



ST. CHARLES  
SINCE 1834

# City of St. Charles Engineering Design and Inspection Policy Manual

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# **ENGINEERING DESIGN AND INSPECTION POLICY MANUAL**

## **TABLE OF CONTENTS**

### **SECTION I. SANITARY SEWER SYSTEM**

- A. DESIGN REQUIREMENTS
- B. MATERIALS

### **SECTION II. STORM SEWER SYSTEM**

- A. DESIGN REQUIREMENTS
- B. MATERIALS

### **SECTION III. STORM WATER MANAGEMENT / SITE GRADING**

- A. DESIGN RESTRICTIONS
- B. DESIGN REQUIREMENTS
- C. MATERIALS

### **SECTION IV. WATER SYSTEM**

- A. DESIGN RESTRICTIONS
- B. DESIGN REQUIREMENTS
- C. MATERIALS

### **SECTION V. PAVEMENT / ROADWAYS**

- A. DESIGN REQUIREMENTS

### **SECTION VI. DESIGN REFERENCES**

### **SECTION VII. INSPECTION PROCEDURES**

- A. STORM AND SANITARY
- B. WATER DISTRIBUTION SYSTEM
- C. PAVEMENT AND ROADWAYS

### **SECTION VIII. ENGINEERING DETAILS**

# **SECTION I**

## **SANITARY SEWER SYSTEM**

- A. DESIGN REQUIREMENTS**
- B. MATERIALS**

***A: Design Requirements:***

- 1) Auger: Augering will be required at all roadway crossings unless otherwise permitted by the City of St Charles appropriate Engineering Division. Steel casing and “Cascade” spacers (or approved equal) shall be utilized. Following completion of the auger, the casing shall be filled with pea gravel or sand, and the ends shall be blocked and mortared shut (refer to City casing pipe detail).
- 2) Cover Depth: All sanitary sewer and services must have a minimum cover of four (4) feet.
- 3) Calculations: Provide calculations to substantiate the available capacity of the receiving sewer.
- 4) Drop Connections: Exterior drop connections will be permitted only where site conditions are not conducive for an elevation drop of less than two (1) foot. Interior drop connections will not be permitted (refer to City new drop manhole detail(s)).
- 5) Manhole Spacing: Manholes shall be provided at:
  - 400’ minimum intervals.
  - Change in pipe diameter
  - Change in pipe material
  - Change in grade
  - Change in horizontal alignment
- 6) Manhole Sizing: Sanitary sewer manholes shall have a minimum inside diameter of four (4) feet (refer to City sanitary manhole detail).
- 7) Separation Requirements: A minimum ten (10) foot horizontal separation shall be established between the sewer and any proposed or existing water distribution facility, or the invert of the water main shall lie a minimum of 18” above the top of the sewer pipe. Where neither of the above conditions can be met, the water main shall be encased for the duration of the horizontal conflict (10’ on each side of a perpendicular conflict), or the sewer shall be constructed of water main quality materials for the duration of the conflict (10’ on each side of a perpendicular conflict).
- 8) Services, Domestic: Domestic sanitary services shall be constructed of PVC SDR 26 with a minimum diameter of 6”. All domestic services shall connect to the public sewer with a wye fitting. A cleanout shall be installed within (10) feet of the structure.
- 9) Services, Industrial & Commercial: Industrial and commercial sanitary services shall be constructed of PVC SDR 26 or 21 with a minimum diameter of 6”. All industrial and commercial services shall connect to the public sewer at a manhole, and an inspection

manhole shall be provided within (10) feet of the structure (refer to manhole details for service connections).

- 10) Sewer Pipe, Materials (gravity): Sanitary sewer shall be constructed of the following materials:
  - i) Depth less than 20': PVC SDR 26 or Ductile Iron Pipe, Class 52
  - ii) Depth greater than 20': PVC SDR 21, or Ductile Iron Pipe, (class to be specified by depth, and manufacturers specifications)
  
- 11) Sewer Pipe, Minimum Size: Public sewer may have a minimum diameter of 8", and must provide a minimum self-cleaning flow velocity of 2 fps.
  
- 12) Force Main: Sanitary sewer force main shall conform to the following:
  - i) 4" minimum diameter
  - ii) Ductile Iron Pipe, Class 52 or PVC SDR 21 with Poly-wrapping
  - iii) Clean-outs at all vertical and/or horizontal bends, or at 700' minimum intervals in a manhole. Cleanouts will be installed via the use of a "T" connection with a cap at the top of the cleanout.
  - iv) Minimum flow velocity of two (2) fps
  - v) Air release valve shall be located at the high point of the force main.
  
- 13) Trench Backfill: All utility and service trenches within (3) feet of paved surfaces, or at a distance specified by the Engineer, shall be backfilled with CA-7 (Virgin Crushed Limestone). FA-6 (clean beach sand) material shall be used in all other unpaved locations. All Backfill material shall be properly compacted unless otherwise directed by the appropriate Engineering Division. Backfill under existing pavements, where an open cut of the pavement has been approved, shall be Flowable Fill that meets the IDOT standards of Controlled Low Strength Material (CLSM) Mixture #1. No fly ash will be permitted in this mix (refer to City pipe trench detail).
  
- 14) Lift Station: Lift stations will be permitted only where site conditions do not allow for the construction of a functional gravity sewage collection system. Where lift stations are permitted, the following criteria shall be met:
  - i) A lift station design report shall be submitted for review (*Contact the City of St Charles appropriate Engineering Division for sample report and/or additional information, see Section 6 for phone numbers*).
  - ii) A complete set of shop drawings and product specification information (i.e.: generator, pump, lift station...) shall be provided to the City for review.
  - iii) A detailed plan depicting the proposed layout of the lift station, including the location of the generator, control panel, wet and dry wells, access drive, and fencing, lighting, and landscape features shall be submitted for review.
  - iv) A natural gas powered emergency generator shall be provided.
  - v) A communication connection to the main Sewage Treatment Plant alarm system shall be provided.

vi) A dedicated lot and access drive shall be provided to the City.

- 15) Extension of Sewer System: Sanitary sewer system must be extended as a minimum, to the limit of the development at a minimum slope for self-cleaning velocity. Note on plans which sewer lines are to be public and private. Sanitary sewers shall be designed to accept all existing and future demand, based on the fully developed state under present zoning and the City's Comprehensive Plan.
- 16) Disconnection of Existing Services: Disconnection of existing services at their respective mains shall be by means of cutting out existing wye or tee and replacing with a straight piece of equal size pipe and making the final connection with "non-shear" mission couplings. Disconnection of all services must be performed prior to the demolition of an existing structure. Existing services to be abandoned shall be filled or removed.
- 17) Connecting to an Existing Sewer: When connecting to an existing sewer main by means other than an existing "Y", "T", or an existing manhole, one of the following methods shall be used:
- i) Using pipe cutter, neatly and accurately cut out desired length of pipe for insertion of proper fittings. Use "band-seal" couplings or similar couplings, and non-shear rings and clamps to fasten the inserted fittings and hold it firmly in place. Mission couplings shall have the length of boot approximately equal to the pipe diameter. Follow manufacturer's recommendations for the installation. No cut-in connection, made by breaking or cutting a hole in the main and inserting the spigot end of an ordinary sewer pipe shall be permitted.
  - ii) Circular, saw-cut of sewer main with proper tools ("Shower-tap" machine or similar) and proper installation of hub-"Y" saddle or hub-"T" saddle, in accordance with manufacturer's recommendations. This method shall only be allowed for pipe sizes over 12 inches in diameter. All must be encased in concrete flowable fill.
- 18) Structures Located Within the Floodplain: Sanitary sewer manholes constructed on the flood plain must have a rim two feet (2') above the base flood elevation or have a water-tight-lock-type frame and cover, Neenah R-1916 C or approved equal.
- 19) Video Note on All Plans: Engineering plans must contain the following note: "A current color video record and a type written transcription of the internal inspection of the newly constructed sewer system shall be submitted prior to refunding of site improvement escrow retention monies by the City of St Charles. All public mains shall be videotaped. The contractor must rotate the lens of the camera to look at all services. The service connections must be noted in the television report. When the proposed sanitary sewer system is to connect to an existing sanitary sewer system abutting the property, the existing sewer must also be televised and reported. The contractor shall coordinate the televising of existing contiguous sewers with the City of St Charles. All lines shall be flushed and cleaned prior to videotaping."

