

Chapter 16.44

**LAND IMPROVEMENTS**

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**16.44.005 Definitions.**

- A. See Chapter 16.08 for applicable definitions.
- B. Abbreviations:
  - ANSI = American National Standards Institute,
  - ASTM = American Society for Testing Materials,
  - AWWA = American Water Works Association,
  - DI = Ductile Iron,
  - IDOT = Illinois Department of Transportation,
  - IDOT CA-6 = That department's gradation of coarse aggregate,
  - PVC = Polyvinylchloride, a plastic,
  - SDR = Standard Dimension Ratio,
  - VCP = Vitrified Clay Pipe.

(Ord. 1997-M-103 § 1; Ord. 1989-M-65 § 1.)

**16.44.010 Purpose.**

The following standards and specifications set forth in this chapter outline the minimum Ordinance No. 1963-21, the subdivision control ordinance of the city of St. Charles. The standard specifications are covered under three primary headings of:

- A. Sanitary sewers;
- B. Water mains;
- C. Street construction.

The standard specifications are followed by a series of general specifications which outline in detail the materials to be used and the methods to be followed in accomplishing the work. (Ord. 1960-29 (part).)

**16.44.030 Standards for road and bridge construction.**

In the standard specifications for street construction, reference is made to the Standard Specifications for Road and Bridge Construction of the Illinois Department of Transportation, adopted July 1, 1988, three copies of which were filed with city clerk more than 30 days prior to the passage of the ordinance adopting this provision. These are to be considered as a part of these standards and specifications as if quoted herein verbatim. These specifications are hereinafter referred to as "State standard specifications." (Ord. 1989-M-65 § 1.)

**16.44.050 Plans and specifications - Requirements generally.**

- A. All plans and specifications for land improvements shall be prepared generally in accord with those prepared for the city on city financed improvements.
- B. Street plans shall show all horizontal and vertical alignment. Curve data for horizontal and vertical curves shall be included on the plan sheets.
- C. Storm sewers shall be provided unless existing storm sewers are adequately sized and placed to accommodate runoff. Such sewers shall provide for extension to land lying within the drainage area, whether such land is within the subdivision or not. Storm sewers shall be designed by the Rational Method and copies of the design computations shall be submitted with the plans. Inlets shall be provided so that surface water is not carried across or around any intersection, nor for more than a distance of six hundred feet in the gutter.
- D. All plans shall describe an adequate number of bench marks, with elevations referenced to mean sea level, so that elevations may be checked at any point without more than one setup of a surveyor's level.
- E. Unless otherwise approved, plans shall be on twenty-four-inch by thirty-six-inch sheets. Each set of plans shall include a title sheet showing the name of subdivision, type of work covered, a

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- location map showing relation of area to be improved to existing streets, an index of sheets, a summary of quantities, and the name and address of the person preparing the plans. Plan and profile shall be plotted on federal aid sheets, plat 1 or 2, at a scale of one inch to fifty feet, horizontal; and one inch to five feet, vertical. Cross sections shall be plotted on federal aid sheets, plat 3, at a scale of one inch to ten feet, horizontal and vertical. All necessary information shall be shown, including earthwork quantities.
- F. All plans and specifications shall be prepared by an engineer legally authorized by the state and shall bear the engineer's seal.
  - G. The subdivider and any contractors employed by him shall take special care to avoid disturbance of lot and block corners and other survey points. Any such corners or points removed or disturbed shall be reestablished in their correct position and location before application is made for acceptance by the city.
  - H. No deviations from plans and specifications shall be made without prior approval.
  - I. Before acceptance of improvements, the subdivider shall furnish the city with the original or certified copies of all materials tests required, an affidavit that all materials, labor and other costs have been paid for and three prints of plans revised to show the final layout of the improvements as built. These shall clearly indicate the location of all underground utilities and shall give measurements to house service sewers measured from the nearest downstream manhole and water services measured from lot or block corners.

(Ord. 1960-29 (part).)

### **16.44.060 Sanitary sewers - Standard specifications for Gravity Sewers.**

- A. Installation shall be in accordance with the Standard Specification for Water and Sewer Main Construction in Illinois, fourth edition (hereafter the "Standard Specifications"), three copies of which were filed with the city clerk more than 30 days prior to the passage of the ordinance adopting this provision, and applicable provisions of the St. Charles Municipal Code shall govern. The sanitary sewer system designs shall have a minimum usable, watertight service life of fifty (50) years.
- B. Sewers shall be of adequate size to serve the entire development proposed. The minimum size of street sewers shall be eight (8) inches inside diameter. The minimum size of sewer service connection is six (6) inches, inside diameter.
- C. Before commencing the sewer layout, the subdivider shall confer with the City to determine the required size and grades for any trunk sewers traversing the subdivision to fit the City's overall plan. These shall be installed by the subdivider under arrangements as provided in the subdivision control ordinance.
- D. A registered Illinois professional engineer must certify conformance to applicable provisions of 16.44.090 through 16.44.120.
- E. A registered Illinois professional engineer must certify conformance to applicable installation provisions of 16.44.130 through 16.44.330.
- F. Sanitary sewer service laterals shall be provided for each lot, parcel or tract. The lateral shall extend to the right-of-way line.
- G. Sanitary sewer service connections shall consist of a 1/8 sewer pipe curve set in the bell of a Y fitting or a combination T-Y molded fitting. The necessary lengths of straight pipe may extend to within five (5) feet of the building foundation. All requirements for material and installation for sewer mains are applicable to sewer service connection pipes. Testing of sewer service connection pipes shall be done as part of sewer main tests as defined in Section 16.44.260 for infiltration of water and exfiltration of air under pressure. PVC sewer service pipe is not required to have deflection tests. Television testing of sewer service pipe is not required.

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- H. On completion of the sewer, the contractor shall provide facilities at the low end of the main sewer for temporarily dewatering the sewer. Water pumped out shall be disposed of in a manner acceptable to the city engineer.
- I. No construction shall commence until a copy of a permit from the Illinois Environmental Protection Agency is filed with the City.
- J. Manholes shall conform to standard drawing number 16.44.060.J (Exhibit at end of Chapter)
- K. Minimum weight of cover shall be as follows:
  - 1. On collector streets, five hundred forty pounds.
  - 2. On minor streets and cul-de-sacs, four hundred pounds.
- L. The fluid flow design characteristics of all sewer pipe shall use a Manning "n" Factor of .013. (Ord. 2005-M-18 § 1; Ord. 2002-M-30 § 1; Ord. 1989-M-65 § 1.)

### **16.44.061 Sanitary Sewers – Standard Specifications for Force Main Sewers**

- A. Installation shall be in accordance with the Standard Specification for Water and Sewer Main Construction in Illinois, fourth edition (hereafter the “Standard Specifications”), three copies of which were filed with the city clerk more than 30 days prior to the passage of the ordinance adopting this provision, and applicable provisions of the St. Charles Municipal Code shall govern. The sanitary sewer system designs shall have a minimum usable, watertight service life of fifty (50) years.
- B. Force main sewers shall be of adequate size to serve the entire development proposed and the maximum capacity of the proposed lift station, whichever is greater. The minimum size of a force main shall be four (4) inches inside diameter.
- C. A registered Illinois professional engineer must certify conformance to applicable provisions of 15.44.090 through 16.44.120.
- D. A registered Illinois professional engineer must certify conformance to applicable installation provisions of 16.44.130 through 16.44.330.
- E. A manhole shall be placed over each horizontal bend in the force main and each horizontal bend of the force main shall be an elbow with a cap.
- F. Manholes shall be placed over the force main a minimum of every seven hundred (700) feet and a tee with a cap shall be placed inside every manhole.
- G. On completion of the force main, the contractor shall provide facilities at the low end of the main sewer for temporarily dewatering the sewer. Water pumped out shall be disposed of in a manner acceptable to the City Engineer.
- H. No construction shall commence until a copy of a permit from the Illinois Environmental Protection Agency is filed with the City.
- I. Manholes shall conform to standard drawing number 16.44.060.J (Exhibit at end of Chapter)
- J. An air release valve and vault shall be placed at each high point of the force main. Air release valve and vault shall conform to standard drawing number 16.44.061.J (Exhibit at end of Chapter)

(Ord. 2005-M-18 § 1.)

### **16.44.070 Water Distribution Systems - Standard specifications.**

- A. Water main pipe shall have a minimum diameter to satisfy fire flow requirements or eight (8) inches unless the total length of the public main is 300 feet or less and as approved by the Director of Public Works, the minimum diameter may be six (6) inches. Water main pipe shall be ductile iron manufactured in accordance with the requirement of ANSI/AWWA C151/A21.51. Push-on joints and mechanical joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11. Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50

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- and shall be based on laying conditions and internal pressures specified in the project plans with a minimum thickness class of 52. All side yard and rear yard water main not directly adjacent to a public roadway or paved surface shall have a minimum thickness class of 55 with a type five laying condition, as defined in ANSI/AWWA C/600/A21.50 Section 3.3.7, see City Standard Drawing No. 16.44.070.03, attached. Pipe shall have cement mortar lining and seal coating in accordance with ANSI/AWWA C104/A21.4.
- B. Installation of Ductile-Iron water mains and their appurtenances shall be in accordance with the requirements of ANSI/AWWA C600/A21.50. Including lubricating mechanical joint gaskets with pipe lubricant and applying a minimum of 75 foot pounds of torque to bolting systems. Water main shall have a minimum type three laying conditions, as defined in ANSI/AWWA C600/A21.50 Section 3.3.7, see City Standard Drawing No. 16.44.070.01, attached. Polyethylene encasement is required in all installations in accordance with ANSI/AWWA C105/A21.5. Polyethylene encasement may be deleted if soil analysis, from the site, performed by a Professional Engineer, approved by the City, indicated that polyethylene encasement is not required. To insure electric conductivity, brass wedges shall be installed per Section 41.205C of the Standard Specifications for Water and Sewer Construction in Illinois, dated May 1996, as amended. Water main shall have a minimum cover of 5 (five) feet and maximum bury depth of 10 (ten) feet, unless approved by the City Council. Water main and publicly owned water appurtenances shall be located a minimum of 20 (twenty) feet from buildings or structures. If site conditions will not allow for the minimum separation approval must be received from the City Council.
- C.
1. Mechanical joint fittings shall be restrained by a device, which consists of multiple individually activated gripping surfaces built into a mechanical joint follower gland. Device shall be manufactured from ductile iron conforming to ASTM 536.80. The restraining device shall be such that it can replace a standardized mechanical joint gland and can be used with any standard mechanical joint beel conforming to ANSI/AWWA C111/A21.11 and to ANSI/AWWA C153/A21 of the latest revision. The device shall utilize torque sensitive, "twist off nuts" that shall be incorporated in the design or the wedge activation screws to insure proper torque. The restrained device shall have a published working pressure rating 350 PSI in sizes through 16" and 250 PSI above 20". A 2.0 safety factor will be built in to the working pressure rating. Restraint device for mechanical joints shall be Uni-flange series 1400 manufactured by the Ford Meter Box Company of Wabash, Indiana or 1100 or 3000 series Megalug Manufacturer by EBAA Iron Sales, Inc. of Eastland, Texas.
  2. Pipe from mechanical joint restraint specified in 16.44.070 C.1. shall be restrained in accordance with the minimum guidelines stated in City Standards Drawing No. 16.44.070.04 attached. Push joint pipe restraint shall be Field Lok 350 gasket as manufactured by United States Pipe and Foundry Company of Birmingham, Alabama or Series 1700 Megalug by EBAA Iron Sales In. of Eastland, Texas or Series 1390 Pipe Restraint as manufactured by Ford Meter Box Co., Inc. of Wabash, Indiana.
- D. Ductile-iron Compact Fittings shall be manufactured in accordance with the requirements of ANSI/AWWA C153/A21.53. Ductile-Iron and Gray-Iron fittings material and manufacture shall be in accordance with the requirements of ANSI/AWWA C11/A21.10.
- E. Distribution system valves shall be resilient wedge gate valve, epoxy coated, non-rising stem, o-ring seal, open left with a 2" square operating nut, manufactured in accordance with the requirements of AWWA C509-87. All distribution valves shall be housed in valve manholes in accordance with the detail provided in the exhibit entitled "Valve Vault" appended to this chapter except those valves on hydrant leads which shall be furnished with cast iron boxes and covers. Valves with a nominal pipe diameter under 10 inches shall be housed in valve manholes with an

