flow capacity. All sewers shall be designed to prevent damage from superimposed loads (permanent or temporary).

## Joints and Infiltration

- Sewer joints shall be designed to minimize infiltration and to prevent the entrance of roots. Leakage tests shall be as specified. This shall include appropriate water or low-pressure air testing (see provided specifications).
- Pipe trench installation shall include a "clay bulkhead" every 300-feet to prevent water from moving along the stone bedding and backfill.
- Sanitary sewers shall be constructed of ductile iron at stream crossings. Top of pipe shall be a minimum of 2-feet below stream bed.

## CCTV Inspection Prior to City Acceptance only if gravity impacted

- The use of CCTV inspection of gravity sewer with NASSCO compliant coding and database will be required prior to placing the sewer in service. Results of such tests shall be certified to the City Engineer in writing by a registered engineer.

## Force Main Valves

- Force Mains shall have Air Release Valves (ARV) installed at each high point and along the force main as appropriate to remove air in the pipeline. ARVs shall be installed in H20 rated manholes and shall be ARI D-025 (manufacturer and model) and sized and located according to the manufacturer guidelines.
- Force Main line valves shall comply with the requirements of the included City of Columbia Engineering Regulations Part 3.3: Design of Pump Stations.

## Thrust Restraint for Force Mains

- Thrust restraint for all force mains shall be provided by use of restrained joint pipe, except where connections or other circumstances require the use of concrete thrust blocking (these rare exceptions must be approved in writing by City Engineer). Locations where restrained joints are required will be indicated on the plans and profiles including the minimum lengths necessary, the beginning and ending locations, and other pertinent information.
- In restrained sections of pipe joints shall be locking ring type restrained joints per the pipe manufacturer's standard or approved gripper gaskets as detailed in the Owner's Standard Specifications Section 02615.
- Fitting joints shall be locking ring type restrained joints per the manufacturer's standard. Mechanical joint restraint systems that utilize a wedge style gripping system or a gland/ring positive restraint system will be considered acceptable on a case by case basis as approved by the Owner as detailed in the Owner's Standard Specifications Section 02615.
- Restrained joint lengths shall be determined by use of a thrust restraint calculator. The Ductile Iron Pipe Research Association's (DIPRA) on-line calculator is recommended. The Engineer-of-record shall submit a signed and sealed summary of these thrust restraint calculations to include all assumptions and results with the 60-percent design submittal.

## Manholes

- Location – Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; at all gravity pipeline intersections; and at distances not greater than 400 feet.
- Material – Manholes shall be precast and shall meet the provided specifications.
- Drop Type – An inside drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solid deposition.