20) Connecting to an Existing Structure: Pipe penetrations into existing sanitary manholes shall be properly sized and cored and sealed with flexible watertight connections (refer to City sanitary sewer connection to existing manhole detail).

21) Separation Requirements: Sanitary and storm sewer utility services shall be separated by a minimum ten feet (10') of horizontal separation.

***B: Materials:***

1) Drop Connections: Drop connections shall be constructed of Ductile Iron Pipe, Class 52 or PVC SDR 26, per manufactures specifications. All drop manhole piping shall be encased in concrete (refer to standard drop manhole detail).

2) Frame & Lid:     Frame: *Neenah R-1713 or R-1916C in Floodplain*  
                          Lid:     *Neenah R-1713 or R-1916C type "B" with the words  
  "City of St. Charles - SANITARY" cast into surface.*

3) Joints: All joints shall conform to ASTM D-3212 for PVC pipe and ASTM A-746 for ductile iron. Both pipe types shall be joined by means of a flexible gasket. Gaskets for PVC joints shall be in conformance with ASTM A 21.11-79 (AWWA C111).

4) Manhole: New sanitary manholes are to be precast reinforced concrete eccentric type with a minimum 48" I.D. barrel section; Cone sections shall have a 3 inch integrally cast precast concrete collar; Pipe penetrations are to be sealed via the use of a cast in place flexible synthetic rubber pipe sleeve which is to be fastened to the pipe with two stainless steel bands. Barrel sections shall be sealed using (2) butyl rubber strips per tongue and groove section. Chimney seals are to be internal type, manufactured by "Cretex" or approved equal by Public Works. All new or adjusted steps shall be made of steel reinforced plastic, using an approved plastic meeting ASTM D4101, Type II, Grade 49108 over a #3 Grade 60, ASTM A615, reinforcing bar. A maximum of 8" of adjusting rings shall be used (refer to standard sanitary manhole detail).

5) Services: Sanitary services shall be constructed for all build-able lots. Services shall be constructed of PVC SDR 26 pipe, six (6) inch minimum diameter, and shall be extended to the rights-of-way limits. All connections to the public main shall be at a manhole or at a "wye" fitting approved by Public Works Division. Once installed all services extending to the City right-of-way limits shall be located utilizing a 2" x 4" wooden stake painted red.

6) Sewer Pipe, Materials: Sanitary sewer shall be constructed of the following materials:

- Depth less than 20': PVC SDR 26 or Ductile Iron Pipe, Class 52
- Depth greater than 20': Ductile Iron Pipe, Class 52 or PVC SDR 21
- Force Main: Ductile Iron Pipe, Class 52 or PVC SDR 21

- 7) Thrust Blocks (force main): Thrust blocking shall be a combination pre-cast masonry blocks and “*Mega-lug*” brand restraints.
  
- 8) Trench Backfill: All utility and service trenches within (3) feet of paved surfaces, or at a distance specified by the Engineer, shall be backfilled with CA-7 (Virgin Crushed Limestone). FA-6 (clean beach sand) material shall be used in all other unpaved locations. All Backfill material shall be properly compacted unless otherwise directed by the appropriate Engineering Division. Backfill under existing pavements, where an open cut of the pavement has been approved, shall be Flowable Fill that meets the IDOT standards of Controlled Low Strength Material (CLSM) Mixture #1. No fly ash will be permitted in this mix (refer to City pipe trench detail).

## **SECTION II**

# **STORM SEWER SYSTEM**

**A. DESIGN REQUIREMENTS**

**B. MATERIALS**

***A: Design Requirements:***

- 1) Auger: Augering will be required at all roadway crossings unless otherwise permitted by the City of St Charles appropriate Engineering Division. Steel casing and “Cascade” spacers (or approved equal) shall be utilized. Following completion of the auger, the casing shall be filled with pea gravel or sand, and the ends shall be blocked and mortared shut (refer to City casing pipe detail).
- 2) Catch Basins: Catch basins shall consist of four (4) foot minimum interior diameter reinforced concrete structures with a 3’ sump (refer to restrictor structure detail).
- 3) Cover Depth: All storm sewer and sump lines must have a minimum cover of two (2) feet.
- 4) Video Note on All Plans: Engineering plans must contain the following note: “A current color video record and a type written transcription of the internal inspection of the newly constructed sewer system shall be submitted prior to refunding of site improvement escrow retention monies by the City of St Charles. All public mains shall be videotaped. The contractor must rotate the lens of the camera to look at all services. The service connections must be noted in the television report. When the proposed sanitary sewer system is to connect to an existing sanitary sewer system abutting the property, the existing sewer must also be televised and reported. The contractor shall coordinate the televising of existing contiguous sewers with the City of St Charles. All lines shall be flushed and cleaned prior to videotaping.”
- 5) Disconnection of Existing Services: shall be by means of cutting out existing “wye” or tee and replacing with a straight piece of equal size pipe and making the final connection with “non-shear” mission couplings. Disconnection of all services must be performed prior to the demolition of an existing structure.
- 6) Flared End Sections: All flared end sections greater than or equal to 12 inches, that will receive or discharge storm water, shall have a removable grate system to prevent entry. This grate system shall be made from steel stock that is hot-dipped galvanized after fabrication.
- 7) Extension of Sewer System: The storm sewer must be extended to the limits of the subdivision or lot and must be sized to accept all tributary areas.
- 8) Capacity Calculations: Provide calculations to substantiate the available capacity of the existing receiving storm sewer/stream in light of the design discharge from the proposed development. Note on all plans which sewer lines are to be public and private. All proposed storm sewer systems shall be designed for a 10-year storm event per the Kane County Stormwater Ordinance as adopted and modified by the City of St. Charles.
- 9) Connecting to an Existing Sewer: When connecting to an existing sewer main by means other than an existing “Y”, “T”, or an existing manhole, one of the following methods shall be used:

- a. Using pipe cutter, neatly and accurately cut out desired length of pipe for insertion of proper fittings. Use “band-seal” couplings or similar couplings, and shear rings and clamps to fasten the inserted fittings and hold it firmly in place. Mission couplings shall have the length of boot approximately equal to the pipe diameter. Follow manufacturer’s recommendations for the installation. No cut-in connection, made by breaking or cutting a hole in the main and inserting the spigot end of an ordinary sewer pipe shall be permitted.
- b. Circular, saw-cut of sewer main with proper tools (“Shewer-tap” machine or similar) and proper installation of hub-“Y” saddle or hub-“T” saddle, in accordance with manufacturer’s recommendations. This method shall only be allowed for pipe sizes over 12 inches in diameter. All must be encased in concrete flowable fill.

10) Frame & Grate: Frames and grates shall be provided as appropriate for the structure location (i.e.: depressed curb, barrier curb, overflow route, rear yard...). All grates to be located near a paved surface shall be “bicycle safe”. Calculations may be required to demonstrate that the proposed grates allow for an inflow that does not exceed the design capacity for the downstream pipe (refer to standard details).

11) Inlets: Inlets shall consist of a two (2) foot minimum interior diameter reinforced concrete structure. Inlets shall be placed at the sag of vertical curves in roadways, at low points in parking areas, and at other locations as necessary to minimize stormwater ponding and/or flow across roadways or intersections. Storm sewer inlets shall be placed not more than 500’ apart in pavement and shall not exceed 250’ in grassy areas.

12) Release Structure / Restrictor: The release structure shall be of a weir wall orifice design (refer to overflow weir structure detail) or as approved by the City of St. Charles.

13) Underground Storage System

- a. Underground chambers must be large enough to allow the chamber to be manually cleaned.
- b. Access points for ingress and ventilation purposes are to be provided in the chamber at a maximum spacing of 100 feet and at the ends of the chamber.
- c. Underground storage chambers are to be clearly labeled on the engineering plans as “Private Storm Water Storage Facility.” These chambers are to be maintained by the developer until a owners association has been established.
- d. Poured in place reinforced concrete chamber designs must be signed and sealed by an Illinois Licensed Structural Engineer.
- e. All reinforcement steel shall be epoxy coated and all concrete shall be treated with a protective concrete coating, on the interior and exterior of the chamber.
- f. For precast concrete construction, geo-textile fabric must be placed over the top of the structure, and all joints must be grouted.
- g. All structural steel members used shall be Corten or hot dipped galvanized. All connections shall have a like treatment.
- h. A minimum of 12 inches of topsoil plus sod must be placed to cover the underground storage facility when constructed under pervious surface.