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- inside diameter of 4 feet, valves 10 inches and larger shall be housed in valve manholes with an inside diameter of 5 feet. The weight on the manhole's cast iron cover and lid shall be not less than four hundred pounds, except where the manhole lies with the paved surface area of a collector street in which case the manhole cover and lid shall weigh not less than five hundred forty pounds. Manhole lids shall have "Water" imprinted on the lid. Water main with a bury depth of 6.0' and greater shall have steps installed in valve vaults.
- F. Fire Hydrants shall be either Clow Medallion Fire Hydrants, as manufactured by the Clow Valve Company of Oskaloosa, Iowa, or Mueller Super Centurion 200 Fire Hydrants, as manufactured by Mueller Company, Decatur, Illinois, or Waterous Pacer Model WB-67-250, or equal as approved by City Council. Hydrants will have two, two and one-half inch hose nozzles and one, four and one-half inch steamer nozzle threaded for St. Charles thread. All threads shall be National Standard. All hydrants shall be for six-inch pipe connection and shall have a five-inch valve opening. Hydrants shall be of sufficient length to allow for five feet of cover over the hydrant lead. An auxiliary six-inch valve and valve box shall be installed on each hydrant lead. All hydrants shall have two coats of paint matching the city standard for color, commonly known as Rover Red. Hydrants shall have installed "Hydrfinder Standard" hydrant locators as manufactured by the Radon Corporation of St. Charles, Illinois, or equal approved by the City Council.
- G. Valve boxes on hydrant leads shall be buffalo-type, three piece, Mueller No. H-10357, Clow F-2450, or equal as approved by the City Council. All valve boxes shall have a valve box stabilizer installed.
- H. After the water mains have been tested in accordance with Section 16.44.290 and disinfected in accordance with Section 16.44.300 the water service line shall be provided from the main to the outlet side of the curb stop, for each lot. The copper service pipe shall be soft temper, type-K copper tubing, one-inch diameter minimum. Approved fittings shall be of compression type manufactured by the Ford Meter Box Co. Inc., of Wabash, Indiana, the Mueller Co. of Decatur, Illinois, or equal as approved by City Council, as follows:
- One Inch Corporation Stop:
    - Ford No. FB 1000-4-Q
    - Mueller No. B-25008
  - One Inch Curb Stop:
    - Ford No. B-44-444-Q
    - Mueller No. B-25155
- Every water service line from the corporation to the curb stop shall be inspected by the Water Division Foreman or his designee. All inspections shall be open trench. Contractors requesting service line inspections shall contact the Water Division 48 hours prior to requested inspection time.
- I. Each curb stop shall be provided with a cast iron service box Mueller No. H-10300 or equal approved by the City Council complete with lid. Service box shall be of sufficient length to permit the top to be installed approximately three inches above finish grade. Each service box shall be provided with a cap with the word "water" cast in the top.
- J. Tapping sleeves, for sizes up to eight-inch, shall be stainless steel manufactured by Romac Industries, Inc., of Seattle, Washington, Model No. SST-945 or Mueller Co. of Decatur, Illinois, Model No. H-615 or equal approved by the City Council. All fasteners used to connect tapping sleeve to tapping valve shall be 304 grade stainless steel fasteners.
- K. Unless specifically approved, all water mains and services shall be laid in separate trenches from sewer and sewer services, as outlined in Sections 16.44.130 through 16.44.140.

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- L. No Public Water Main construction shall commence until a Public Water Supply Construction Permit is obtained from the Illinois Environmental Protection Agency, and a copy of such permit is filed with the city.
- M. Landscape plantings shall not interfere with operations and maintenance of water appurtenances. Trees shall not be planted within ten feet of all hydrants, valve vaults, or curb boxes. Bushes and shrubs shall be maintained five feet from water appurtenances. Sod is required around hydrants for ten feet. Hydrant plants shall follow the guidelines depicted in City Standard drawing No. 16.44.070.02, attached.
- N. All below grade, factory installed bolts and fasteners shall be 304 grade stainless steel.  
(Ord. 2007-M-89 § 1; Ord. 2002-M-95 § 1; Ord. 1999-M-29 § 1; Ord. 1997-M-103 § 1; Ord. 1993-M-46 § 1; Ord. 1960-29 (part).)

### **16.44.080 Street construction - Standard specifications.**

- A. Subgrade.
  - 1. The subgrade of all streets shall be graded and rolled in accordance with state standard specifications. Prior to placing any type of base material, the subgrade shall be inspected and approved by the city. Twenty-four hours advance notice shall be required for such inspections. (Ord. 1989-M-65 § 1.)
  - 2. Particular attention is directed to the requirements for the replacement of soft and unstable material as contained in Article 22.3 of the state standard specifications.
  - 3. Embankment shall be placed and compacted in accordance with Section 16 of said specifications.
  - 4. Rock shall be excavated to a minimum depth of four inches below the subgrade.
- B. Gravel of Crushed Stone Base Course.
  - 1. This work shall be in accord with Section 29 of the state standard specifications. The type of base construction shall be type B and shall comply with Article 29.5(b). The requirement of using a spreader box or mechanical spreader may be waived by the city.
  - 2. The granular material used shall be grade 7, 8, or 9, unless a modified gradation of material is submitted to the city and approved by the city in writing. All granular materials shall be tested by a testing laboratory approved by the city and copies of tests, as required by the State Highway Department, shall be furnished to the city prior to the placing of such materials.
- C. Bituminous Surface Treatment, Subclass A-3.
  - 1. This work shall be in accordance with Section 39 of the state standard specifications. Seal coat aggregate may be used in lieu of cover coat aggregate in the construction of the two cover coats.
  - 2. Any loose aggregate remaining on the completed surface or lying in the gutters shall be picked up by hand brooming or other approved method.
  - 3. A thin layer of sand shall be applied to all areas of the completed surface that tends to bleed from excessive bituminous material as directed by the city.
- D. Bituminous Concrete Surface Course, Subclass B-5. This work shall be in accordance with Section 44 of the state standard specifications. The bituminous mixture shall be placed only when the temperature of the air in the shade is above forty degrees fahrenheit and only when weather conditions are deemed suitable by the city.
- E. Concrete Gutter, Type B Modified.
  - 1. This work shall be in accord with the applicable portions of Section 80 of the state standard specifications and the city's standard. Cylinders shall be taken of the concrete and tested for compressive strength by a laboratory approved by the city.

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2. This type of construction shall be considered a minimum standard by the city and any alternate type of combination concrete curb and gutter shall be submitted to the city for approval prior to commencing any street construction.
- F. Portland Cement Concrete Sidewalk. This work shall be in accordance with Section 89 of the state standard specifications. The city's sidewalk standard shall be used as a minimum for the width and thickness of sidewalks.
- G. Storm Drainage.
1. Catch basins, manholes, and inlets shall be constructed in accord with Section 75 of the state standard specifications.
  2. Storm sewers shall be constructed in accord with Section 66 of said specifications. The minimum inside diameter of storm sewers permitted to be used shall be twelve inches, except that a single inlet can be connected into a catch basin or manhole with a ten-inch diameter storm sewer. All drainage facilities are subject to approval by the city and shall provide sufficient capacity for the draining of upland areas contributing to the storm water runoff on the street.
- (Ord. 1960-29 (part).)

### **16.44.091 Vitrified clay pipe, material.**

- A. All VCP pipe shall conform for acceptance to A.S.T.M. C-700.
  - B. Joints shall conform to requirements of Section 16.44.240, or shall conform to requirements of A.S.T.M. C-425.
- (Ord. 1989-M-65 § 1.)

### **16.44.092 Ductile iron pipe, material.**

The City Engineer shall specify whether mechanical or push-on joint will be used. The engineering plans shall specify certification and test records. Engineering plans shall specify written statements of conformance for inspection and foundry records as provided in these specifications.

(Ord. 1997-M-103 § 1; Ord. 1989-M-65 § 1.)

### **16.44.093 PVC plastic pipe, material.**

- A. All PVC pipe and fittings shall conform to ASTM D-3034 for sizes six (6) through fifteen (15) inches. The minimum SDR is twenty-six (26) for pipe and SDR thirty-five for fittings. For pipe diameters eighteen (18) to twenty-seven (27) inches, pipe and fittings shall conform to ASTM F-679. All PVC plastic shall have a cell classification of 12454-B. Purchase orders shall specify written report of test results and certification of material by manufacturer per ASTM specifications.
  - B. Joints shall conform to ASTM D-3212. Solvent joints are not permitted.
- (Ord. 1989-M-65 § 1.)

### **16.44.096 Special conditions, material.**

For pipe sizes not herein specified or for other conditions of environment or application, the engineer will specify an alternate material as described in the standard specifications. (Ord. 1989-M-65 § 1.)

### **16.44.101 Vitrified clay pipe, application.**

- A. Standard strength clay pipe (ASTM C-700) shall be permitted for trench depth of twelve (12) feet or less measured from top of pipe. Extra strength clay pipe (ASTM C-700) shall be used for

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depths up to twenty (20) feet. Ductile iron or other engineer specified material shall be used for depths exceeding twenty (20) feet.

- B. VCP shall only be used for gravity mains (i.e., zero pressure).  
(Ord. 1989-M-65 § 1.)

### **16.44.102 Ductile iron pipe, application.**

DI pipe may be used on all gravity mains (i.e., zero pressure) and shall be used on all force mains or for depths exceeding twenty (20) feet. Coal tar enamel or other suitable coating will be specified by the engineer to protect internal diameter from corrosion. When external corrosion resistance is required, the polyethylene encasement of ANSI C-105 shall be used. (Ord. 1989-M-65 § 1.)

### **16.44.103 PVC pipe, application.**

PVC pipe shall only be used in gravity mains (i.e., zero pressure) for depths up to twenty (20) feet or less measured from top of pipe. (Ord. 1989-M-65 § 1.)

### **16.44.110 Sewer pipe, VCP specials.**

- A. Branches shall be furnished with the connection or connections of the size or sizes specified, securely and completely fastened by fusion in the process of vitrification to the barrel of the pipe.
- B. Channel or split pipes, curves and branches shall be accurate half-sections of the corresponding size of straight pipe and specials.
- C. Pipes shall bear the initials or name of the person, company or corporation by whom they are manufactured, location of the mill, and the symbol ES on extra strength pipe.

(Ord. 1960-29 § KA(3).)

### **16.44.120 Sewer pipe, inspection of material.**

- A. All pipes shall be subject to inspection at the factory as defined in material testing specifications included herewith, and at the trench or other point of delivery by the engineer. The purpose of this inspection by the engineer will be to cull and reject pipes which fail to comply with the requirements of the specifications.
- B. All rejected pipes will be plainly marked by the engineer and shall be replaced by the contractor with pipes which meet the requirements of these specifications, without additional cost.

(Ord. 1989-M-65 § 1.)

### **16.44.130 Sewer and water main construction - Generally.**

- A. The work included in Sections 16.44.140 through 16.44.300 consists of the furnishing of all material and labor required for the construction complete in place of sewers or water mains and will be paid for either on a lump sum basis or unit price basis whichever is stipulated in the proposal.
- B. Included in Sections 16.44.140 through 16.44.300 is all excavation required by such work, all pumping, bailing and draining, sheeting and shoring, removal and disposal of buried structures and obstacles, and all necessary measures to provide for local travel and access.
- C. The costs of all junctions shall be included in the contract price unless otherwise specified in the proposal.
- D. Connections with existing sewers or water mains shall be made at points noted on the plans and wherever an existing sewer or water main is intercepted by the proposed system of sewers or water mains, if so ordered by the engineer.
- E. Old manholes shall be reappointed and any loose brick in the walls of the manholes shall be relaid.

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- F. Junctions for future sewer connections shall be bricked off at the ends, thoroughly closing them. When connections are made with sewers carrying water, special care must be taken that no part of the work is built under water, a flume or dam must be put in and the new work kept dry until finished.
- G. The terminations or intersections of submains and laterals with main and submain respectively, shall be made through junctions previously built. If for any cause, the junction previously made in the sewer with which the contractor is to connect is to be changed in size or position or a new one is to be built, the contractor shall without extra charge, do all the necessary labor of any kind as a result of said change.

(Ord. 1960-29 § KF(1).)

### **16.44.140 Sewer and water main construction - Protection of water mains and service lines from sewers.**

- A. Water mains - Horizontal clearance.
  - 1. Whenever possible, a water main should be laid at least ten feet horizontally from any existing or proposed drain or sewer line.
  - 2. Should local conditions prevail which would prevent a lateral separation of ten feet, a water main may be laid closer than ten feet to, or in the same trench as, a storm or sanitary sewer, provided the main is laid in a separate trench or on an undisturbed earth shelf located to one side of the sewer and at such an elevation that the bottom of the water main is at least eighteen inches above the top of the sewer. This deviation must be approved in writing by the city engineer.
  - 3. If it is impossible to obtain proper horizontal and vertical separation as stipulated in subparagraph 1 and 2 of this subsection, both the water main and sewer should be constructed of ductile-iron pipe and be pressure-tested to assure watertightness before backfilling. Such tests to be conducted in the presence of the City Engineer.
- B. Water mains - Vertical clearance.
  - 1. Whenever water mains must cross house sewers, storm drains, or sanitary sewers, the water main should be laid at such an elevation that the bottom of the water main is eighteen inches above the top of the drain or sewer. This vertical separation should be maintained for that portion of the water main located within ten feet, horizontally, of any sewer or drain crossed, said ten feet to be measured as the normal distance from the water main to the drain or sewer.
  - 2. Where conditions exist that the minimum vertical separation set forth in subparagraph 1 of this subsection cannot be maintained, or it is necessary for the water main to pass under a sewer or drain, the sewer main should be laid with ductile-iron pipe, and the pipe should extend on each side of the crossing until the normal distance from the water main to the sewer or drain line is at least ten feet. In making such crossings, it is preferable to center a length of water main pipe over the sewer to be crossed so that the joints will be equidistant from the sewer and as remote therefrom as possible. Where a water main must cross under a sewer, a vertical separation of eighteen inches between the bottom of the sewer and the top of the water main should be maintained, along with means to support the larger-sized sewer lines to prevent their settling and breaking the water main.
- C. Water service lines - Clearances. The horizontal and vertical separation between water service lines and all sanitary sewers, storm sewers, or any drain should be the same as for water mains, as detailed in subsections A and B of this section, except that when minimum horizontal and vertical separation cannot be maintained, brass, copper or ductile-iron pipe shall be used for water service lines.