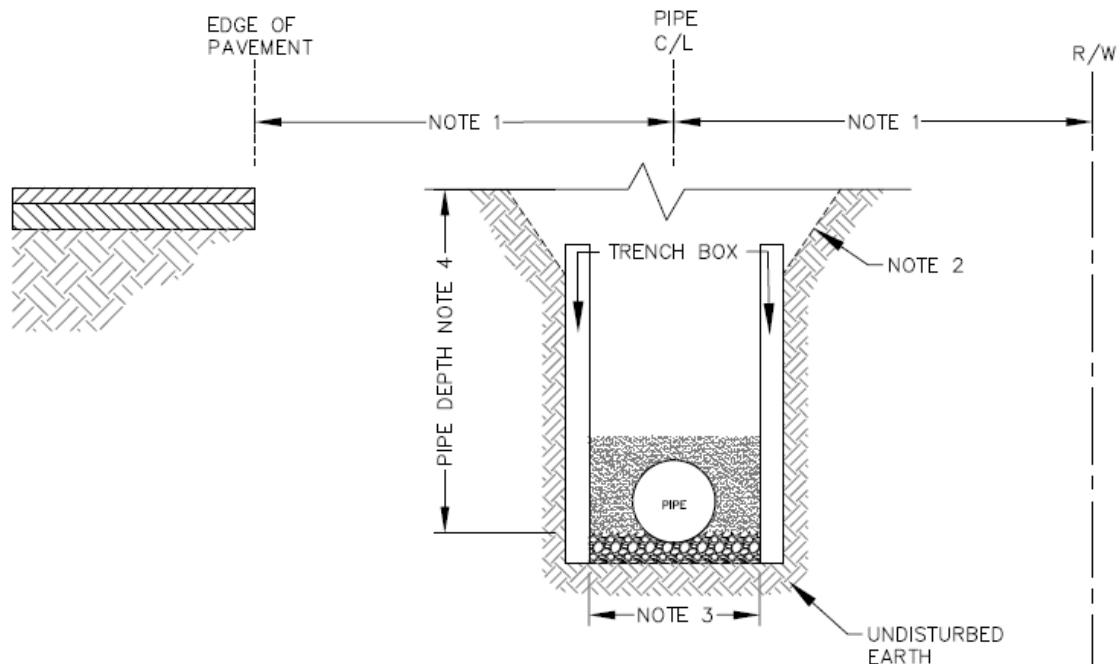
- **Diameter** – The minimum interior diameter of manholes shall be 48 inches. For sewer pipes in sizes eight inches up to 15 inches, manholes shall be a minimum of four feet in diameter. For sewer pipes 18 inches and larger, manholes shall be a minimum of five feet in diameter.
- **Manhole Depth** – The four-foot diameter manhole shall have a minimum depth of four feet and a maximum depth of less than 12 feet measured from the top of pipe to the top of the ring. Manholes of greater depth shall be five feet in internal diameter.
- **Flow Channel** – The flow channel through manholes shall be made to conform in shape and slope to that of the sewers.
- **Water tightness** – Watertight manhole covers shall be used wherever the manhole tops may be flooded by street runoff or high water and where the manhole covers are below the 100-year flood elevation. Manholes shall be waterproofed on the exterior.
- **General** – The City has included a Manhole Design and Style guide. Manholes shall conform to these requirements unless otherwise approved by the City in writing.

## **Relocation Requirements**

- Relocations shall be in accordance with the SCDOT's Utility Accommodation Manual.
- Relocations for City infrastructure shall also be required to; ensure future access (for maintenance, repairs, or replacement, prevent possible damage to new or existing utilities due to construction activity, prevent the pipeline from being too shallow or deep to future final grade, remove pipe from future pavement, adjust valves/rims and other infrastructure to final grade, and ensure that a future leak or break would not risk critical roadway infrastructure.
- Relocations shall not place pipelines near or under columns, MSE walls, abutments, or other transportation or utility infrastructure (mast arm foundations, electrical equipment, etc.) in a way that prevents the safe access or impedes future access of the utility by the City. These design standards include a graphic depicting a minimum guideline for future utility access. City utility infrastructure shall be located a safe distance from structural elements (columns, walls, abutments, etc.) such that excavating to the utility with a single standard trench box can be done safely and without risk to the structural element.
- Should a pipeline have to be located under an embankment, it shall be placed in a casing pipe just as required by jack and bore specifications. All final pipeline locations (existing and proposed) shall allow for maintenance (digging down to) without impact to roadway or other infrastructure.
- Relocations shall not leave short runs of existing pipe between relocated sections unless approved by the City. Short runs of existing pipe between relocated segments that shall also be relocated will be generally defined as a pipeline length equal to 75% of the longest segment on either side of the section recommended to remain.