- 14) Separation Requirements: A minimum ten (10) foot horizontal separation shall be established between the sewer and any proposed or existing water distribution facility, or the invert of the water main shall lie a minimum of 18” above the top of the sewer pipe. Where neither of the above conditions can be met, the water main shall be encased for the duration of the horizontal conflict (10’ on each side of a perpendicular conflict), or the sewer shall be constructed of water main quality materials the duration of the conflict (10’ on each side of a perpendicular conflict).
- 15) Sewer Pipe, Minimum Size: Public sewer shall have a minimum diameter of 10” for the first “run” of pipe, 12” minimum for all other.
- 16) Slope: Slope shall be adequate to provide a minimum flow velocity of 3 fps and maximum acceptable velocity is 10 fps.
- 17) Structure Sizing: Manholes and catch basins shall have a minimum inside diameter of four (4) feet for sewer pipe 18” or less in diameter, five (5) feet for sewer pipe 21” to 48” in diameter. Pipes larger than 48” in diameter will require a special design (refer to standard manhole and catch basin details)
- 18) Structure Spacing: Manholes / Catch basins shall be provided at:
- 400’ minimum intervals.
  - Change in pipe diameter.
  - Change in pipe material.
  - Change in vertical alignment.
  - Change in horizontal alignment.
- 19) Sump Lines: Domestic sump services shall be constructed of PVC SDR 26 with a minimum diameter of 4”. All domestic services shall connect to the public sewer by removing a section of main and installing a new “wye” fitting for pipes less than 15” in diameter, “Kor-N-Tee” Boots for pipes 15” and larger, or at a structure (refer to connection detail).
- 20) Trench Backfill: All utility and service trenches within (3) feet of paved surfaces, or at a distance specified by the Engineer, shall be backfilled with CA-7 (Virgin Crushed Limestone). FA-6 (clean beach sand) material shall be used in all other unpaved locations. All Backfill material shall be properly compacted unless otherwise directed by the appropriate Engineering Division. Backfill under existing pavements, where an open cut of the pavement has been approved, shall be Flowable Fill that meets the IDOT standards of Controlled Low Strength Material (CLSM) Mixture #1. No fly ash will be permitted in this mix (refer to City pipe trench detail).
- 21) Underdrains: Underdrains will be required under curbs at the bottom of all roadway sags. Underdrains shall extend 50 feet on each side of the inlet. Underdrains shall be perforated polyethylene pipe. The underdrain shall be encased in gravel trench with no fines, and a geotextile fabric shall be used to limit sedimentation in the pipe (refer to standard “Pipe Underdrain” detail).

- 22) Sump Lines: Storm services shall be constructed for all buildable lots. Services shall be constructed of PVC SDR 26 pipe, six (6) inch minimum diameter, and shall be extended to the rights-of-way limits. All connections to the public main shall be at a manhole or at a “wye” fitting approved by Public Works Division. Once installed all services extending to the City right-of-way limits shall be located utilizing a 2” x 4” wooden stake painted green.
- 23) Culverts: Culvert pipe designs shall be in accordance with the Illinois Department of Transportation “Standard Specification for road and Bridge Construction” latest edition. Publicly owned culver pipes shall be PVC for pipes less than 15” in diameter or RCP for pipes equal to 15” or larger in diameter.

***B: Materials:***

- 1) Casing: Where water main protection is required, encasement shall consist of PVC SDR 26, or steel casing with “*Cascade type CCR-STD*” spacers or approved equal.
- 2) Frame & Grate:
- |                               |            |  |
|-------------------------------|------------|--|
| Curb Inlet/C.B.:              | High back: | <i>Neenah R-3281-A or R-3278-1</i>         |
|                               | Depressed: | <i>Neenah R-3506-A2</i>                    |
| C.B., “behind the curb type”: |            | <i>Neenah R-3305</i>                       |
|                               |            | <i>Neenah R 1713 (Refer to Lid Detail)</i> |
| C.B./M.H., Type “D”:          | Grate:     | <i>Neenah R 1713 (Refer to Lid Detail)</i> |
|                               | Frame:     | <i>Neenah R-1713</i>                       |
| C.B., “beehive type”:         |            | <i>Neenah R-4340-B</i>                     |
- 3) Manhole: Manholes shall be reinforced concrete with steps provided 16” on-center. All manholes shall have a minimum inside diameter which conform to the following:
- 18” storm sewer and smaller - four (4) foot inside diameter
  - 21” to 48” storm sewer - five (5) foot inside diameter
  - Larger than 48” storm sewer - special design required
- 4) Sewer Pipe, Materials: Main line storm sewer shall be constructed of one of the following:
- a. Pre-cast reinforced concrete pipe, with “O-ring” joints;
  - b. PVC pipe, rigid, (Min. SDR 26, push-on gasket joints);
  - c. All joints shall conform to ANSI 21.11 for ductile iron pipe.
  - d. Ductile iron pipe, (Class 52), minimum;
  - e. HDPE pipe, (Rigid with corrugated exterior and smooth interior meeting AASHTO M-294, Type S. Pipe sections shall be joined with PVC double bell couplers installed on the pipe with O-ring gaskets. Ex-filtration standards shall meet or exceed that of PVC SDR 26 with push-on-joints.) **FOR PRIVATE USE ONLY. NOT TO BE**

**USED WITHIN PUBLIC RIGHT-OF-WAY OR FOR PUBLICLY OWNED AND MAINTAINED STORM SEWER**

- f. The type of pipe material will be dependent upon the depth of bury, soil conditions, and pipe criteria, and as approved by the City of St. Charles.
  - g. For RCP/CSP pipe, lifting holes shall not be allowed on pipes less than 84” in diameter.
  - h. All storm sewer smaller than 15-inches in diameter that will be publicly owned and maintained shall be PVC pipe, rigid, (Min. SDR 26, push-on gasket joints).
- 5) Flared End Section: Flared end sections and subsequent riprap material shall be designed and specified per the Illinois Department of Transportation “Standard Specification for Road and Bridge Construction” latest edition. Flared end sections shall be constructed of a concrete material only or approved by the appropriate Engineering Division.

## **SECTION III**

# **STORM WATER MANAGEMENT /SITE GRADING**

- A. DESIGN RESTRICTIONS**
- B. DESIGN REQUIREMENTS**
- C. MATERIALS**

***A: Design Restrictions:***

- 1) High Water Level: The proposed grading conditions shall not result in conditions that will cause water to pond on adjacent property or to rise within (2) feet of any existing or proposed top of foundation elevations or low opening of a structure.
- 2) Off-site Grading: Off-site grading will not be permitted unless permission in the form of an easement is obtained from the subject property owner.
- 3) Release Rates: Storm water release rates shall at a minimum meet or exceed the Kane County Stormwater Ordinance as adopted and modified by the City of St Charles.
- 4) Watershed boundaries: Proposed construction may not result in any modification to existing watershed boundaries or the alteration of off-site drainage patterns.
- 5) Wetlands: Existing wetlands may not be altered without an authorized permit from the Army Corps of Engineers, as well as consent from FEMA, the IEPA, and the Department of Natural Resources, Office of Water Resources.

***B: Design Requirements:***

- 1) Detention Basins (Dry basins): Shall meet or exceed the Kane County Stormwater Ordinance as adopted and modified by the City of St Charles.
- 2) Detention Basins (Wet basins): Shall meet or exceed the Kane County Stormwater Ordinance as adopted and modified by the City of St Charles.
- 3) Flared End Section: Flared end sections shall be required in any areas where a storm sewer discharges into a detention basin. Trash grates shall be provided on all flared end sections 12 inches in diameter and greater. Permanent erosion control shall be provided with riprap at all flared end sections. Temporary erosion control in the form of straw bales shall be provided at all outlet flared end sections, and shall be maintained until the topsoil has been adequately stabilized with vegetative cover. All flared end sections greater than or equal to 12 inches, that will receive or discharge storm water, shall have a removable grate system to prevent entry. This grate system shall be made from steel stock that is hot-dipped galvanized after fabrication.
- 4) Green Space, Slope Requirements: Green space slopes shall conform to the following:
  - 4:1 maximum slope
  - 2% minimum slope
  - Where retaining walls are required, a registered Illinois Structural Engineer must sign the plans if the proposed height is four (4) feet or higher.