(Ord. 1997-M-103 § 1; Ord. 1989-M-65 § 1.)

**16.44.150 Sewer and water main construction - Excavation.**

- A. The contractor shall make to the necessary width and depth all excavations required for the construction of the improvement. Excavation shall include clearing the site of the work, the loosening, loading, removing, transplanting and disposing of all materials, wet or dry, necessary to be removed for purpose of construction, the sheeting, bracing, draining and backfilling of trenches and pits and the grading and shaping of fill about finished structures.
- B. The contractor must assume the risk of meeting quicksand, hardpan, boulders, clay, rubbish, unforeseen obstacles, underground conduits, gas pipe, drain tile, railroad tracks, pavements, etc., and accept payment for all work at the contract price.
- C. No claim for an amount of money beyond the contract price of the work will be entertained or allowed on account of the character of the ground in which the trench or other excavations are made, except for rock excavation.
- D. The sites of all excavations and embankments shall be first cleared of all trees (except those designated by the engineer to be saved), stumps, brush, rubbish, or other surface material which shall be removed and disposed of in a satisfactory manner. All top soil, loam and similar material covering the location of excavation shall be removed and kept separate and piled for use in resurfacing as may be directed. All trees designated by the engineers to be saved shall be adequately protected by boxes in a manner approved by the engineer.
- E. The ground shall be excavated in open trenches except where tunneling is considered necessary or proper by the engineer, in such direction as is required, to the width and depth as may be necessary for the proper construction of sewer or water main and appurtenances according to plans.
- F. The trenches must be of sufficient width for ample room within the limits of the excavation or the lines of the sheeting to permit the work to be constructed in the manner and size specified.
- G. Subsection G does not apply to PVC gravity sewer pipe; see Section 16.44.155. The bottom width of the trench at and below the top of the pipe, and inside the sheeting and bracing, if used above the top of the pipe, shall not exceed the following widths, unless otherwise specifically approved by the engineer:

<b>Pipe Size (in inches)</b>	<b>Maximum Width at Top of Pipe</b>
6 through 12	Inside diameter + 18 inches
15 through 21	Inside diameter + 20 inches
27 through 30	Inside diameter + 22 inches
36 and over	Inside diameter + 32 inches

(Ord. 1997-M-103 § 1.)

- H. Subsection H does not apply to PVC gravity sewer pipe; see Section 16.44.155. If the character of the ground met in excavating is such that the external form of the sewer cannot be preserved, the excavation shall be made to conform as nearly as possible to the external shape and dimensions of the sewer and the space between the external sewer lines and the bottom and the sides of the excavation as made shall be filled by the contractor with crushed stone, Type B, per ASTM C-12, compacted to a minimum proctor density of 80%.
- I. Where trench backfill is to be paid for separately, the width of the trench shall be limited as specified herein. If a wider trench is dug, trench backfill outside these limits shall be furnished and placed at the contractor's expense.

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- J. The excavation of the trench shall not advance more than two hundred feet ahead of the completed masonry or pipe work except where, in the opinion of the engineer, it is necessary to drain wet ground.
- K. No tunneling of pipe sewers or water mains will be allowed except upon written permission from the owner. The tunnels shall be of such width and height as the engineer may direct and shall be excavated in conformity with the cross-section approved by him.
- L. Elevation of the bottom of trenches shall be checked to the satisfaction of the engineer before sewers or water mains are laid.
- M. In the event that any existing gas pipes, water pipes, conduits, sewers, watercourses and tile drains are blocked or interfered with during the construction of said improvement, the contractor shall maintain continuous operation and restore the same and leave it in the same condition as they were prior to the improvement.
- N. At all cross streets, the contractor shall, when directed by the engineer, make provision for the passage of vehicles and pedestrians either by bridging or otherwise.
- O. The contractor must make necessary arrangements with all persons, firms and corporations owning or using any pipes, tracks or conduits, affected by this improvement, to maintain and protect such pipes, tracks or conduits during construction. The cost of any such protection must be merged in the prices bid for the improvement.

(Ord. 1989-M-65 § 1; Ord. 1960-29 § KF(3).)

**16.44.155 PVC sewer pipe - Excavation.**

- A. Subsections 16.44.150 A through D and I through O apply to PVC sewer pipe. Common trench construction does not apply.
- B. Trench width:
  - 1. Narrow, unsupported, vertical-walled trench. The amount of pavement to be removed and replaced, amount of rock excavation or the amount of embedment material used may dictate that the most economical installation is the narrow, vertical-walled trench. The width of haunching material shall provide a minimum of six to nine inches clearance on each side of the pipe for six inches and larger sizes. In narrow trenches, the pipe embedment shall be compacted all the way to the trench walls.

NARROW TRENCH WIDTH, MINIMUM	
<u>Nominal Pipe Size</u>	<u>Trench Width, Minimum</u>
<u>Inches</u>	<u>Inches</u>
6	18
8	24
10	26
12	30
15	30
18	32
21	34
24	36
27	40

- 2. Wide trench. Wide trenches are classified as trenches whose width at the top of the pipe is greater than 2-1/2 pipe diameters on each side of the pipe or a total of 6 pipe diameters. There is no width of trench beyond which the load on a flexible pipe exceeds the prism load; accepted installation practices dictate narrow trench construction. In isolated circumstances, it may be more cost effective to use wide trench construction, i.e., in areas where narrow

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trench walls cannot be maintained. If trench width at the top of a small diameter pipe (6", 8" and 10" diameters) would exceed 6 pipe diameters, the embedment up to the pipe springline shall be compacted to a point approximately 2-1/2 pipe diameters from each side of the pipe. For larger diameter PVC pipe (12"-48" diameters) installed in wide trenches, the embedment up to the pipe springline shall be compacted to a point at least one pipe diameter or 24 inches from each side of the pipe, whichever is greater.

- C. Braced and sheeted trenches. The general requirements of the standard specifications will apply. Depending upon the severity of the condition, the installer may elect to use tight sheeting, stay bracing, trench jacks or a trench shield or box to support the trench during pipe-laying operations. If the condition is too severe, it may be necessary to leave any sheeting in place or to use chemical or cement grouting of the soil adjacent to the excavation to prevent migration between the material used beneath and around the pipe and trench wall material. To allow sufficient working room plus trench wall support, the minimum excavated trench width to the outside of the sheeting or shield box shall be as shown in table:

SUPPORTED TRENCH WIDTHS, MINIMUM	
<u>Nominal Pipe Size</u>	<u>Trench Width, Minimum</u>
<u>Inches</u>	<u>Inches</u>
6	36
8	36
10	42
12	42
15	48
18	48
21	50
24	52
27	56

NOTE: Widths are based upon 8 to 10 inches clearance on each side of the pipe to the inner face of trench supports. The trench supports are assumed to be 6 inches thick trench box or shield walls or 4 inch walls inside of 2 inches sheeting. Exceptionally deep trenches with thicker sheeting and bracing or other systems of trench support may require variation of these trench widths. Timber sheeting, where used below the top of the pipe, shall be driven approximately 2 feet below the bottom of the pipe and be left in place approximately 1.5 feet above the top of pipe. In supported trenches, compaction of foundation and materials shall extend to the trench wall or sheeting left in place. When using movable trench support, care shall be exercised not to disturb the pipe location, jointing or embedment. Removal of any trench protection below the top of the pipe and within 2-1/2 pipe diameters of each side of the pipe is prohibited after the pipe embedment has been compacted. Movable trench supports can only be used in wide trench construction where supports extend below the top of the pipe or on a shelf above the pipe with the pipe installed in a narrow, vertical-wall subditch. Any voids left in the embedment material by support removal shall be carefully filled with IDOT CA-6, granular material which is adequately compacted. Removal of bracing between sheeting shall only be done where backfilling proceeds and bracing is removed in a manner which does not relax trench support. When advancing trench boxes or shield, longitudinal pipe movement or disjoints shall be prevented.

(Ord. 1989-M-65 § 1.)

**16.44.160 Sewer and water main construction - Trenching and trimming.**

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- A. All trenches must be of sufficient width for properly constructing sewers, water mains, conduits, or other structures in the manner and of the size specified; and for removing any material which the engineer may deem unsuitable for foundation as well as to permit suitable sheeting and bracing to be placed wherever required. Whenever the nature of the ground will admit, the bottom shall have the shape and dimensions of the outside of the masonry or pipe.
- B. Wherever, in the opinion of the engineer, it is impossible to use excavating machinery and protect existing private or public property, or wherever use of excavating machinery will do damage of such nature as to involve irreparable or very costly damages, the contractor will use hand excavation tools.
- C. Sidewalks must in no case be obstructed and the contractor shall make provision at all cross streets and driveways for the free passage of foot passengers and vehicles by bridging or otherwise.

(Ord. 1960-29 § KF(4).)

### **16.44.170 Sewer and water main construction - Unauthorized excavation.**

Whenever the excavation is carried beyond the lines and grades given by the engineer, the contractor shall, at his own expense, refill all such excavated space with such material and in such manner as may be directed. Beneath and around concrete structures, space excavated without authority shall be thoroughly compacted when refilling or, if deemed necessary by the engineer, shall be refilled with concrete at the contractor's expense. (Ord. 1960-29 § KF(5).)

### **16.44.180 Sewer and water main construction - Protection against water.**

- A. The contractor shall do all pumping and bailing, build all drains, and do all other work necessary to keep the excavation clear of groundwater, sewage or stormwater during the progress of the work and until the finished work is safe from injury.
- B. Where the excavation is in wet sand and suitable construction conditions cannot be obtained by other methods, the contractor shall install and operate at no additional compensation a pumping system connected with well points, so as to drain the same effectually. No masonry shall be laid in water and water shall not be allowed to rise over masonry until concrete or mortar bags set at least forty-eight hours. All water pumped or drained from the work shall be disposed of in a satisfactory manner without damage to adjacent property or to other work under construction. Necessary precautions shall be taken to provide against flooding.
- C. No sanitary sewer shall be used for disposal of trench water, unless specifically approved by the city engineer and then only if the trench water does not ultimately arrive at existing pumping or sewage treatment facilities. No water containing settleable solids shall be discharged into storm sewers. The proposed method for the control of ground water shall be submitted to the city engineer for approval.

(Ord. 1989-M-65 § 1.)

### **16.44.190 Sewer and water main construction - Maintenance of excavation.**

- A. All trenches and other excavations shall be properly sheeted and braced to furnish working conditions acceptable to the engineer and to prevent damage and delay to the work. Side slopes shall be such that material will not slide into the bottom and any material sliding down shall be removed. Where masonry is built directly against the sides or bottom of the excavation, the final trimming shall be done just before the concrete is placed. To secure the protection of the work, the contractor must furnish and put in place at his own expense, braces, sheeting, etc., as may be necessary for the safety of the work, the public or adjacent property.
- B. The sheeting and bracing shall be removed as the work progresses in such manner as to prevent the caving in of the sides of the excavation, or any damage to masonry. While being drawn, all

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- vacancies left by the plank, shall be carefully filled with fine sand and rammed by special tools or puddled as directed.
- C. Where a sewer or water main is built along an existing pavement, curb and gutter or sidewalk, the trench shall be sufficiently sheeted and braced to prevent caving and said sheeting shall not be removed until the backfill has been flooded and completed.
  - D. The owner may order the sheeting and bracing left in, when in its opinion it is necessary for the protection of the work, the public or adjacent property. Any sheeting so ordered left in place will be paid for at a rate quoted in the proposal, said price to cover the furnishing, cutting, placing and bracing.
  - E. The contract price shall include the cost of all temporary supports and braces that may be necessary to secure a safe prosecution of the work until the permanent structure is complete; such temporary supports must in all cases be removed by the said contractor at his own expense after or concurrently with the completion of the permanent structure.  
(Ord. 1960-29 § KF(7).)