## **SCDOT's Rights-of-way and Easements**

- Where water distribution mains (up to 12-inch in diameter) are located in SCDOT's rights-of-way, the location shall be a minimum distance of 7.5-feet from the edge of the right-of-way as long as the bottom of the pipe trench is no deeper than 7.5-feet. Where the bottom of the trench is between 7.5-feet and 10-feet the location shall be a minimum distance of 10-feet from the edge of the right-of-way.
- Where pipelines (16-inch in diameter and larger) are located in rights-of-way, the location shall be a minimum distance of 10-feet from the edge of the right-of-way as long as the bottom of the pipe trench is no deeper than 10-feet.
- Water/Sewer utilities in rights-of-way must have clearances from other structures, utilities, obstacles to allow for the City to maintain and access the utility in the future. The City must be able to dig down to a Utility located in a right-of-way, while using a single trench box, without impacting other utilities, structures, or obstacles. Any exceptions to this must be explicitly approved by the City. At a minimum, other utilities shall not be located within 3 feet horizontally of the outside of a pipe wall unless approved by the City. Please see the detail below showing the minimum clear area required to access the utility. It is understood that other utilities will need to cross this utility access envelope, but that should occur at perpendicular angles.



**NOTES:**

1. PIPE BURIED UP TO A DEPTH OF 7.5 FEET SHALL BE LOCATED AT LEAST 7.5 FEET HORIZONTAL DISTANCE INSIDE OF THE RIGHT-OF-WAY (R/W) LINE AND AT LEAST 7.5 FEET HORIZONTAL DISTANCE OUTSIDE THE EDGE OF PAVEMENT. PIPE BURIED UP TO 10 FEET OF DEPTH SHALL BE LOCATED AT LEAST 10 FEET INSIDE OF THE R/W LINE AND AT LEAST 10 FEET HORIZONTAL DISTANCE OUTSIDE THE EDGE OF PAVEMENT.
2. PIPELINE SHALL BE LOCATED AND ORIENTED RELATIVE TO OTHER UTILITIES AND ROADWAY RELATED INFRASTRUCTURE SUCH THAT THE CITY CAN EXCAVATE DOWN TO ACCESS AND MAINTAIN OR REPLACE THE PIPE. THE AREA WITHIN A TRENCH BOX PROFILE SHALL REMAIN CLEAR OF OBSTRUCTIONS THAT WOULD PREVENT INSTALLATION OF A TRENCH BOX, OR THAT WOULD CONFLICT, DAMAGE OR RISK OTHER UTILITIES OR ROADWAY RELATED INFRASTRUCTURE. ASSUME THE TRENCH BOX REACHES 6.5 FEET ABOVE THE INVERT OF THE UTILITY AND 1:1 SIDE SLOPES ABOVE THE TOP OF THE TRENCH BOX.
3. FOR PIPES 8"-12" IN DIAMETER, ASSUME AN INTERIOR TRENCH BOX SPREAD OF 36". FOR PIPES 16"-30" DIAMETER ASSUME AN INTERIOR TRENCH BOX SPREAD OF 60".
4. PIPE SHALL NOT BE BURIED WITH LESS THAN 3 FEET OF COVER UNLESS SPECIFICALLY APPROVED IN WRITING BY THE CITY, AND NO PIPE SHALL BE DEEPER THAN 10 FEET OF DEPTH TO THE BOTTOM OF PIPE UNLESS SPECIFICALLY APPROVED IN WRITING BY THE CITY.

## PIPELINE LOCATION REQUIREMENTS

NOT TO SCALE

- Any pipe depth greater than 10-feet must be approved by the City.
- City utility infrastructure in SCDOT's Right-of-way must remain accessible and traversable with a standard 4-wheel drive truck. And have sufficient access points from public non-restricted roadways, to allow future access to the utility.
- A buried water or sewer facility may be located under a bridge or elevated roadway structure if it crosses perpendicular to the structure and if it has a minimum of 25-feet vertical clearance from the ground surface to the bottom of the structure to allow for City excavation equipment to access the utility for repair. If the required clearance cannot be provided the buried crossing shall be installed in a steel casing per the City's Standard Specifications. Cased crossing shall be designed with access for maintenance at

the casing ends. Buried pipelines shall not be installed under and parallel to a bridge or elevated roadway structure. Any exceptions to this must be approved by the City.