- 5) Inlet Ponding, Maximum Levels: The engineer shall calculate the 100 year water surface elevations for the stormwater storage facilities. Inlet ponding in excess of one (1) foot during a 100-year event will not be permitted. The overflow route and limits of ponding shall be clearly illustrated on the plans. Paved parking lots may not be utilized to provide any portion of the required site run-off storage volume.
- 6) Overflow: An overflow drainage route must be established. All storm water management facilities shall have a clearly defined and protected overflow route illustrated with an overflow elevation and a large arrow. The overflow routes through the subdivision shall also be illustrated with large arrows, and spot elevations shall be shown at 50' intervals along the route.
- 7) Pavement, Slope Requirements: Pavement slopes shall conform to the following:
  - 1% minimum and 5% maximum slope (pavement)
  - 0.5% minimum slope (curb & gutter)
  - 8% maximum slope (driveways only)
- 8) Release Rate: Shall meet or exceed the Kane County Stormwater Ordinance as adopted and modified by the City of St Charles.
- 9) Release Structures: Shall meet or exceed the Kane County Stormwater Ordinance as adopted and modified by the City of St Charles.
- 10) Stormwater Management Report: A Stormwater Management Report shall be submitted to the City for review. The report shall include the following:
  - All appropriate permit forms, associated fees need be submitted.
  - A narrative that discusses topographical conditions, soil conditions, analysis methodology, modeling results, and conclusions.
  - Data from an analytical modeling program which features hydrograph methodology, TR20 or equal.
  - A critical duration analysis shall be performed which analyzes the proposed topographic and drainage conditions for the 2, 6, 12, 18, and 24 hour durations of the 100 year rainfall. Hydrograph methodology shall be used in cooperation with projected rainfall data as documented in the "Bulletin 70 Huff Distribution Curve". The largest storage volume that is produced from this analysis shall be the required volume for the development.
  - Basin sizing calculations; required and proposed stormwater storage volumes.
  - Stormwater release structure calculations including proposed, required, and existing release rates.
  - Exhibits which illustrate the following:
    - Existing conditions (i.e.: topography, buildings / structures, water bodies, roadways...).
    - Proposed conditions (i.e.: topography, lot alignments, top of foundation elevations, roadways, drainage ways, stormwater storage facilities, overflow routes...).
    - Existing and proposed watershed boundaries and ridgelines.

- Proposed 100-year water surface elevation and high water level.

11) Topography: A drainage plan shall be provided which includes the following:

- One (1) foot contours.
- Easements, including dimensions and easement type.
- Proposed storm water storage facilities.
- Existing water bodies and drainage features.
- Proposed roadways and rights-of-way's.
- Proposed lot alignments and lot numbers.
- Proposed top of foundation elevations.
- Overflow drainage routes and 100-year water surface elevations with cross sections.
- Proposed basin volumes, 100-year water surface elevations, and high waster levels.
- Storm sewer appurtenances.
- Proposed elevations at all lot corners and along all break points at side yards.

***C: Materials:***

- 1) Casing: Where water main protection is required, encasement shall consist of PVC SDR 26, or steel casing with “*Cascade type CCR-STD*” spacers or approved equal.
- 2) Flared End Section: Flared end sections shall be required in any areas where a storm sewer discharges into a detention basin. Trash grates shall be provided on all flared end sections 12 inches in diameter and greater. Permanent erosion control shall be provided with riprap at all flared end sections. Temporary erosion control in the form of straw bales shall be provided at all outlet flared end sections, and shall be maintained until the topsoil has been adequately stabilized with vegetative cover. All flared end sections greater than or equal to 12 inches, that will receive or discharge storm water, shall have a removable grate system to prevent entry. This grate system shall be made from steel stock that is hot-dipped galvanized after fabrication.

# **SECTION IV**

## **WATER SYSTEM**

- A. DESIGN RESTRICTIONS**
- B. DESIGN REQUIREMENTS**
- C. MATERIALS**

***A: Design Restrictions:***

- 1) Dead End Water Main: The construction of dead end water main will not be permitted. Where dead end mains cannot be avoided on a temporary basis, a fire hydrant shall be placed at the end.
- 2) Pipe Compound: Pipe compound will not be permitted in any water main construction, including service connections. A general note to this effect shall be included in the Final Engineering Plans.

***B: Design Requirements:***

- 1) Tunneling: Augering or directional drilling will be required at all roadway crossings unless otherwise permitted by the City of St Charles appropriate Engineering Division. Steel casing and “Cascade” spacers shall be utilized exclusively. Following completion of the auger, the casing shall be filled with pea gravel or sand, the ends shall be blocked and mortared shut, or have end boots installed.
- 2) Cover Depth: All water main, hydrant leads, and services must have a minimum cover of five (5) feet, and a maximum cover of (10) feet. Variations from these standards will require approval of appropriate Engineering Division.
- 3) Fire Flows: Fire flows shall be calculated at a twenty (20) psi residual pressure and shall be available for a minimum four (4) hour continuous duration for flows above 2,000 gpm, and a two (2) hour continuous duration for flows below 2,000 gpm. Appropriate water pressure and flow must be provided in accordance with the St. Charles Municipal Code, Ord. 15.28.060:
  - Single family Detached Residential: 1,000 - 1,500 gpm
  - Town / Row or Cluster Housing: 1,500 - 2,000 gpm
  - Apartment Type Construction: 3,000 - 4,000 gpm
  - Industrial & Storage: 3,000 - 5,000 gpm
  - Research & Development Laboratories: 3,000 - 4,000 gpm
  - Business & Commercial Areas: 3,000 - 4,500 gpm
  - Mercantile Centers: 3,000 - 6,000 gpm
  - Assembly & Education: 3,000 - 5,000 gpm
  - Health Care & Institutional: 3,000 - 4,000 gpm
- 4) Hydrant Leads: All hydrant leads must be constructed of DIWM CL 52 with a minimum diameter of 6”. Where hydrant leads are longer than 100’, 8” diameter DIWM will be required.
- 5) Hydrant Spacing: Hydrants must be placed at a minimum of 400-foot intervals, and may not be less than five (5) feet from the back of curb. No buildable area shall be farther than 300’ from a fire

hydrant, and a minimum of one hydrant shall be located at each intersection. For larger projects, hydrants shall be proposed at high points for air release. All hydrant locations shall be coordinated with the City of St. Charles Fire Department and appropriate Engineering Division.

- 6) Horizontal and Vertical Separation: - Watermains and Sewer horizontal and vertical separations shall conform to the latest version of the “Standard Specifications for Water & Sewer Construction in Illinois. Reference to these standard and specification should be made when it is impossible to meet separation requirements for casing pipe requirements (refer to standard casing pipe detail).
- 7) Abandoning and Replacing Existing Services: All existing services shall be abandoned at the corporation stop (close corporation stop, cut services, and install copper disk). Existing services should be replaced from the new main to the B-Box if service is lead. If service is copper, it should be cut and tapped into the new main. Approved trench backfill material is to be placed where any trench lies within (3) feet of the edge of pavement, curb, or sidewalk. It is assumed all lines are lead and must be replaced to B-Box.
- 8) Interruption of Water Usage: Water services may only be interrupted when the transfer of services to the new main takes place. Services shall be transferred subsequent to testing and chlorination of the proposed main. The contractor shall contact the St. Charles Water Division at 1-630-377-4405 prior to transfer of service. Residents and Businesses must be informed a minimum of 24 hours in advance of any interruption by the City of St. Charles Water Division staff.
- 9) Services, Domestic: Domestic water services shall be provided to each lot. The minimum size for domestic services is (1) inch. Once installed all services extending to the City right-of-way limits shall be located utilizing a 2” x 4” wooden stake painted blue.
- 10) Services, Fire Protection: Where fire protection services are required, separate domestic and fire protection services shall be provided. Each service must have an independent tie into the public water main.
- 11) Thrust Blocking: Preformed concrete block thrust blocking shall be provided at all bends greater than 10 degrees, at all mechanical joint connections, and at all fire hydrants (refer to city thrust blocking detail).
- 12) Trench Backfill: All utility and service trenches within (3) feet of paved surfaces, or at a distance specified by the Engineer, shall be backfilled with CA-7 (Virgin Crushed Limestone). FA-6 (clean beach sand) material shall be used in all other unpaved locations. All Backfill material shall be properly compacted unless otherwise directed by the appropriate Engineering Division. Backfill under existing pavements, where an open cut of the pavement has been approved, shall be Flowable Fill that meets the IDOT standards of Controlled Low Strength Material (CLSM) Mixture #1. No fly ash will be permitted in this mix (refer to City pipe trench detail).
- 13) Valve Spacing: Right-hand closing resilient wedge gate valves at intervals not over 600 feet intervals.