### **16.44.200 Sewer and water main construction - Foundations and timbers.**

- A. After the trench has been opened and to grade, it will be examined by the engineer who will determine whether or not it is satisfactory for pipe laying or it is necessary to stabilize the base, install concrete cradle, or drive piling. Any pipe laid in a trench that has not been examined and approved by the engineer is done so at the contractor's risk.
- B. The contractor will be allowed additional compensation for this work at prices named for the different kinds of foundation required only when shown on plans or called for in the proposal or specifications.
- C. Whenever the ground is sufficiently firm and unyielding, the masonry or pipes (except PVC pipe and ductile-iron water main) shall be laid directly on the bottom of the excavation and, in the cases of pipes, if the foundation is good, firm earth, it shall be pared or molded to give a full support to the lower half of each pipe and, if necessary, Type B, ASTM C-12 crushed stone shall be adopted in case the excavation has been made deeper than necessary. (Ord. 1997-M-103 § 1.)
- D. When so designated on the plans or ordered by the engineer, the contractor shall furnish and place piling foundations. Piling shall be driven or jetted in a manner acceptable to the engineer. The contractor is advised to purchase piling so designated or ordered only after a test pile (or piles) has been placed. When piling is required, the contractor when ordered by the engineer shall furnish and place test piles in a location designated by the engineer. The bearing value of a driven test pile will be computed on the basis of the engineering news record formula. When so ordered by the engineer, the contractor shall furnish and place framework and shall merge, in the unit price bid for pile foundations, the extra cost of furnishing the placing test pile (or piles). Payment will be made for test piles only on the per foot price included in the proposal for piling.
- E. Payment for all piling will be based on the actual length of piling incorporated in the work, that is, cut off tops will not be included in footage measured for payment.
- F. Any timber used for constructing timber cradles, or any other part of the permanent construction for said work, shall be subject to inspection, and approved by the engineer before it is installed in the work. Nothing but sound, durable timber, suitable in the opinion of the engineer for the purposes for which it is to be used shall be allowed on the work for sheeting, bracing or supporting timber. The dimensions of the timber to be used as a part of the permanent construction shall be specified by the engineer before such timber is installed in the work.
- G. No allowances will be made for timber installed and left in place, unless the quality and sizes of said timber have been passed upon by the engineer and unless the installation of such in writing by the engineer as their authorized representative. Timber piling shall be peeled mixed

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hardwood, sound for line and straightness with approximately a twelve-inch butt and a minimum of a six-inch tip.

- H. Concrete cradle composed of one part of Portland cement, two parts of fine aggregate and three and one-half parts of coarse aggregate shall be constructed where shown on plans and of such size and section as shown thereon, at points as are designated on the plans, or as ordered by the engineer. This concrete shall be of the same materials and workmanship as herein specified for concrete except weight batching will not be required.

(Ord. 1989-M-65 § 1; Ord. 1960-29 § KF(8).)

### **16.44.210 Sewer main construction, alignment.**

The contractor shall use an engineer approved method for measuring the line at each sewer. The contractor will keep appropriate records to enable accurate as-built drawings to be developed. (Ord. 1989-M-65 § 1; Ord. 1960-29 § KF(9).)

### **16.44.220 Sewer and water main construction - Grade.**

- A. Sewers must be built so as to remain true to line and grade. The inclining grade of the bottom of the sewer after completion shall be such that after flooding, the floodwater will drain off so that no remaining puddle of water will be deeper than three-eighths of an inch on pipe thirty-six inches internal diameter or smaller, and five-eighths of an inch on pipe larger than thirty-six inches internal diameter. Any section of pipe that does not comply with this specification at any time previous to final acceptance of the work shall be replaced or relaid at the contractor's expense.
- B. The contractor must locate and keep a record of all Y's and T's by measurement to nearest downstream manhole. A copy of such record will be furnished the engineer prior to final acceptance.

(Ord. 1960-29 § KF(10).)

### **16.44.230 Sewer and water main construction - Pipe laying.**

- A. Each pipe shall be laid on an even, firm bed so that no uneven strain will come on any pipe and particular care shall be exercised to prevent the pipes bearing on the sockets. Each pipe shall be laid in conformity with the line and levels given by the engineer and in the presence of the inspector.
- B. The bell end of all sewer pipe shall be laid up grade.
- C. The interior of all pipes shall, as the work progresses, be cleared of all dirt, jointing material and superfluous material of every description. On small pipes, where cleaning after laying may be difficult, a swab or drag shall be kept in the pipe line and pulled forward past each joint immediately after its completion.
- D. At times when the pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be allowed to enter the pipe. Before commencing work and removing the end-closure device, the contractor shall prepare the trench properly by dewatering and mucking out all unsuitable materials and backfilling the trench bottom to the proper grade with satisfactory material.
- E. Except for PVC sewer pipe, before lowering and while suspended, the pipe shall be inspected for defects by striking with a light hammer to detect cracks. Any defective, damaged or unsound pipe shall be rejected.
- F. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
- G. All pipe shall be stored in such a fashion as to keep foreign matter from being deposited inside it. Particularly, water main pipe shall be placed along the proposed alignment so that street surface water does not carry foreign objects and possible contaminants into it. If, in the opinion of the

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engineer, the pipe contains dirt that will not be removed during the flushing operation, the interior of the pipe shall be cleaned and swabbed. If necessary with water mains, it shall be swabbed with a bactericidal solution made up with calcium hypochlorite, chlorinated lime or sodium hypochlorite.

- H. Whenever necessary to deflect water pipe from a straight line either in a vertical or horizontal plane to avoid obstructions, the degree of deflection shall be approved by the engineer.
- I. The contractor shall not backfill sewers until elevation and gradient of sewers and pipe joints have been checked, inspected and approved by the engineer. Water mains shall not be backfilled until testing is completed.

(Ord. 1989-M-65 § 1; Ord. 1960-29 § KF(11).)

### **16.44.231 Sewer and water main construction - Encasement.**

- A. Where open trench construction is not practical, boring with concurrent installation of casing pipe shall be used. This work shall be done by a specialized contractor approved by the City Engineer.
- B. The casing pipe shall be new, smooth wall, welded steel pipe with bituminous coating. The pipe shall have 3/8 inch minimum wall thickness and its material shall have a minimum tensile yield strength of 35,000 p.s.i. All casing pipe joints shall be welded and leak-proof.
- C. All water and sewer mains installed in casing pipe shall have stainless steel casing spacers as manufactured by Cascade Waterworks Manufacturing Company of Yorkville, Illinois, or equal approved by the City Council installed per manufacturing standards.
- D. All sanitary sewer mains in the casing pipe shall be flanged mechanical joint, ductile iron pipe as specified in Section 16.44.092. No pipe deflection is permitted.
- E. The encased sewer pipe shall be tested in accordance with Section 16.44.260 prior to backfilling and closing the casing ends, casing pipe joints shall be welded and leak-proof. Pressure mains shall be tested in accordance with Section 16.44.290 prior to backfilling and closing ends. Each end of the casing shall be sealed with brick and mortar.
- F. After connection to mains, the sewer pipe shall be again tested in accordance with Section 16.44.260.

(Ord. 1997-M-103 § 1; Ord. 1989-M-65 § 1.)

### **16.44.235 PVC sanitary sewer construction - Trench.**

- A. Trench bottom. The soil surface at the trench bottom shall be free of any protrusions which may cause point loading on any portion of the pipe or bell, and shall provide a firm, stable and uniform support for the pipe.
- B. Special trench foundation. Where an unstable trench bottom condition is encountered, it shall be stabilized or alternative special trench foundation methods used. The engineer may elect to require a special foundation upon which bedding shall be provided.
- C. Over-excavation. During the course of construction, should the contractor inadvertently over-excavate the trench more than 6 inches below the bottom of the pipe, but less than 12 inches below the bottom of the pipe, he shall fill that area of over-excavation with IDOT CA-6 embedment material and compact to a density equal to the native soil. The contractor shall fill any area of over-excavation more than 12 inches below the bottom of the pipe with processed, crushed stone in the same manner as required above for special foundation but at his expense.
- D. Rock subgrade. Ledge rock, hard pan, cobbles, boulders or stone larger than 1-1/2 inches shall be removed from the trench bottom to permit a minimum bedding thickness of six (6) inches.

(Ord. 1989-M-65 § 1.)

**16.44.236 PVC sanitary sewer construction - Embedment materials and placement.**

- A. See city standard drawing no. 16.44.236, attached.
- B. Methods of placing embedment materials:
  - 1. ASTM D-2321 for Class I material shall govern procedures. Uniform layers not exceeding six (6) inches loose depth shall be compacted for pipe and manhole excavations.
  - 2. Saturation. If flooding, jetting or puddling is employed for compaction, care must be taken to provide drainage and prevent flotation of the pipeline. Saturation shall not be permitted when ground and ambient temperature is less than 32 degrees F. Erosion of support at the pipe sides and bottom by water jetting shall be prevented. Apply only enough water to give complete saturation. Allow time for the saturated soil in each layer to de-water and solidify until it will support the weight of workers.
  - 3. Use of compaction equipment. Take care to avoid contact between the pipe and compaction equipment directly over the pipe until six inches of backfill has been placed over top of the pipe to assure that such equipment will not damage or disturb the pipe. Compaction will not be permitted below 32 degrees F. ambient and ground temperature.
- C. Compaction by hand placement, hand tamping or dumping is not acceptable.
- D. The embedment shall be compacted to a minimum of 90% of Modified Proctor Density in accordance with ASTM D-2049 or other methods approved by the engineer.  
(Ord. 1993-M-49 § 1; Ord. 1993-M-27 § 1; Ord. 1989-M-65 § 1.)

**16.44.237 PVC sanitary gravity sewer - Pipe and fitting joining.**

- A. General procedure. Before being set in place, each component of piping shall be inspected for damage and cleaned. Damaged components shall be marked rejected. Pipe bells shall be laid on the upstream end. Sewer laying shall commence at the lowest elevation and shall terminate only at manholes, service branches or cleanouts. Trenches shall be de-watered. Whenever pipe laying is interrupted, the end of the pipe shall be temporarily plugged to prevent the entrance of water, mud or foreign matter, and the pipe shall be secured to prevent its being dislodged.
- B. Location and alignment. Pipe and fittings shall be embedded in the trench with the invert conforming to the required elevations, slopes and alignment, and with the pipe bottom uniformly and continuously supported by a firm bedding and foundation. As-built drawings shall locate sanitary sewer services in the right-of-way.
- C. Cutting and beveling pipe. For shorter than standard pipe lengths, field cuts may be made with either hand or mechanical saws or plastic pipe cutters. Ends shall be cut square and perpendicular to the pipe axis. Spigots shall have burrs removed and ends smoothly beveled by a mechanical beveler or by hand with a rasp or file. Field spigots shall be stop-marked with felt tip marker or wax crayon for the proper length of assembly insertion. The angle and depth of field bevels and lengths to stop-marks shall be comparable to factory pipe spigots. (NOTE: For pipe manufactured in accordance with ASTM F-679, the pipe manufacturer shall be contacted for specific cutting and beveling instructions.)
- D. Assembly of joints. Assemble all joints in accordance with recommendations of the manufacturer. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench. If unusual joining resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, reclean the joint components and repeat the assembly steps. NOTE: Fitting bells may permit less insertion depth than pipe bells. (NOTE: When mechanical equipment is used to assemble joint, care should be taken to prevent over-insertion.)

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- E. Branch fittings. Fittings for service branches in new construction shall be molded with all gasketed connections. Fabricated fittings are not acceptable. Taps into existing lines shall use a gasketed fitting in conjunction with a repair sleeve coupling or a gasketed saddle wye or tee with all stainless steel clamps. When connecting to an existing sewer main by means other than an existing wye or tee, one of the following methods shall be used:
1. Circular saw-cut of the sewer main by proper tools ("Sewer-Tap" machine or similar) and proper installation of hub-wye saddle.
  2. Remove an entire section of pipe (breaking only the top of one bell) and replace with a wye branch section.
  3. With pipe cutter, neatly and accurately cut out desired length of pipe for insertion of proper fitting, using "Band-Seal" or similar flexible-type coupling to hold it firmly in place. "Band-Seal" or similar flexible-type couplings shall be used in the connection of sewer pipe of dissimilar materials. Typical couplings include Indiana Seal 102-66, Fernco 1002-66 or equal. Some clay pipe may require slightly larger couplings, i.e., Indiana Seal 106 or Fernco 1006. A typical connection would involve a PVC "Y" molded fitting, another one foot (or more) extension of PVC pipe, depending on depth of cover, the coupling and the clay pipe. Contractor shall provide details of direct connections to city interceptors and show construction procedure for protecting city structures. Clay/plastic pipe connections must be watertight. Holes for wye saddles shall be laid out with a template and shall be de-burred and carefully beveled where required to provide a smooth hole shaped to conform to the fitting. The contractor will be permitted to use fittings which include factory-molded wyes. Fabricated fittings shall not be used.
- F. Building Services:
1. When main line bedding, haunching, initial and final backfill must be disturbed to install fittings and service lines, the contractor is directly responsible to ensure that the bedding, haunching, initial and final backfill with appropriate compacting and detectable marking tape are restored.
  2. Service risers shall be installed in accordance with the standard specifications. Trench and embedment shall be in accordance with 16.44.235 and 16.44.236. Backfilling shall be with IDOT CA-6 or FA-6 ("ag-line" a byproduct of the limestone grinding process is not permitted) granular material.
- G. Pipe Caps and Plugs. All caps and plugs shall be braced, staked, anchored, wire-on or otherwise secured to the pipe to prevent leakage and/or loss under the maximum anticipated thrust from internal abnormal operating conditions such as test pressures from water or air.
- H. Manholes. Manhole connections shall be made as follows:
1. Manhole couplings providing elastomeric gasket seal. Unit is grouted into manhole wall. Pipe inserts into coupling.
  2. Water stop in various forms (e.g., flexible boot or sleeve, O-ring or gasket) produced from elastomeric compound is grouted or locked into manhole wall. Pipe inserts into water stop.
  3. Pre-cast manhole with connection ports with elastomeric seals pre-cast into manhole wall. Pipe inserts into connection port.
- All manhole connections shall be made using proper water stops. If Portland cement grout is incorporated in the manhole connection, the grout shall be of a type that expands, rather than shrinks, upon curing. Water stops shall be installed in accordance with manufacturer's recommendations. Hinged connections which use short pipe bell stubs outside the manhole face will not be required to prevent shear breakage in PVC sewer pipe because of its flexibility. Direct bonding between PVC pipe and concrete manhole is not allowed. The hold shall be created by a core in the manhole wall.