- Location of new water and sewer pipelines in roadways must have the advance approval of the City. If approved, the pipeline design must include bedding and backfill adequate for the loading anticipated from the roadway traffic and the depth of the pipeline and horizontal clearances must be reasonable for access for maintenance as described elsewhere in the Utility Relocation Design Criteria.
- **Easements**—It is anticipated that the vast majority of City utility infrastructure will be relocated within SCDOT right-of-way. There may be occasions where an easement is needed instead of locating within the right-of-way. If that occurs, the following additional guidelines apply:
  - Where pipelines (up to 12-inch in diameter) are located in easements, the easements shall have a minimum width as listed in the following chart. The easements will be centered on and around the pipeline and its appurtenances.
  - Where pipelines (16-inch in diameter and larger) are located in easements, the easements shall have a minimum width of 20-feet as long as the bottom of the pipe trench is no deeper than 10-feet.
  - Water/Sewer utilities in easements or rights-of-way must follow the same pipeline location requirements as detailed above for right-of-way.
  - Standard Utility Easements must be accessible and traversable with a standard 4-wheel drive truck. And have sufficient access points from public non-restricted roadways, to allow access to all areas of the easement.
  - Easements shall be acquired by the CCR Design-Build contractor.
  - Easement must at a minimum meet the following Standard Width for Utility Easements. In specific cases these easement guidelines may not be sufficient to provide sufficient access and could need to be increased. The chart below is for 8-inch to 12-inch diameter pipelines. Pipelines 15-inch to 30-inch will require an additional 5-feet of width.

Standard Widths for Utility Easements  
(8" pipe diameter and below)

<u>UTILITY DEPTH</u>	<u>EASEMENT WIDTH</u>
7.5 ft or Less	15 ft
7.6 ft - 10.0 ft	20 ft
10.1 ft - 12.5 ft	25 ft
12.6 ft - 15.0 ft	30 ft
15.1 ft - 17.5 ft	35 ft
17.6 ft - 20.0 ft	40 ft

NOTE:

All utility easements are to be located centered on and around the utility and its appurtenances.

Easement widths shall not vary between manholes.

Minimum easement width is 15 feet.

The depth of the utility is measured from the invert of the pipe at the deepest point to the finished grade.

### **Separation from Other Utilities**

#### Horizontal

As required in Section 6 above, water and sewer pipelines shall be located and oriented relative to other utilities and roadway related infrastructure such that the City can excavate down to access and maintain or replace the pipe. The area within a trench box profile shall remain clear of obstructions that would prevent installation of a trench box, or that would conflict, damage, or risk other utilities or roadway related infrastructure. Assume the trench box reaches 6.5 feet above the invert of the utility and 1:1 side slopes above the top of the trench box.

Based on the guidance stated in Section 6 above.

- For pipelines up to 12-inch diameter; a minimum of 30-inches of horizontal separation (outside to outside) from adjacent utilities, storm drainage, or other obstacles is required. This assumes an interior trench box spread of 36-inches, and an assumed minimum of 12-inches of clearance is needed between the trench box and adjacent utilities and storm drainage.
- For pipelines up to 30-inch diameter; a minimum of 33-inches of horizontal separation (outside to outside) from adjacent utilities, storm drainage, or other obstacles is required. This assumes an interior trench box spread of 60-inches, and an assumed minimum of 12-inches of clearance is needed between the trench box and adjacent utilities and storm drainage.

### Vertical

Pipe shall not be buried with less than 3 feet of cover unless specifically approved in writing by the City, and no pipe shall be deeper than 10 feet of depth to the bottom of pipe unless specifically approved in writing by the City.

It is understood that other utilities will need to cross this utility access envelope, but that should occur at perpendicular angles.

At a minimum, sanitary sewers and water mains shall cross each other with 18-inches of separation per SCDHEC regulations. The water main should pass over the sewer whenever possible. Full pipe joints for both water and sewer shall be centered at the crossing to maximize separation as indicated in City of Columbia Water Detail #10.

At a minimum, other utilities and storm drains shall cross water and sanitary sewers with a minimum of 12-inches, however greater separation is preferred wherever possible.