- 14) Valve Vaults: Valve vaults are to be precast reinforced concrete, eccentric type (refer to standard detail and materials section for sizing specifications). A maximum of (8-inches) of adjusting rings shall be used.
- 15) Frame and Covers: All valve vault structures shall have a Neenah Foundry Company R-1713 frame and type “B” Lid with concealed pick hole. Lids shall be furnished with “City of St. Charles - Water” cast into the top surface (refer to City standard detail).
- 16) Water Main, Minimum Size: The minimum size for any public water main shall be 8” (with the exception of hydrant laterals that may be 6”, (see design requirement #3 above for fire flow considerations).
- 17) Separation: A ten-foot horizontal separation shall be maintained between water mains and appurtenances, and all other utilities, public or private.
- 18) Appurtenance Separation: Water appurtenances shall be a minimum of (20) feet from permanent structures; this applies to any structure that may require a building permit (i.e. retaining walls, pools, shed, garages, etc.)
- 19) Dead Ends: Dead end water mains longer than 300’ should not be permitted. The water system must be extended, as a minimum, to the limits of the development and looped wherever possible. Note on all plans which mains are to be public and private.
- 20) Adjustment of Structures: All adjustments to valve vaults shall be made with precast concrete adjusting rings not to exceed a maximum of eight (8) inches overall in height. Watertight valve vaults shall be provided for each valve. Barrel sections shall be seated using (2) butyl rubber strips per tongue and groove section. Valve vaults are to be precast reinforced concrete, concentric type (refer to standard detail and materials section for sizing specifications). After final adjustments have been made, all joints in precast structures shall be mortared. The mortar shall be composed of one part cement to three parts sand, by volume, based on dry metals and shall be thoroughly wetted before laying. Vaults may only be extended to a maximum of 23” from the surface to the inside flare of the manhole cone section.
- 21) Connecting to Existing Water Mains: Connection to the end of an existing a water main shall be with a valve only. No new water main should be connected to the existing water main unless the new water main can be pressure tested separately. Connection to an existing water main shall be done by pressure connection only unless authorized by the appropriate Engineering Division. Pressure connection and valve shall be located within the valve vault. No pressure connection shall be within 3 feet of an existing water main joint. If pressure connection cannot be done, use a cut in sleeve and tee connection. All fittings will be swabbed out with a chlorine solution of at least 50 mg/L. A City Representative must test this solution.
- 22) Service Taps: Service taps to water mains are not permitted until after bacteriological sampling and analysis has been completed to the satisfaction of the appropriate Engineering Division. No water service connection shall be made by any person or firm other than a State

of Illinois licensed contractor, with a State of Illinois licensed plumber on the job, bonded with the City.

- 23) Landscaping: Landscape plantings shall not interfere with operation and maintenance of water appurtenances. Trees shall be placed no closer than (10) feet from any structure(s).
- 24) Fire Hydrants: Fire hydrants shall be installed with a maximum of one extension kit used, and a maximum extension of 36". Fire hydrant extension kits must be of the same manufacture as the hydrant, and must be installed according to the manufacturer's specifications using original manufacturer's parts.
- 25) Joint Restraint: All mechanical joint fittings shall have restraining glands installed. Restraint device shall be Uni-flange by Ford Company or Mega-lug by EBAA Iron. Push joint pipe restraint shall be Field Lock Gaskets by US Pipe or Series 1700 Mega-lug or Series 1390 Pipe Restraint by Ford. Lengths of pipe restraint shall be determined from manufacturers installation specifications (refer to watermain restraint detail).

***C: Materials:***

- 1) Corporation Stops:
  - a. Compression fittings.
    - i. Mueller B-25008-N (1"-1 ½"-2")
    - ii. Ford
      1. FB1000-4-Q-NL 1"
      2. FB1000-6-Q-NL 1 ½"
      3. FB 1000-7-Q-NL 2"
    - iii. A. Y. McDonald 4701-BQ (1", 1 ½", 2")
    - iv. Q Series Brass
- 2) Curb Stops:
  - a. Compression fittings.
    - i. Mueller B-25155-N (1"-1 ½"-2")
    - ii. Ford
      1. B-44-444-Q-NL 1"
      2. B44-666-Q-NL 1 ½"
      3. B-44-777-Q-NL 2"
    - iii. A. Y. McDonald 6104-Q (1", 1 ½", 2")
    - iv. Q Series Brass
- 3) Curb Box: (Minneapolis pattern, lid marked "WATER")
- 4) Buffalo Type:
  - a. For 1" thru 2", Mueller H-10300 Copper service
  - b. A. Y. McDonald, 5615 1 ¼"

- 5) Fire Hydrant:
  - a. Approved Models: (Refer to standard Fire Hydrant Detail)
    - i. Mueller Super Centurion 200
    - ii. Waterous Pacer Model WB-67-250
    - iii. Clow Medallion
    - iv. All hydrants shall have:
      1. 6” mechanical joint connection
      2. 5 ¼” valve opening
      3. 5” cover over hydrant lateral
      4. 6” valve on lateral
      5. “Hydrfinder” standard hydrant locator, installed
      6. Valve box shall have a valve box stabilizer installed \*  
\*(Valve box adaptor #2 type A, as made by Adaptor, Inc. or approved equal)
  
- 6) Fire Hydrant Paint: Safety Red, Sherwin Williams ‘Shercryl’ 6403-31922, B66R300
  
- 7) Bolts Placed Underground: All below grade factory installed bolts and fasteners shall be 304-grade stainless steel.
  
- 8) Valves: 4” through 16” diameter” Right-hand closing Resilient Wedge gate valves, conforming to AWWA Standard C-509 as manufactured by the Clow Corporation, Waterous Company or approved equal. All below grade factory installed bolts and fasteners shall be 304-grade stainless steel.
  
- 9) Valve Vaults: Watertight valve vaults shall be provided for each valve. Barrel sections shall be sealed using a butyl rubber or rubber strip (Refer to City standard valve vault detail).
  - a. 3” through 6” valves..... Min. 4’ inside diameter vault minimum
  - b. 8” and larger valves..... Min. 5’ inside diameter vault minimum
  - c. Pressure Taps..... Min. 5’ inside diameter vault minimum
  - d. Valve Vault Lid..... Neenah R-1712, Type B or approved equal
  - e. The word “WATER” shall be cast into the surface of the lid.
  - f. Vaults are not required for hydrant auxiliary valves except when a pressure tap for a hydrant lateral is in a roadway.
  
- 10) Watermain Pipes:
  - a. Ductile Iron Class 52, conforming to AWWA Standard C-151.
    - i. Cement Lining, conforming to AWWA Standard C-104.
    - ii. Mechanical or push-on joints shall conform to AWWA Standard C-111.
    - iii. At minimum, Type 3 laying conditions shall be provided, conforming to AWWA Standard C-600 (Attached).
  - b. All watermains shall be encased in a High Density polyethylene encasement with its material specifications and installation method in accordance with ANSI.AWWA C105/A21.5, ASTM A674, using “Method A” installation.

- c. All side yard and rear yard water mains not directly adjacent to public roadways or paved surfaces shall be Ductile Iron Pipe, Class 55 with a type 5 laying condition.
- d. Brass Wedges shall be installed to provide electrical conductivity.