(Ord. 1993-M-27 § 2; Ord. 1989-M-65 § 1.)

**16.44.240 Sewer construction, VCP sewer joints.**

- A. Joints between consecutive pipe shall be made with jute and plastic, hot poured asphaltic joint compound, die-cast asphaltic slip-seal jointed pipe, or the die-cast plastic jointed pipe. Material specifications shall be as follows:
1. Jute shall be of the best quality square braided type, tarred, and of a size to suit the details of the pipe joint.
  2. Plastic asphalt compound shall consist of a mixture of mineral asphalt and a proper proportion of mineral filler. It shall be of such a composition that it will not slump or run after its application, but sufficiently plastic to trowel into the annular space of the joint.
  3. Asphaltic slip-seal jointing material shall consist of a compound of sufficient hardness after die-casting on the spigot end and inside the bell end, that it will not run, slump or in any way lose its shape as originally cast when subjected to weather and temperature differences. The jointing material shall be covered with a protective coat to prevent stickiness.
  4. The plastic joint material shall be of a flexible, plastic substance similar or equal to the polyvinyl chloride plastic commonly used in sewer practice. The material shall be resistant to all possible attacks of chemicals and weather. Such material shall be securely bonded or fused to the pipe at the factory, in molds so shaped as to fabricate a convex ring on the spigot end of the pipe and a symmetrical concave ring in the bell end of the pipe. The material shall be of such dimensions that when the two ends are engaged, a mechanical joint under uniform compression is formed. The joint when engaged shall be flexible enough to allow reasonable deflection in any direction and still maintain uniform compression.
  5. It shall adhere to wet vitrified tile giving a strong impervious bond. It shall be mixed on the job with the proper amount of liquid asphalt as recommended by the manufacturer.
  6. Hot poured asphaltic compound shall comply with the following specifications:
    - a. Specific gravity, 1.00 to 1.03;
    - b. Softening point, two hundred ten to two hundred forty degrees Fahrenheit;
    - c. Penetration @ seventy-seven degrees Fahrenheit, twenty to thirty;
    - d. Susceptability factor (equals penetration @ one hundred fifty-five degrees Fahrenheit minus penetration at thirty-two degrees Fahrenheit divided by penetration @ seventy-seven degrees Fahrenheit), minimum of one;
    - e. Must pass the marble soaking test.
  7. Material shall be furnished by a standard manufacturer for this particular service.
  8. The contractor must submit a sample of the compound to be used together with directions for its use, its analysis, manufacturer's name and a list of installations for reference.
- B. Construction specifications shall be as follows:
1. In all jointing operations, trenches must be dewatered until joints are placed and sufficient time has elapsed to assure adequate hardening. Bell or spigot or tongue and groove ends of pipe shall first be wiped clean. They shall then be coated with a prime coat of the same asphalt as is included in the jointing material.
  2. If plastic asphalt compound is used, the jointing material shall be spread in the lower half of pipe in an amount to fill annular space. A strand of jute shall then be embedded in the material and the spigot or tongue end of the next pipe inserted to true alignment and the pipe pushed home. The jute shall then be thoroughly caulked into the annular space in the upper half of the pipe. The remainder of the annular space around the entire joint shall then be completely filled with jointing material thoroughly rammed and caulked into place. Joints shall be finished off with a trowel to a bevel of about forty-five degrees. On pipes of an internal diameter of eighteen inches and over, joint shall be pointed and smoothed up from inside after backfill is placed. Backfill shall not be placed until the jointing material has

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thoroughly set, and particular care must be exercised in backfilling operations to prevent damage to joints.

3. If hot poured jointing material is used on bell and spigot pipe, a strand of jute shall be laid in the lower half of the bell and the spigot end of the next pipe inserted to true alignment. The jute shall then be thoroughly caulked into the annular space around the entire joint. An asbestos runner of type recommended by the joint manufacturer shall then be placed around the pipe and carefully sealed with clay to prevent loss of material. The joint shall then be poured full, particular care being exercised to prevent loss of material. The joint shall then be poured full, particular care being exercised to prevent air being entrapped. A runner shall remain in place a sufficient time to permit hardening of jointing material. Any defect in a joint showing when the runner is removed shall be carefully filled and patched.
4. On tongue and groove pipe, joints shall be prepared as described above, jute placed around the entire tongue, and adjacent pipe pulled home. Jute shall be carefully caulked into place. A closely fitting metal ring shall then be placed on the interior of pipe at the joint to act as form for jointing material. A strip of heavy building paper, tar paper or other material approved by the engineer shall be placed around the outside of the joint and carefully held in place with clay plastered against the pipe and paper, and with backfill material. The joint shall then be carefully poured from the top, taking particular care to prevent entrapping air. Joints shall be carefully pointed from inside of the pipe after backfill is placed.
5. If the asphaltic die-cast, slip-seal joint is used on the bell and spigot end, a solvent recommended by the pipe manufacturer must be applied to both bell and spigot ends before making the joint. This application shall be applied in such a manner that the joint will be made in a period of time not to exceed five minutes from the time of application.
6. If the die-cast plastic joint is used on the bell and spigot end, a solution recommended by the pipe manufacturer must be applied to both the bell and spigot ends before making the joint. The joint will be made in the fashion as prescribed by the pipe manufacturer, observing all procedure and time regulations. The contractor shall submit a manufacturer's brochure on the type of joint he contemplates using which establishes the proper installation techniques.

(Ord. 1960-29 § KF(12).)

### **16.44.241 Sewer construction – Force Main.**

- A. General procedure. Before being set in place, each component of piping shall be inspected for damage and cleaned. Damaged components shall be marked rejected. Pipe bells shall be laid on the upstream end. Sewer laying shall commence at the lowest elevation and shall terminate only at manholes, service branches or cleanouts. Trenches shall be de-watered. Whenever pipe laying is interrupted, the end of the pipe shall be temporarily plugged to prevent the entrance of water, mud or foreign matter, and the pipe shall be secured to prevent its being dislodged.
- B. Installation of Ductile-Iron force mains and their appurtenances shall be in accordance with the requirements of ANSI/AWWA C600/A21.50. Including lubricating mechanical joint gaskets with pipe lubricant and applying a minimum of 75 foot-pounds of torque to bolting systems. Force main shall have a minimum type three laying conditions, as defined in ANSI/AWWA C600/A21.50 Section 3.3.7, see City Standard Drawing No. 16.44.070.01, attached. Polyethylene encasement is required in all installations in accordance with ANSI/AWWA C105/A21.5. Polyethylene encasement may be deleted if soil analysis, from the site, performed by a professional engineer, approved by the City, indicated that polyethylene encasement is not required. To insure electric conductivity, brass wedges shall be installed per Section 41.205C of the Standard Specifications for Water and Sewer Construction in Illinois, dated May 1996, as amended. Force main shall have a minimum cover of four (4) feet and maximum bury depth of ten (10) feet, unless approved by the City Council. Force main and publicly owned

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appurtenances shall be located a minimum of 20 (twenty) feet from buildings or structures. If site conditions will not allow for the minimum separation approval must be received from the City Council.

C.

1. Mechanical joint fittings shall be restrained by a device, which consists of multiple individually activated gripping surfaces built into a mechanical joint follower gland. Device shall be manufactured from ductile iron conforming to ASTM 536.80. The restraining device shall be such that it can replace a standardized mechanical joint gland and can be used with any standard mechanical joint bell conforming to ANSI/AWWA C111/A21.11 and to ANSI/AWWA C153/A21 of the latest revision. The device shall utilize torque sensitive, "twist off nuts" that shall be incorporated in the design or the wedge activation screws to insure proper torque. The restrained device shall have a published working pressure rating 350 PSI in sizes through 16" and 250 PSI above 20". A 2.0 safety factor will be built in to the working pressure rating. Restraint device for mechanical joints shall be Uni-flange series 1400 manufactured by the Ford Meter Box Company of Wabash, Indiana, or 1100 or 3000 series Megalug Manufacturer by EBAA Iron Sales, Inc., of Eastland, Texas.
2. Pipe from mechanical joint restraint specified in 16.44.070 C.1. shall be restrained in accordance with the minimum guidelines stated in City Standards Drawing No. 16.44.070.04 attached. Push joint pipe restraint shall be Field Lok 350 gasket as manufactured by United States Pipe and Foundry Company of Birmingham, Alabama or Series 1700 Megalug by EBAA Iron Sales In. of Eastland, Texas or Series 1390 Pipe Restraint as manufactured by Ford Meter Box Co., Inc., of Wabash, Indiana.

D. Ductile-iron Compact Fittings shall be manufactured in accordance with the requirements of ANSI/AWWA C153/A21.53. Ductile-Iron and Gray-Iron fittings material and manufacture shall be in accordance with the requirements of ANSI/AWWA C11/A21.10.

E. All below grade, factory installed bolts and fasteners shall be 304-grade stainless steel.

(Ord. 2005-M-18 § 1.)

### **16.44.260 Sanitary sewer construction, gravity sewer testing.**

- A. Testing shall be in accordance with the Standard Specifications, Sections 31.1.11 and 31.1.11A through 31.1.11D. The sewer shall meet the requirements of:
- Infiltration of water,
  - Exfiltration of air under pressure,
  - Television inspection.

In addition, PVC sewer pipe must meet five (5) percent deflection test requirements.

B. All tests must be conducted in the presence of representatives of the city of St. Charles and the engineer. Written certification of test conformance shall be provided by an Illinois Registered Professional Engineer.

C. All sewer mains shall be fully tested.

(Ord. 2005-M-18 § 1; Ord. 1989-M-65 § 1; Ord. 1960-29 § KF(14).)

### **16.44.261 Sanitary sewer construction, force main testing.**

A. The force main shall be tested for leakage between points as designated by the engineer. Testing shall be in accordance with the requirements of ANSI/AWWA C600-93 (Revision of ANSI/AWWA C600-87) Section 4, with a minimum test pressure of 150 psi.

B. The contractor shall give the City Engineer a minimum of twenty-four hours advance notice of the time he contemplates making the test in order that the City Engineer or his designee is present to observe the test.

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- C. The utmost of care shall be taken during the filling operation to prevent any possible contamination or discharge to the existing sanitary sewer system.
  - D. The contractor shall furnish and install all the necessary equipment and apparatus, as determined by the City, for making the test.
  - E. All tests must be conducted in the presence of representatives of the City of St. Charles and the Engineer. An Illinois Registered Professional Engineer shall provide written certification of test conformance.
  - F. All force mains shall be fully tested.
- (Ord. 2005-M-18 § 1.)

### **16.44.270 Sewer and water main construction - Backfilling.**

#### A. MATERIALS

- 1. Select Excavated Materials are defined as subsoil material free of debris, waste, frozen materials, vegetable matter, rock or gravel larger than two (2)" in any dimension and other deleterious matter. Subsoil shall be capable of being compacted to a minimum of 90% Modified Proctor Density in accordance with ASTM D1557 or AASHTO T180.
- 2. Granular Trench Backfill is defined as cohesionless materials free of clay, slag, debris, waste, frozen materials, vegetable matter, and other deleterious matter. Fill materials shall be capable of being compacted to minimum of 90% Modified Proctor Density in accordance with ASTM D1557 or AASHTO T180.
  - a. Provide pit run granular trench backfill materials, conforming to IDOT Standard Specifications for Road and Bridge Construction, Section 704, gradation shall be CA-6 or FA-6 (ag-lime, a byproduct of the limestone grinding process, is not permitted for FA-6); suitability of all granular fill materials shall be subject to approval of the city.

#### B. BACKFILL AND FILL

- 1. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below:
  - a. Under grassed or landscaped areas, use select excavated material.
  - b. Under walks and pavements, use approved granular trench backfill fill materials as indicated on the drawings.
  - c. Under steps, use granular trench backfill fill material, as indicated on the drawings.
  - d. Trenches under or within two (2) feet of pavements, use approved granular trench backfill materials.
  - e. Do not backfill trenches until tests and inspections have been made and authorization is given by Owner's Representative. Use care in backfilling to avoid damage or displacement of pipe systems.
- 2. Backfill excavation as promptly as work permits, but not until completion of the following:
  - a. Inspection, testing, approval, and recording locations of underground utilities.
  - b. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.
  - c. Removal of trash and debris.
  - d. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

#### C. COMPACTION

- 1. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D1557.

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- a. Lawn/Landscaped or Open Areas: Compact top six (6) inches of subgrade and each layer of backfill or fill material to 85% of Modified Proctor Density in accordance with ASTM D1557.
  - b. Walkways: Compact top six (6) inches of subgrade and each layer of backfill or fill material to 90% Modified Proctor Density in accordance with ASTM D1557.
  - c. Trenches Under Pavement: Compact each layer of backfill material to 90% Modified Proctor Density in accordance with ASTM D1557.
2. Compacting of materials by flooding, ponding, or jetting is not permitted without written permission from the city.
- D. FIELD QUALITY CONTROL
1. Quality Control Testing During Construction as Required by the City: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.
    - a. Paved Areas: Make at least one (1) field density test of subgrade for every 5,000 sq. ft. of paved area, but in no case less than three (3) tests.
- E. MARKING SEWER LINES
1. Detectable underground marking tape shall be installed over ALL sanitary sewer lines. The three (3) inches minimum wide tape shall be encased aluminum foil and shall be color-stripped safety green and be printed, "Caution: Buried Sewer Line BELOW." The tape shall be buried twelve (12) to eighteen (18) inches deep in the backfill. In the event the tape is broken or destroyed by subsequent construction, it shall be restored.
- F. All surplus, excavated material which is not used in backfilling shall be loaded and disposed of. (Ord. 1993-M-27 § 3; Ord. 1989-M-65 § 1; Ord. 1960-29 § KF(15).)

### **16.44.280 Sewer and water main construction - Covering.**

- A. The sewers or water mains shall in all cases be covered with earth to a depth of not less than four feet or as shown on the plans and, where the trenches do not furnish sufficient material, the contractor shall supply such deficiency.
  - B. If additional cover beyond four feet is required to be placed over the sewer or water main for its protection, the contractor shall furnish and spread earth, or granular material free from animal or vegetable matter in such a manner and in sufficient quantity so that after it is thoroughly compacted, the embankment will be of uniform grade and cross-section and of the dimensions shown or specified on the plans or proposal sheet.
- (Ord. 1997-M-103 § 1; Ord. 1960-29 § KF(16).)

### **16.44.290 Water main construction - Testing water mains.**

- A. The pipe line shall be tested for leakage between points as designated by the engineer. Tests shall be made with all the joints uncovered. Testing shall be in accordance with the requirements of ANSI/AWWA C600-87 Section 4, with a minimum test pressure of 150 psi.
  - B. The contractor shall give the city engineer a minimum of twenty-four hours advance notice of the time he contemplates making the test in order that the city engineer or his designee is present to observe the test.
  - C. The utmost of care shall be taken during the filling operation to prevent any possible contamination to the existing water distribution system.
  - D. The contractor shall furnish and install all the necessary equipment and apparatus, as determined by the city, for making the test.
- (Ord. 1997-M-103 § 1.)

**16.44.300 Sewer and water main construction - Disinfecting water mains.**

- A. Before being placed in service, all new water mains shall be cleaned and chlorinated with liquid chlorine, according to the A.W.W.A. publication, "A Standard Procedure for Disinfecting Water Mains - AWWA C651-86," as amended. (Ord. 1997-M-103 § 1; Ord. 1990-M-17 § 1.)
- B. The contractor shall give the engineer at least twenty-four hours' notice ahead of the time he contemplates disinfection in order that the engineer may be present and observe the work.
- C. Following the chlorination, the contractor will collect and submit for bacteriological analysis two sets of samples, each set to be collected on successive days. Mains will not be accepted or placed in service until satisfactory reports are obtained for two sets collected on successive days and the engineer has been provided with copies of all test results satisfactorily evidencing the mains to be ready for service.
- D. The contractor shall include the entire costs of disinfecting mains and appurtenances in the contract price for water mains.

(Ord. 1960-29 § KF(18).)

**16.44.310 Storm Sewer Manhole - Description.**

- A. Manholes shall be constructed on the sewer lines at points designated on the plans. The base for manholes on sewers twenty-four inches in diameter and smaller shall be constructed of concrete, circular in shape, of a diameter twelve inches larger than the outside wall diameter of the manhole. The base shall be six-inches thick under the bottom of the outside of the pipe and shall include concrete fillets, as shown on the contract drawings. Pipe may be laid through the manholes, the top one-half of the pipe broken out after the base has been poured, and the remaining bottom half of the pipe used for the flow line through the manhole.
- B. Manholes shall be circular in shape and of four-foot inside diameter. The upper two feet six inches of the manhole masonry shall come in to an inside diameter of twenty-four inches at the top. Manholes on sewers larger than twenty-four-inches internal diameter shall be constructed to the details shown on the contract plans.

(Ord. 2002-M-30 § 1; Ord. 1960-29 § KG(1).)

**16.44.320 Storm Sewer Manhole - Material specifications.**

- A. The walls of the manholes shall be monolithic concrete, concrete blocks, brick or precast concrete rings. If not particularly specified in unit specifications, any of the said types may be used. The following wall thicknesses apply to manholes up to twelve-feet deep. Over twelve-feet depth, the wall thickness shall be increased four inches. Monolithic concrete sidewalls shall be six inches in thickness.
- B. Concrete precast rings shall be five inches in thickness, with one coat of a bituminous paint such as Inertol's Standard applied on the inside surface at the manufacturer's plant site. When using precast manholes, the contractor shall install the tile through the manhole supported on concrete blocks or bricks allowing sufficient space for the base underneath. The first precast ring shall also be supported on concrete blocks or bricks with the top of the blocks or bricks two inches below the flow line of the sewer. Concrete fillets shall be poured from the midpoint of the tile on each side to an elevation six inches above at the manhole walls. A bituminous jointing compound, approved by the engineer, shall be used between rings.
- C. The concrete for monolithic construction and the concrete for precast manhole rings shall be of the same mix as hereinafter specified for the base.
- D. Concrete blocks for manhole sidewalls shall be of a strong dense concrete made to conform to the dimensions of the manhole. The blocks shall conform to the requirements of the "Standard Specifications for Concrete Masonry Units for Construction of Catch Basin and Manholes,"

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- American Society for Testing Materials, designation C 139-39. Brick sidewalls for manholes shall be eight inches in thickness. Bricks shall be grade MA, conforming to the specifications for sewer bricks, American Society for Testing Materials, designation C-32.42.
- E. Bricks and concrete blocks shall be laid up in a mortar composed of one part portland cement and two parts clean torpedo sand.
  - F. Brick and concrete block manholes shall be plastered on the outside with a mortar coat, one-half inch thick, of the same consistency, after four courses have been laid; then the inside face shall be neatly pointed. Following this, four additional courses shall be laid, the outside plastered as above and the inside pointed up, with the process continuing until the top course is reached.
  - G. Concrete for use in the manhole base, monolithic construction and precast concrete rings shall be composed of one part portland cement, two parts of clean graded torpedo sand, and three and one-half parts of clean graded gravel, or crushed stone. The maximum size of gravel or stone shall be one and one-half inches. Only a sufficient amount of water shall be added to the mix to produce a workable mix. Concrete shall be mixed in batches in an approved mixer for a period not less than one and one-half minutes after all ingredients have been added.
  - H. The manhole frame and cover shall be of close-grained gray iron semisteel in a solid cover of a design conforming to the standard of the owner. The minimum weight of the frame and cover shall be as shown on plans or in the specifications. Castings shall be free from cold shuts or blow holes, and accurately cast to provide true and even bearing.
  - I. The metal in the castings shall comply with the following analysis and shall develop a tensile strength of not less than twenty-eight thousand pounds per square inch:
    - a. Steel, not less than 0.15 percent;
    - b. Silicon, not more than 1.66 percent;
    - c. Sulphur, not more than 0.082 percent;
    - d. Phosphorous, not more than 0.170 percent;
    - e. Manganese, not less than 0.600 percent.
    - f. Total Carbon, not less than 3.50 percent.
  - J. Manhole steps shall be furnished and placed at sixteen inches on center. They shall be cast iron of a design and section approved by the engineer.
- (Ord. 2002-M-30 § 1; Ord. 1960-29 § KG(2).)

### 16.44.330 Catch basin - Description.

- A. Catch basins shall be constructed at points and locations shown on the plans.
  - B. Unless otherwise shown in the contract drawings, catch basins shall be circular in shape and of four-foot inside diameter. The upper two feet six inches of the catch basin shall come in to an inside diameter of twenty-four inches at the top. Catch basins shall be seven-feet deep, measured from the top of the base to the top of the masonry.
  - C. The base for catch basins shall be six inches in thickness constructed of concrete, circular in shape, six inches larger than the outside diameter of the catch basin.
  - D. An eight-inch one-half trap outlet shall be provided in the catch basin wall two feet six inches above the top of the inside of the base. The outlet shall be connected to the nearest storm sewer manhole. The bottom two feet six inches of the inside wall of the catch basin from the base up to the eight-inch one-half trap outlet shall be plastered with a one-half inch coat of portland cement mortar. In like manner the upper four feet six inches of the outside of the catch basin shall also be plastered with a one-half inch coat of portland cement mortar.
- (Ord. 1960-29 § KG(3).)

### 16.44.340 Catch basin - Material specifications.

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- A. Materials of construction, wall thickness, concrete, and portland cement mortar, shall conform to the specifications herein specified for manhole construction.
- B. The catch basin frame and cover shall be fabricated of gray iron semisteel as specified for manhole frames and covers in either solid or open cover as ordered by the engineer, of a design conforming to the standard of the owner. The minimum weight of the frame and cover shall be dipped in coal tar varnish.

(Ord. 1960-29 § KF(4).)

### **16.44.350 Inlet construction.**

- A. Street inlets, where specified, shall be constructed to the dimension and design shown in the contract drawings. Materials of construction, wall thickness, concrete and portland cement mortar shall conform to the specifications for manhole construction. Frame and cover shall conform to the specifications for catch basin frame and cover.

(Ord. 1960-29 § KG(5).)

### **16.44.360 Rock excavation - Generally.**

This work shall include all excavation in rock for sewers, water mains, structures and elsewhere called for by the plans or contract completion. Rock excavation shall include:

- A. All boulders and rocks measuring one-half cubic yard or more;
- B. Solid or ledge rock that cannot be excavated without resorting to continuous drilling and blasting;
- C. Slate, shale, sandstone and other hard material that cannot be excavated with a modern power shovel of three-quarter cubic yard capacity, adequately powered and in good mechanical condition, without continuous drilling and blasting. The contractor shall prove by demonstration that slate, shale, sandstone, or other hard material encountered cannot be moved with heavy equipment without continuous drilling and blasting.

It is the intent of these specifications that all material including loose rock which may be excavated with the usual trenching machinery will not be considered rock excavation even though the encountering of such material tends to slow the rate of excavating. (Ord. 1960-29 § KR(1).)

### **16.44.370 Rock excavation - Measurement.**

- A. Rock excavation will be measured by the cubic yard in its original position. The contractor shall strip the rock in sections and shall not commence excavation until the engineer has established the elevation of the top of the rock.
- B. Rock excavation for structural work will be measured to the bottom of the structural foundation and for a distance of two feet outside the horizontal limiting dimensions of the structure. For sewer or water pipe excavations, the measurements for width of trench in rock will be that as constructed but not to exceed the maximum width as stipulated in the general specifications for sewer and water main construction.
- C. Measurements for depth in rock excavation for pipe will be six inches below the bottom of the pipe.

(Ord. 1960-29 § KR(2).)

### **16.44.380 Rock excavation - Pipe protection in rock.**

All sewer, water main and other pipe laid in rock shall have a minimum clearance from the extreme exterior of the pipe, flange or spigot to the rock of six inches and shall be bedded in well compacted sand to the top of the pipe. (Ord. 1960-29 § KR(3).)

### **16.44.390 Rock excavation - Undercuts.**

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All excavations in rock undercut shall be brought to proper grade with well compacted sand except under structures on concrete foundations where the same shall be brought to grade with concrete. (Ord. 1960-29 § KR(4).)