11) Joint Restraint: All mechanical joint fittings shall have restraining glands installed. Restraint device shall be Uni-flange by Ford Company or Mega-lug by EBAA Iron. Push joint pipe restraint shall be Field Lock Gaskets by US Pipe or Series 1700 Mega-lug or Series 1390 Pipe Restraint by Ford. Lengths of pipe restraint shall be determined from manufacturers installation specifications (refer to watermain restraint detail).

12) Copper Service Lines:

- a. One-inch diameter minimum
- b. Type K copper tubing
- c. Compression fittings only

1-inch service connections only may be connected utilize the direct tap methods to 6-inch mains and larger only. If there is insufficient diameter water main to install a direct tap, then a saddle tap shall be allowed. Service taps of 1 ¼", 1 ½," & 2" require the use of a tapping saddle. Saddles shall be full circle, 304-grade stainless steel, with nylon washers and Nitrile gasket, as manufactured by Smith-Blair; model #372, or approved equal.

13) Tapping Sleeves:

- a. 4" through 8" diameter:
  - i. Romac SST-945 stainless steel or approved equal or Smith – Blair 665 stainless steel or approved equal, or Mueller H-615 cast iron or approved equal.
- b. 10" and larger diameter:
  - i. Mueller H-615 cast iron or approved equal.
  - ii. Flange fasteners shall be 304-grade stainless steel.

14) Casing pipe: Carrier pipe shall be centered within a casing by use of model CCS stainless steel Casing Spacers as manufactured by Cascade Waterworks Mfg. of Yorkville, Illinois or prior approved equal. Fill casing pipe void with sand and install End Boots as manufactured by Cascade Waterworks Mfg. of Yorkville, Illinois.

15) Ductile Service Lines:

- a. Fire:
  - i. The first O. S. & Y. valve on the inside of the building must be in place for pressure testing, chlorination and sampling.
  - ii. Testing against flanges will not be allowed.
- b. Domestic:
  - i. The first permanent valve on the inside of the building must be in place for pressure testing, chlorination and sampling.
  - ii. Testing against flanges will not be allowed.

# **SECTION V**

## **PAVEMENT / ROADWAYS**

### **A. DESIGN REQUIREMENTS**

**A: Design Requirements:**

- 1) Generally: Street Systems shall be designed to meet the requirements of the applicable jurisdiction (e.g., City, IDOT, KDOT, DUDOT, and ST Charles Township). Any proposed street dedication shall be in accordance with the following standards.
- 2) Right-of-way and Pavement Requirements:

| Street Designation | Minimum R.O.W. Width | Minimum Street Width | Minimum Structural Number | Minimum Horizontal Centerline Radius | Minimum Tangent |
|--------------------|----------------------|----------------------|---------------------------|--------------------------------------|-----------------|
| <b>Residential</b> |                      |                      |                           |                                      |                 |
| Estate             | 66 ft.               | 26 ft.               | 2.40                      | 200 ft.                              | 50 ft.          |
| Local              | 66 ft.               | 33 ft.               | 2.90                      | 200 ft.                              | 50 ft.          |
| Collector          | 80 ft.               | 39 ft.               | 3.65                      | 300 ft.                              | 100 ft.         |
| Arterial           | 100 ft.              | 52 ft.               | See Note 1                | 500 ft.                              | 200 ft.         |
| <b>Industrial</b>  |                      |                      |                           |                                      |                 |
| Local              | 66 ft.               | 40 ft.               | 3.00                      | 200 ft.                              | 50 ft.          |
| Collector          | 80 ft.               | 44 ft.               | See Note 1                | 300 ft.                              | 100 ft.         |
| Arterial           | 100 ft.              | 52 ft.               | See Note 1                | 500 ft.                              | 200 ft.         |

**Note 1:** Heavily traveled streets in industrial and residential areas shall be considered on an individual basis and pavement designs shall be based on specific engineering data for each street

| Street Designation | Minimum Gradient | Maximum Gradient | Minimum Soil Support (I.B.R.) | Maximum A.D.T. |
|--------------------|------------------|------------------|-------------------------------|----------------|
| <b>Residential</b> |                  |                  |                               |                |
| Estate             | 0.5%             | 7.0%             | 3.0                           | 400            |
| Local              | 0.5%             | 7.0%             | 3.0                           | 1,000          |
| Collector          | 0.5%             | 5.0%             | 3.0                           | 3,500          |
| Arterial           | 0.5%             | 5.0%             | 3.0                           | 10,000         |
| <b>Industrial</b>  |                  |                  |                               |                |
| Local              | 0.5%             | 5.0%             | 3.0                           | 1,000          |
| Collector          | 0.5%             | 5.0%             | 3.0                           | 3,500          |
| Arterial           | 0.5%             | 5.0%             | 3.0                           | 10,000         |

- 3) Pavement Lengths:
  - a. Maximum residential block length shall be per title 16.08.030.
  - b. Cul-de-sac shall have a maximum length of as defined in Title 12.30.050(B)4

4) Pavements: Pavements shall be designed and constructed so as to obtain a minimum twenty (20) year service life with minimal maintenance after acceptance of the pavement by the City of St. Charles. The design engineer should consider such factors as construction and end use traffic loading sub-base IBR, etc., in determining the structural make up of the pavement section.

a. Pavement Materials and Minimum thickness: The following two pavement sections are the MINIMUM acceptable to the City. Their use must be supported by calculations to substantiate the use of the minimum pavement section.

i. Rigid Pavement

1. A minimum of 9” Portland Cement Concrete pavement (PCC) designed in accordance with IDOT standards. All Portland Cement Concrete shall be treated with a protective coat application.
2. Concrete pavements shall be reinforced in accordance with IDOT standards.
3. Concrete pavement shall have a minimum 4-inch of sub-base granular material, Type B. Milled asphalt meeting aggregate sub-grade specifications **cannot** be used for sub-base granular material, Type B.
4. Portland Cement Concrete shall have minimum 14-day compressive strength of 3500 psi.
5. In cases where an additional cross section may be needed for the sub-grade, the use of 9” of aggregate material meeting aggregate sub-grade gradation (i.e. crushed concrete) and a 3” milled asphalt cap may be used. Milled asphalt or the blending of asphalt millings with crushed concrete or other crushed aggregate material **is not allowed** for use in either the sub-grade or sub-base material.

ii. Flexible Base Pavement

1. Flexible base pavements shall have minimum of four inch (4”) Sub-base Granular Material, Type B. Milled asphalt meeting Aggregate Sub-grade specifications cannot be used for Sub-base granular Material Type B.
2. Hot-Mix Asphalt Base Course, 6”
3. Hot-Mix Asphalt Binder Course, IL-19.0, N50, 2 ¼”
4. Hot-Mix Asphalt Surface Course, Mix “C”, N50, 1 ½”
5. In cases where an additional cross section may be needed for the sub-grade, the use of 9” of Aggregate Material meeting Aggregate Sub-grade gradation 9 i.e. crushed concrete) and a 3” milled asphalt cap may be used. Milled asphalt or the blending of asphalt millings with crushed concrete or other crushed aggregate material **is not allowed** for use in either the sub-grade or sub-base material.

Note: All asphalt is to be laid by a self-propelled mechanical spreader.

b. Sub-grade: All sub-grade material shall have a minimum Illinois Bearing Ratio (IBR) of 3.0. All unsuitable sub-grade material, including sub-grade material having an IBR

less than 3.0 shall be removed and replaced with a suitable fill material, or the pavement must be designed to compensate for the soil condition. The soil support IBR values selected for use by the engineer shall represent a minimum value for the soil to be used.