### **16.44.400 Rock excavation - Other work included.**

Rock excavation item shall also include all pumping, bailing, drilling and blasting, and the satisfactory removal and disposal of rock. Excavated rock may be used in backfill, provided other provisions of this contract are not contradicted. (Ord. 1960-29 § KR(5).)

### **16.44.410 Rock excavation - Basis of payment.**

Rock excavation work will be paid for at the contract unit price per cubic yard for rock excavation. (Ord. 1960-29 § KR(6).)

### **16.44.430 Valves, hydrants, gates and appurtenances - Generally.**

All valves, hydrants, gates and appurtenances installed under this section shall be fabricated and placed in compliance with the following specifications. The type of valve, hydrant, gate or appurtenance shall be as designated in the project specifications or as shown on the engineering plans, and shall conform to section 16.44.070. (Ord. 1997-M-103 § 1; Ord. 1960-29 § LD(1).)

### **16.44.440 Valves - sewer construction**

#### **A. General.**

1. All valves shall be of a standard manufacture, and of highest quality, both as to material and workmanship. All valves shall have the name, monogram or initials of the manufacturer cast thereon, and shall be identified by catalog numbers. All valves shall be provided with hub, spigot, mechanical joint, flange or screwed ends as specified, shown on the drawings, or required. In general, all valves three inches in diameter and smaller shall be provided with screwed ends unless otherwise shown. Valves two inches in diameter and smaller shall be all brass or bronze, and valves over two inches in diameter shall be iron bodies, fully brass or bronze mounted.
2. Hub and spigot ends of valves shall conform to the standard specifications of the American Standards Association (A.S.A.). Flanged ends of valves shall conform, as to dimensions and drillings to the A.S.A. class 125 specifications with boltholes straddling the centerlines, unless otherwise shown on the engineering plans. All screw ends of valves shall have threads conforming to the American standard for pipe threads. Mechanical joints shall conform to A.S.A. specification A21.11.
3. All valve materials shall be of the best quality especially adapted for the service required, and the workmanship shall be first class in all respects. All surface forming joints or bearing surfaces shall be machined to a perfect fit. All disc and seat rings shall be carefully and firmly secured in place with the iron castings machined where the rings bear, and the backs of the rings machined all over. After the rings have been fastened securely in place, the front shall be machined all over to a perfectly true and smooth bearing.
4. All valves shall be of ample strength to withstand and operate satisfactorily under the working pressures and shall be subject to the test pressures both expressed in pounds per square inch given in the following table. The class of valve to be used on each service shall be as defined in the unit specifications.

Class of Valve	Cold Water Pressure in Pounds Working	Per Square Inch Test
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A	150	300
B	50	100
C	25	50

5. Tests shall be made in the shop with a hydrostatic water pressure, cost of tests to be merged in the cost of the valves, and any valves which leak or which show any defects shall be rejected.
  6. Certificate from the manufacturer that the above tests have been successfully withstood shall be furnished by the contractor upon request. After the valves have been set they shall be tested for satisfactory operation with the pipelines by the contractor.
- B. Gate Valves.
1. All gate valves of over two inch nominal diameter shall be of the double-disc type with either nonrising stems or outside screws and yokes as designated in the project specifications, and shall be designed to take full pressure on either face. All valves buried underground shall have nonrising stems and operating nuts. Valves shall be constructed with bolted bonnets provided with stuffing boxes having bolted followers. The stuffing boxes shall be so arranged as to be readily accessible and shall be packed ready for use. Stems shall be fabricated of brass or bronze with lathe cut half V-pattern threads. Gate valves shall be equipped with standard handwheels, operating nuts, extension stems, a combination of extension stems and handwheels or operating nuts, spur gearing, bevel gearing or chain operators, as designated in the unit specifications, or shown in the engineering plans. Valves shall open by turning to the left. Extension stems shall be provided with bronze bushed brackets at approximately 10 feet on centers where installed in lengths over ten feet.
  2. Gate valves of fourteen-inch nominal diameter and larger for use in a horizontal line with stem horizontal or inclined shall be equipped with a brass track in the lower side of the body and brass rollers and brass scrapers in the lower side of the discs.
  3. Joints for buried valves shall be of the same type specified for the piping system.
- C. Check Valves.
1. All check valves shall be of the horizontal, single-disc, swing type, designed to operate with a minimum loss of pressures. Check valves shall be so designed that when there is no flow through the line, the discs shall hang lightly against their seats and shall afford ample waterway with but a small angle of opening. All check valves shall be provided with screwed or bolted covers for access to the discs.
  2. Check valves on the air discharge lines shall be of special design for air service with lightweight disc and guaranteed not to chatter in service, and to close tightly against back pressures.
  3. Check valves of the single-disc type vertical pump discharge shall be provided with extended hinge pin and outside adjustable lever and weight so installed as to assist the gate in closing.
- D. Globe and Angle Valves. All globe and angle valves shall be of suitable design to provide the full pipe area through all parts of the valve and to operate with pressure on either side of the seat. Valves shall be of the inside screw-type seat yoke to insure square seating of the disc. Valves of three inches and less in diameter shall be provided with renewable composition discs of a material suitable for air or water, according to the use to which the valve is put. They shall be equipped with cast iron handwheels and shall be packed ready for use.
- E. Plug Valves. Valves of the lubricant plug design shall consist of a cylindrical or conical shaped plug mounted in a semisteel machined casing or of the eccentric plug-type, tight closing, mounted in a semisteel machined casing. Valves smaller than eight inches in diameter shall be equipped with nuts for wrench operation. Valves eight inches in diameter and larger shall be equipped with worm gears and handwheels. Two wrenches for each size of operating nuts on valves installed

## LAND IMPROVEMENTS

- and a supply of lubricant shall be furnished for the lubricated plug-type valves. Valves of the nonlubricated-type shall come equipped with operating lever attached.
- F. Sampling Valves. Sampling valves shall be of the lever operated, cam-action solid-wedge type, with bolted or screwed cap.
  - G. Hose Valves. Hose valves shall be of the nonrising stem, wedge-disc type with cast iron handwheels. Hose threads for one-inch to two-inch size shall be Chicago standard. Hose threads for two and one-half-inch size shall conform to the standard hose thread adopted by the owner.
  - H. Chemical Valves. Valves on chlorine lines and ferric chloride shall be completely rubber lined and specifically designated for corrosive liquids, similar and equal to Hills McCanna, Chlorine Institute, or approved equal.
  - I. Telescopic Valves. Telescopic valves shall be furnished and installed to details shown on the engineering plans.
  - J. Cone Valves.
    - 1. Cone valves shall be of the reseating conical plug type. Valves shall be operated by handwheels and operating nut or with automatic hydraulic or electrical controls, as designated in the unit specifications.
    - 2. Each reseating conical plug type valve shall consist essentially of a cast iron or semisteel valve body or housing of adequate design and a conical plug arranged to be rotated in the housing manually or by means of a pressure-operated hydraulic cylinder. The plug shall have through it a circular opening which, when the valve is fully open, shall match smoothly with corresponding openings, in the inlet and discharge ends of the valve body.
    - 3. To open or close a valve, it shall be necessary that the plug be rotated approximately ninety degrees. The valve shall be so designated that following either the opening or closing of the valve, the conical plug will reseal and lock in either the open or closed position. The valve shall be so designed that the operating mechanism shall be easily accessible for inspection, repair or replacements. It shall also be possible to remove the plug from the valve body without disconnecting the valve body from the line. The valve bodies, valve plugs and valve body covers shall be of cast iron or semisteel.
  - K. Installation of Valves. All valves shall be installed in accordance with the specifications of the pipe to which they are connected.
- (Ord. 1997-M-103 § 1; Ord. 1960-29 § LD(2).)

### **16.44.460 Yard hydrants.**

Yard hydrants shall be a heavy antifreeze compression action type with positive automatic drain. Hydrants shall be set in the ground five feet and shall be equipped with one-inch Chicago standard hose threads. (Ord. 1997-M-103 § 1; Ord. 1960-29 § LD(4).)

### **16.44.490 Plug drain valves.**

Plug drain valves shall be iron frames, bronze mounted with bronze stems, and shall be equipped with flanges faced and drilled A.S.A. class 125, or spigots, as shown on the contract drawings. Valves shall be provided with two-inch operating nuts, handwheels or extension stems or a combination of extension stems and handwheels or operating nuts. Extension stems shall be provided with bronze bushed brackets at approximately ten feet on centers where installed in lengths over ten feet. (Ord. 1960-29 § LD(7).)

### **16.44.500 Shear gates.**

Shear gates shall be of the iron frame, iron disc, bronze mounted type, with bronze hinge pin and wedge block. Gates shall be equipped with flat, spigot or flange frame as shown on the contract drawings, and a lifting handle or rod equipped with notches or hooks to regulate the gate opening. (Ord. 1960-29 § LD(8).)

**16.44.510 Backwater gates.**

Backwater gates shall be a standard commercial product fabricated of cast iron or steel as designated in the unit specifications, and provided with bronze seat rings on the frame and flap and corrosion resisting metal hinge pins operating in bronze bushings. They shall be designed for a working pressure of twenty-five pounds per square inch plus any impact loads to which they may be subjected in service. Gates shall be equipped with flanges faced and drilled A.S.A. class 125 for attachment to pipes or equipped with flat frames for attachment to wall castings. Wall castings shall be furnished with gates where shown on the contract drawings. Provisions shall be made to lubricate gate hinge pins and to prevent the gate from remaining in an open position. (Ord. 1960-29 § LD(9).)

**16.44.520 Sluice gates.**

- A. Sluice gates shall be of the square frame circular opening, rectangular frame, rectangular opening, or square frame, square opening type as shown on the contract drawings, or designated in the unit specifications, with rising stems and flanged ends. Flanged ends for attachment to pipe flanges and wall casting flanges shall be faced and drilled A.S.A. standard class 125. Flanged ends for attachment to wall thimbles shall be faced and drilled in accordance with the practice of the manufacturer. Sluice gates shall be designed for the heads and type of pressure designated in the unit specifications.
- B. Frames, gates and flanges shall be strongly built of sound cast iron, designed to carry the strains of use without bursting or springing. Both gates and frames shall be provided with bronze noncorrosive facings, dovetailed and securely fastened into the iron castings. The surfaces of the facings shall be machined to a watertight bearing.
- C. Sluice gates shall have enough adjustable bronze wedges properly distributed at sides, tops, and bottoms to force the gates to seal tightly at the point of closure. Suitable side guides shall be provided for keeping gates in proper true position throughout their travel. Bolts or studs for attaching frames to pipe flanges, wall casting flanges or wall thimbles shall be best quality genuine wrought iron or cadmium plated steel with cold pressed hexagon nuts.
- D. Wall thimbles shall be of sound cast iron, designed of ample thickness and size to securely hold the sluice gates in position with sufficient anchors to prevent movement of the thimbles in the concrete. They shall be provided with an integral cast water stop at least six inches from the face of the castings. Flanged face of thimbles shall be faced and tapped for stud bolts. Wall thimbles shall be provided for all sluice gates not shown connected to pipes or wall castings.
- E. Sluice gates shall be carefully erected in their respective positions as shown on the contract drawings, free from all distortion and strains. They shall be set completely assembled with gates wedged lightly into their seats. Under no circumstances shall sluice gates be taken apart to set.

(Ord. 1960-29 § LD(10).)

**16.44.530 Wheel-operated stands.**

- A. Wheel-operated stands shall be made of the best quality cast iron with smooth exterior surfaces, perfect in every respect and equipped with roller-thrust bearings and polished handwheels. They shall be of the rising-stem or nonrising-stem type to suit the valves or sluice gates which they are to operate. Nonrising stem stands shall be equipped with indicators. Provisions shall be made to lubricate all working parts of the stands.
- B. Each stand shall be equipped with a cold rolled steel shaft of ample size supported by bronze bushed guide brackets at intervals not to exceed ten feet. The threaded portion of the stems shall be of manganese bronze with machine cut threads. The different sections of the stems shall be

## LAND IMPROVEMENTS

jointed together with manganese bronze couplings, threaded and keyed to the stems. Anchor bolts for guide brackets and stands shall be genuine wrought iron or cadmium plated.  
(Ord. 1960-29 § LD(11).)

### **16.44.540 Crank-operated stands.**

- A. Crank-operated stands shall be made of the best quality cast iron with smooth exterior surfaces, perfect in every respect, and shall be of the single-crank type, with ball or roller thrust bearings and enclosed steel bevel gears. They shall be of the rising-stem or nonrising-stem type to suit the valves or sluice gates which they are to operate. Nonrising stem stands shall be equipped with indicators. Provisions shall be made to lubricate all working parts of the stands.
- B. Cranks shall be removable and equipped with smooth brass handgrips rotating freely on the handle of the crank. The maximum crank pull shall not exceed forty pounds for complete operation of the valve or sluice gate under full load conditions.
- C. Each stand shall be equipped with a cold rolled steel shaft of ample size supported by bronze bushed guide brackets at intervals not to exceed ten feet. The threaded portion of the stems shall be of manganese bronze with machine cut threads. The different sections of the stems shall be jointed together with manganese bronze couplings, threaded and keyed to the stems. Anchor bolts for guide brackets and stands shall be genuine wrought iron or cadmium plated steel.