- c. Pavement Design Shall Include: In addition to the information provided in the right-of-way and pavement requirements, pavement design shall include the following:
- i. Public Alleys shall be constructed of reinforced Portland Cement Concrete (PCC) designed in accordance to specifications listed above for rigid pavements.
  - ii. Maximum allowable pavement grade = 7% and minimum allowable pavement grade = 0.5%;
  - iii. Driveway grades shall have a minimum slope of 1% and a maximum slope of 8%. All driveway grades in excess of 5% shall substantiate that vehicular bottom clearances are met.
  - iv. Vertical curves shall be used when the absolute value of the algebraic difference between the intersecting pavements' centerlines exceed 1.5%. The minimum length of vertical curves shall be one hundred (100) feet for one and one-half (1.5) percent absolute value of the algebraic difference of grade. For each additional (1.0) percent, or fraction thereof, of absolute value of the algebraic difference in grade over one and one-half (1.5) percent, a fifty-foot increment, or fraction thereof, shall be added to the length of the vertical curve.
  - v. The minimum intersection curb radius:
    1. Two minor streets: 25'
    2. Minor and collector streets: 30'
    3. Tow collector streets: 40'
    4. Truck routes or zoned manufacturing: 45'
  - vi. Curb and gutter shall be a B-6.12 barrier type unless otherwise directed by the City of St. Charles appropriate Engineering Division. Curbs shall be constructed of 6.1 bag mix Portland Cement Concrete: 5-8% air entrained, (PCC) with (2), continuous epoxy coated, #4 rebar. A 1" expansion joints shall be placed at 60' intervals, and contraction joints shall be at 15' intervals and all points of curvature. All B-box, sanitary services and storm service locations shall be marked on the curb with a "W", "S" or "ST", as the case may be. All Portland Cement Concrete shall be treated with a protective coat application.
  - vii. 26-foot wide bituminous pavement shall have a 4" crown as measured from the flag of the curb. 26-foot wide concrete pavement shall have a 4" crown as measured from the flow line of the gutter.
  - viii. Pavement Patches

Note: All pavement patches shall be replaced in kind with the following revisions:

1. Flexible Pavement

Patches shall have a minimum of 6" Hot-Mix Asphalt Base Course, placed over a 4" compacted sub-base of granular material. 2 ¼" of Hot-Mix Asphalt Binder Course, IL-19.0, N50, and 1 ½" of Hot-Mix Asphalt Surface Course, Mix "C", N50 shall be laid subsequent to the Base Course. (See details for pavement patching).

## 2. Rigid Pavement

Concrete pavements shall be replaced with a minimum of 14 day, 3500 psi, 9" of Portland Cement Concrete mix placed over a 4" compacted granular sub-base. The existing pavement shall have #6 epoxy-coated dowel bars, 2' in length, drilled at 24" on center, grouted in place. All Portland Cement Concrete shall be treated with a protective coat application. (See details for pavement patching). PCC shall be a 6.1 bag mix, 5-8% air entrained.

## 3. Composite Pavement

For pavements with a concrete base and asphalt surface, the concrete shall be placed at the same thickness as the existing pavement, but shall be a minimum of 8" thick. #6 Epoxy-coated dowel bars, 2' in length, shall be placed at 24" on center, grouted in place

There shall be a minimum of 2 ½" surface asphalt placed over the concrete, Steel plates shall be placed over all Portland Cement Concrete patches until concrete is cured or a minimum of 3 days. (See details for pavement patching).

- ix. Storm inlets and catch basins placed within the roadway surface shall be designed to incorporate an under drain system of perforated PVC pipe in accordance with the attached detail.

## 5) Sidewalks:

- a. Public Sidewalks are to be constructed of a minimum of five (5) inch thick by five (5) feet wide, 6.1 bag mix Portland Cement Concrete (PCC) with (5-8%) air entrainment. All Portland Cement Concrete shall be treated with a protective coat application.
- b. Public walks that cross driveways are to be thickened to a minimum of (6) inches or the thickness of the driveway;
- c. Sidewalks shall be constructed of one (1) foot off the street R.O.W. line unless otherwise directed by the appropriate Engineering Division;
- d. Sidewalks shall be continuous through driveways.
- e. All utility service locations shall be marked on the curb with a "W", "S" and "ST";
- f. A 1" expansion joint shall be provided at 50' intervals, and contraction joints shall be at 5-foot intervals.

- g. Ramping and sloping of sidewalks at intersections shall be in accordance with the specifications and standards as set forth by the Illinois Department of Transportation, the American Disabilities Act (ADA), and the Illinois Disability Code.

Note: All concrete shall be treated with a protective coat application of linseed oil or curing compound equivalent for temperatures over 40 degrees.

# **SECTION VI**

## **DESIGN REFERENCES**

## **Design References**

All work shall be designed and constructed in accordance with the following references as they apply:

1. "Standard Specifications for Road and Bridge Construction," Illinois Department of Transportation, latest edition.
2. "Manual for Structural Design of Portland Cement Concrete Pavement," Illinois Department of Transportation, latest edition.
3. "Manual of Instructions for the Structural Design of Flexible Pavements on Projects involving MFT, FAS, and FAUS Funds," Illinois Department of Transportation, latest edition.
4. "Design Manual," Illinois Department of Transportation, latest edition.
5. Standard Specifications for Water and Sewer Main Construction in Illinois, latest edition.
6. Kane County "Stormwater Ordinance" as adopted by the City of St. Charles.
7. Transportation Research Board of National Academies "Highway Capacity Manual", latest edition
8. Federal Highway Administration "Manual on Uniform Traffic Control Devices, for Streets and Highways", latest edition
9. American Association of State Highway and Transportation Officials "A Policy on Geometric Design of Highways and Streets", latest edition.

Note: Written requests received prior to final approval for alternate materials and/or construction methods will be reviewed by the Public Works Engineering Division and Community Development Engineering Division prior to final approval.

# **SECTION VII**

## **INSPECTION PROCEDURES**

- A. STORM AND SANITARY**
- B. WATER DISTRIBUTION SYSTEM**
- C. PAVEMENT AND ROADWAYS**

General Note: Inspection of the installation of a development's infrastructure is done to ensure conformance with the Engineering plans and specifications as approved by the City Engineering Divisions. The following sets forth the procedures of the City of St. Charles:

- A. Storm and Sanitary Sewer: Inspection of storm and sanitary sewer improvements throughout St. Charles will be performed to ensure that the project is being constructed in accordance with the approved Final Engineering plans, and to determine if minimum construction and material standards are achieved. If the developer or contractor desires to deviate from the approved plan or does not feel that minimum construction standards are being satisfied, he is responsible for contacting the City immediately. The City of St. Charles will not accept a substandard product, and will not be responsible for any additional cost incurred by the developer / contractor as a result.

Items 1 & 2 of this list of tests shall be required for sanitary sewer improvements in St. Charles. An authorized representative of the City of St. Charles shall supervise all tests. All tests shall be scheduled a minimum of 24 hours in advance.

- 1) Air Test: All sanitary sewers shall pass an air test in conformance with Section 31 of the "Standard Specifications for Water and Sewer Construction in Illinois". The sewer shall be tested at an initial pressure of 3.5 psig above the level of the ground water, and the time for a pressure drop of 1 psi shall be determined. The time for the pressure drop to occur shall not be less than that specified by the "Standard Specifications for Water and Sewer Construction in Illinois".
- 2) Deflection Test: All PVC sanitary sewers shall pass a mandrel test in conformance with Section 31 of the "Standard Specifications for Water and Sewer Construction in Illinois".
- 3) Televising: The Contractor shall provide the Public Works Engineering Division a current color video record and a type written transcription of the internal inspection of the newly constructed sewer system. This shall be submitted prior to refunding of site improvement escrow retention monies by the City of St. Charles and final approval and acceptance of the system. All public and private lines equal to and larger than eight inches in diameter shall be videotaped. The contractor must rotate the lens of the camera to look at all services. The service connections must be noted in the television report. When the proposed sanitary sewer system is to connect to an existing sanitary sewer system abutting the property, the existing sewer must also be televised and reported. The contractor shall coordinate the televising of existing contiguous sewers with the appropriate Engineering Division. Costs associated with this work shall be borne by the contractor.
- 4) Acceptance Inspection: Prior to Council acceptance of public sewers, the City Sewer Division must inspect and approve the improvement. A punchlist of items that require corrective action will be generated, and the developer will coordinate resolution efforts and schedule a re-inspection. Following approval, the acceptance process may proceed. Acceptance inspections will be coordinated through the Development Engineering Office.

5) Maintenance Inspection: Prior to the release of a maintenance guarantee, the City Sewer Division will re-inspect and approve the condition of the sewer improvement. This inspection is performed after a minimum of one year, at the developer's request, or following notification from the financial lending institution that the expiration date for the maintenance letter of credit is approaching. A punchlist of items that require corrective action will be generated, and the developer will coordinate resolution efforts and schedule a re-inspection. Following approval, the maintenance guarantee will be released. The release of the maintenance guarantee shall be coordinated with the Development Engineering Office.

B. Water Distribution System: The mandatory inspection of water main improvements throughout St Charles will be performed to ensure that the project is being constructed in accordance with the approved Final Engineering plans, and to determine if minimum construction and material standards are achieved. If the developer or contractor desires to deviate from the approved plan or does not feel that minimum construction standards are being satisfied, he is responsible for contacting the City immediately. The City of St Charles will not accept a substandard product, and will not be responsible for any additional cost incurred by the developer / contractor as a result.

***NOTE: City of St Charles personnel may only operate public water main facilities. The contractor is not permitted to open, close, or adjust any public water valve for any reason. If an emergency situation arises, the contractor shall contact the City of St. Charles Public Works Department immediately.***

1) Required Testing: The following is a list of tests, which shall be required for water distribution system improvements in the City of St Charles. . A representative of the City of St Charles Water Division or Public Works Engineering Division shall supervise all tests. All tests shall be scheduled 48 hours in advance.

- a. After a water main has been installed and before the water main has been placed into operation, the contractor shall "bag" or cover fire hydrants. The bag shall not be removed until after the main has become operational. All hydrants shall be placed to face the road.
- b. Flushing: Flushing of all water system improvements will be performed to create a minimum pipeline velocity of 2.5'/per second.
- c. All tests shall be scheduled 48 hours in advance.
- d. Disinfection: All water mains shall pass a disinfection test in conformance with AWWA C65186. The following test criteria shall be met:
  - i. 50-ppm initial chlorine concentration (chlorine gas only)
  - ii. 25-ppm residual chlorine concentration (after 24 hour duration). Sample must be extracted under the supervision of a City of St. Charles representative and analyzed by a laboratory of the Cities choice.
  - iii. Sampling will be performed on two consecutive days, 24 hours apart

- e. Leakage Test: All public water main improvements shall pass a leakage test in conformance with AWWA C-600 and C-603. Allowable leakage in gallons per hour may not exceed that determined by the following formula:

$$L = \frac{ND\sqrt{P}}{7400}$$

*L = Allowable leakage in gallons per hour*

*N = Number of joints in length of tested main*

*D = Nominal inside diameter of pipe in inches*

*P = Average test pressure in psi*

- f. Pressure Test:

All public water main improvements shall pass a pressure test in conformance with the requirements of ANSI/AWWA C600-87 Section 4, and the Testing requirements shall follow the “Standard Specifications for Water and Sewer Main Construction in Illinois”, latest edition..

The contractor shall, after installation of the water main system or parts thereof, pressure test and chlorinate the new system. A two-hour pre-test must be made and passed by the Contractor before scheduling the pressure test with the City. The main shall then be pressure tested at 150 PSI for a duration of two hours in the presence of a representative of the City Engineering Division. If a scheduled pressure test does not pass because of the failure of the Contractor to hold a pre-test, the City may charge a reinspection fee to the Contractor. Any other water main work will be halted until the reinspection fees have been paid.

After a successful pressure test, the main shall be chlorinated by gas injection method only, by a qualified technician. Samples shall be taken on 2 consecutive working days, Monday through Friday, 24 hours after chlorination, and after the main has been flushed. A City representative shall determine the number of samples taken. A City representative must be present for the pressure testing, chlorination, flushing, and drawing of the sample. The contractor shall bear the costs of these tests and reinspection fees. If after four samplings, the results do not yield two consecutive satisfactory readings, a re-chlorination will be necessary.

Only the City of St Charles Water Division shall make the water system operational after receiving satisfactory lab reports from a qualified testing lab.

- g. All private fire service lines shall pass a pressure test in conformance with the requirements of ANSI/AWWA C600-87 Section 4. The following test criteria shall be met:
- i. 200 psi minimum initial test pressure
  - ii. 200 psi minimum residual pressure after two hours
  - iii. If an existing valve is utilized for the pressure test, the contractor is responsible for the performance of the valve
  - iv. Test to be observed by City of St. Charles Fire Department representative
  - v. If the pressure gauge fails to ‘zero’ at the end of the test, the test will be failed

2) Inspections:

- a. Notice: The developer or contractor shall contact the City of St. Charles Water Division a minimum of 48 hours in advance of a scheduled inspection.
- b. Acceptance Inspection: Prior to Council acceptance of a public watermain, the City Water Division must inspect and approve the improvement. A punchlist of items, which require corrective action, will be generated, and the developer will coordinate resolution efforts and schedule a re-inspection. Following approval, the acceptance process may proceed. Acceptance proceedings will be coordinated through the Engineering Office
- c. Maintenance Inspection: Prior to the release of a maintenance guarantee, the City Water Division must inspect and approve the condition of the water main. This inspection is performed just prior to one year from the date of City council acceptance of the improvements. This will be at the developer's request, or following notification from the financial lending institution that the expiration date for the maintenance letter of credit is approaching. A punchlist of items, which require corrective action, will be generated, and the developer will coordinate resolution efforts and schedule a re-inspection. Following approval, the maintenance guarantee will be released. The release of the maintenance guarantee shall be coordinated with the Public Works Engineering Office.
- d. B-Boxes: Upon completion of the project, the B-boxes will be adjusted to grade, and checked to see if they are operational without altering the shutoff key. Locations of the B-box with measurements to the property lines shall be supplied to the Public Works Engineering Division and shown on the as-built plans for the project. The Water Division for locating B-boxes will issue a charge. B-box locations shall be marked on the curb/sidewalk with a "W".

C. Pavement and Roadways: Inspection of roadway and paving projects throughout St. Charles will be performed to ensure that traffic control is in place and functional, that the project is being constructed in accordance with the approved Final Engineering plans, and to determine if minimum construction and material standards are achieved. If the developer or contractor desires to deviate from the approved plan or does not feel that minimum construction standards are being satisfied, the Contractor is responsible for contacting the City immediately. The City of St. Charles will not accept a substandard product, and will not be responsible for any additional cost incurred by the developer / contractor as a result.

1) Inspections:

- a. Notice: The developer or contractor shall contact the City of St Charles appropriate Engineering Division a minimum of 24 hours in advance of a scheduled inspection.

- b. Acceptance Inspection: Prior to Council acceptance of a public roadway, the City Engineering Office must inspect and approve the improvement. A punchlist of items, which require corrective action, will be generated, and the developer will coordinate resolution efforts and schedule a re-inspection. Following Engineering approval, the acceptance process may proceed. New pavement will be tested by a City appointed consultant to ensure that the structural strength of said pavement will provide a minimum of twenty (20) years of service life after acceptance. The cost for said testing shall be borne by the developer. This testing shall be completed and approved the City immediately prior to placement of the final surface course of asphalt.
- c. Curb Inspection: An inspection is required for all curb work in the public R.O.W.. The contractor shall contact the Engineering Office 24 hours in advance of the scheduled pour. An Engineering Office representative must inspect and approve the base, forms, alignment, and location, and expansion material prior to the pour.
- d. Maintenance Inspection: Prior to the release of a maintenance guarantee, the City Engineering Office will re-inspect and approve the condition of the roadway. This inspection is performed after a minimum of one year, at the developer's request, or following notification from the financial lending institution that the expiration date for the maintenance letter of credit is approaching. A punchlist of items, which require corrective action, will be generated, and the developer will coordinate resolution efforts and schedule a re-inspection. Following Engineering approval, the maintenance guarantee will be released.
- e. Sidewalk Inspection: An inspection is required for all public sidewalks. The contractor shall contact the Engineering Office 24 hours in advance of the scheduled pour. An Engineering Office representative must inspect and approve the sidewalk base, forms, alignment, and expansion material prior to the pour.
- f. Compaction Test: Compaction tests of the sub-base, base, and surface courses of the pavement shall be made by a qualified testing lab, and must be made in the presence of a representative of the City of St. Charles Engineering Department. The developer/contractor shall bear the cost of the testing. The shape and thickness of the pavement base and sub-base must be checked and approved by a representative of the City Engineering Division before the placement of the next course. Prior to the placement of the surface course, a preliminary punch list generated by the Public Works and Engineering Division must be completed by the contractor.

# **SECTION VIII**

## **ENGINEERING DETAILS**