(Ord. 1960-29 § LD(12).)

### **16.44.550 Motor-operated stands.**

- A. Motor-operating stands shall be designed and built for motor operation of valves and sluice gates, and shall not be hand-operated stands with the various equipment bolted to them. They shall be of the heavy-duty rising-stem type, constructed of a high-grade cast iron or cast steel, and equipped with antifriction thrust bearings to take the upward and downward thrust of the valves or gates. They shall be capable of operating the valves and gates under their maximum operating condition. The motor operating mechanisms, reversing magnetic contactors, control stations and limit switches shall be enclosed in watertight and dust-tight cast iron housings attached to or built integrally with the stands.
- B. The motors shall be suitable for operation on the current characteristics as designated in the unit specifications or shown on the contract drawings, and shall have sufficient torques to start and operate the valves and gates in any position. Motors shall be furnished with ball bearings, shall have class A insulation, with windings impregnated to withstand excessive moisture and shall be rated to run continuously for the time required to completely open and immediately thereafter to completely close the valves or gates without exceeding safe operating temperatures. Manual-operating handwheels shall be provided for emergency operation of the stands, with provisions to prevent simultaneous use of the operating mechanisms. The handwheels shall not revolve when the units are operating electrically. A suitable mechanically actuated valve or gate position indicator shall be furnished with each stand.
- C. Reversing magnetic contractors shall be equipped with silver-to-silver contacts. Limit switches shall be provided for limiting the valve or gate travels in either direction and shall be suitable for fine adjustments and operations, particularly at the seating positions of the valves and gates. Means shall be provided for protection of the motors against overloads, either by means of overload relays, or by automatically disconnecting the motors from the line by means of suitable mechanically actuated switches in event the valves or gates should become jammed or excessive seating pressures should be applied.
- D. Suitable push-button control switches with red, green and white indicating lamps shall be provided and shall be mounted on the stands. The red and green lamps shall indicate the full

**LAND IMPROVEMENTS**

open and closed positions of the valves and gates, respectively, and the white lamps shall indicate that current is available for operations. All lamps shall burn at intermediate position of the valves and gates.

- E. Each stand shall be equipped with a cold rolled steel shaft of ample size, supported by bronze bushed guide brackets at intervals not to exceed ten feet. The threaded portion of the stems shall be manganese bronze with machine cut threads. The different sections of the stems shall be jointed together by manganese bronze couplings, threaded and keyed to the stems. Anchor bolts for guide brackets and stands shall be of genuine wrought iron or cadmium plated steel.  
(Ord. 1960-29 § LD(13).)

**16.44.560 Rubber-seated butterfly valves.**

All rubber-seated butterfly valves installed under this contract shall be fabricated and installed substantially in compliance with the latest revision of A.W.W.A. standard specifications for rubber-seated butterfly valves, C504, and the following specifications.

- A. All valves shall be of ample strength to withstand and operate satisfactorily under the working pressures which will prevail in the lines in which installed and shall be subject to the test pressures and velocities stated in the following table. The class of valve to be installed on each service shall be as defined in the unit specifications.

<b>Class of Valve</b>	<b>Shut-off Pressure-p.s.i.</b>	<b>Maximum Pipeline Velocity-f.p.s.</b>
25-8	25	8
25-16	25	16
50-8	50	8
50-16	50	16
125-8	125	8
125-16	125	16

- B. All valve shafts may consist of a one-piece unit extending completely through the valve disc or may be of the stub-shaft type, which comprises two separate shafts inserted into the valve disc hubs.
- C. All valve discs shall be of a cast or fabricated design, with no external ribs. The valve discs may be designed for either ninety-degree seating or acute-angle seating.
- D. Valve seats shall be of a design that permits removal and replacement at the site of installation and provides tight shutoff at the maximum pressures listed in the above table with zero pressures downstream from the valve. The valve seats shall be of pure gum rubber.
- E. The valve operators shall be capable of transmitting sufficient torque to the valve shafts to seat and unseat the valve under the full design shutoff pressures and water velocities as specified for each class of valve. Valve operators shall be of the type defined in the unit specifications and on the contract drawings.

(Ord. 1960-29 § LD(14).)

**16.44.570 Concrete specifications - Portland cement.**

Portland cement shall conform to Type 1 of the standard specifications and tests for portland cement, (serial designation: C150-44) or to type III of the standard specifications for high-early strength portland cement, (serial designations: C150-44) of the American Society for Testing Materials and subsequent

## LAND IMPROVEMENTS

revisions thereof. All cement shall be handled to the job by sacks bearing the brand and name of the manufacturer, and shall be kept completely dry until used. (Ord. 1960-29 § NB-A(1).)

### **16.44.580 Concrete specifications - Fine aggregate.**

Fine aggregate shall consist of sand having clean, hard, durable, uncoated grains, free from deleterious substances, and shall range in size from fine to coarse within the limits indicated below, percentage by weight:

- A. Passing through No. 4 sieve, not less than ninety-five percent;
- B. Passing through No. 100 sieve, about five percent.

Sand shall be obtained from a source known to be in current use on concrete construction. (Ord. 1960-29 § NB-A(2).)

### **16.44.590 Concrete specifications - Coarse aggregate.**

Coarse aggregate shall consist of crushed stone, gravel or other approved inert materials with similar characteristics or combination thereof, having clean, hard, durable, uncoated particles free from deleterious matter. It shall range in size from fine to coarse within the following percentages, by weight:

- A. Passing through No. 1½ sieve, not less than ninety-five percent;
- B. Passing through No. 4 sieve, not more than five percent.

Coarse aggregate shall be obtained from a source known to be in current use on concrete construction. (Ord. 1960-29 § NB-A(3).)

### **16.44.600 Concrete specifications - Mixing water.**

Mixing water shall be clean and shall be free from oil, acid and injurious amounts of organic matter, alkalies, or other salts. (Ord. 1960-29 § NB-A(4).)

### **16.44.610 Concrete specifications - Metal reinforcement.**

- A. Metal reinforcement shall conform to the requirements of the standard specifications for billet-steel bar concrete reinforcement of intermediate grade (deformed bars) (serial designation: A-15-39) of the American Society for Testing Materials.
- B. Wire for concrete reinforcement shall conform to the requirements of the standard specifications for cold-drawn steel wire for concrete reinforcement (serial designation: A-82-34), or of the standard specifications for welded steel wire fabric for concrete reinforcement (serial designation: A-185-37) of the American Society for Testing Materials.

(Ord. 1960-29 § NB-A(5).)

### **16.44.620 Concrete specifications - Forms.**

Forms shall be of either wood or steel and shall conform to shape, lines and dimensions of the concrete work as shown on the plans. They shall be substantial and shall be designed to resist the pressure to which they are subjected. Forms shall be sufficiently tight to prevent leaking of mortar. They shall be properly braced or tied together so as to maintain position and shape and insure safety to workmen and passersby. Temporary openings shall be provided where necessary to facilitate cleaning and inspection immediately before depositing concrete. Forms shall be assembled in such manner as to facilitate their removal without damage to the concrete. Suitable mouldings or bevels shall be placed in angles of forms to round or bevel the corner or edges of the concrete unless otherwise directed by the engineer. All such mouldings, flutings, or ornaments shall be built of mill finished No. 1 Idaho white pine. Triangular mouldings, when used, shall have two equal sides. All mouldings shall be cut with true edges, and shall not be warped or frayed. (Ord. 1960-29 § NB-A(6).)

**16.44.630 Concrete specifications - Form ties.**

Form ties approved by the engineer shall be used. They shall be of such type as to leave no metal closer than one and one-half inches to the surface of the finished concrete and they shall not leave a hole larger than seven-eighths inches in diameter in the exposed surface of the concrete. Wire ties will not be permitted. (Ord. 1960-29 § NB-A(7).)

**16.44.640 Concrete specifications - Reinforcement placing.**

- A. Metal reinforcement before being placed shall be thoroughly cleaned of mill and rust scale and of coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section will be rejected.
- B. Metal reinforcement shall be accurately positioned and secured against displacement by using annealed wire of not less than No. 16 gauge or suitable clamps at intersections and shall be supported in a manner that will keep all metal away from the exposed surfaces of the wall. Nails shall not be driven into the outside forms to support reinforcement, nor the outside form on wall exposed to view after the structure is completed.
- C. Wherever it is necessary to splice reinforcement otherwise than as shown on the plans, the character of the splice shall be provided by the engineer on the basis of allowable bond stress and the stress in the reinforcement at the splice. Splicing shall not be made at points of maximum stress nor shall adjacent bars be spliced at the same point. Bar splices shall be staggered.
- D. All bars shall be lapped at least forty diameters at all corners and at abrupt changes in direction of walls or wherever splicing of bars is necessary.

(Ord. 1960-29 § NB-A(8).)

**16.44.650 Concrete specifications - Proportioning.**

- A. Fine and coarse aggregate shall be proportioned by volume by suitable containers approved by the engineer. Portland cement in standard unopened cloth or paper sacks as packed by the manufacturer may be considered as equaling one cubic foot.
- B. Water shall be measured by an approved device capable of accurate measurement to one pint, plus or minus, of the total amount of water required per batch.
- C. All concrete shall be volume proportioned on the basis of one part of portland cement, two parts of fine aggregate, and three and one-half parts of coarse aggregate with only enough water added to make a workable mix.

(Ord. 1960-29 § NB-A(9).)

**16.44.660 Concrete specifications - Mixing.**

- A. Concrete shall be mixed in a batch mixer for not less than one and one-half minutes after all the materials are in the mixer drum and until there is a uniform distribution of the materials and the mass is uniform in color and is homogeneous. Small amounts of concrete may be mixed by hand subject to approval and inspection by the engineer.
- B. Concrete from a central plant or mixed in transit mixer trucks may be used if it complies with these specifications. The engineer shall have free access at all times to the batching and mixing plant for sampling of all materials and inspection of work performed for this project. Concrete shall be delivered in watertight containers which will not permit segregation of the materials. When delivered, the concrete shall be uniform throughout the mass.

(Ord. 1960-29 § NB-A(10).)

**16.44.670 Concrete specifications - Depositing concrete.**

## LAND IMPROVEMENTS

- A. Concrete shall be handled from the mixer to the place of final deposit in carts, buggies and shall not be spouted nor delivered by spout or trough, nor dumped into carts with a free fall from the mixer of more than three feet. Every possible precaution shall be taken to prevent separation or loss of ingredients while transporting the concrete.
  - B. Concrete shall be spaded and rodded to thoroughly embed all reinforcement and fixtures. When forms are removed, surfaces shall be even and dense, free from aggregate pockets or honeycomb. Special care shall be taken to secure dense concrete around all inserts.
- (Ord. 1960-29 § NB-A(11).)

### **16.44.680 Concrete specifications - Depositing against other concrete.**

Before depositing new concrete on or against concrete that has hardened, the forms shall be retightened, the surface of the hardened concrete shall be roughened as required, thoroughly cleaned of foreign matter and laitance, and moistened with water. The new concrete placed in contact with hardened or partially hardened concrete shall contain an excess of mortar to insure bond. (Ord. 1960-29 § NB-A(12).)

### **16.44.690 Concrete specifications - Construction joints.**

The placing of concrete shall be carried on continuously between construction joints shown on the drawings or approved by the engineer. If for any reason it shall become necessary to stop the placing of the concrete at places other than those indicated on the drawings, such places shall have the approval of the engineer and the manner of making the joints shall be approved. (Ord. 1960-29 § NB-A(13).)

### **16.44.700 Concrete specifications - Protecting and curing.**

- A. All exposed surfaces of concrete shall be protected against wash by rain. All concrete shall be kept set for a period of five days after placing, except that two days' curing shall be considered sufficient if high-early strength portland cement or concrete is used.
- B. When placing concrete at or below a temperature of forty degrees Fahrenheit or whenever, in the opinion of the engineer, atmospheric temperatures will probably fall below this limit within the next twenty-four-hour period after placing concrete, the mixing water and aggregates shall be heated and the freshly placed concrete protected by adequate housing or covering and heating.
- C. Concrete when placed in the forms shall have a temperature of not less than seventy degrees Fahrenheit nor more than one hundred degrees Fahrenheit. Freshly placed concrete shall be maintained at a temperature of fifty to eighty degrees Fahrenheit or greater for a period of not less than four days after placing. The methods of protection and curing shall be such as to prevent evaporation of moisture from the concrete and injury to the surface.

(Ord. 1960-29 § NB-A(14).)

### **16.44.710 Concrete specifications - Removal of forms.**

Forms shall remain undisturbed until the concrete has attained sufficient strength to sustain its own weight in addition to any temporary or permanent load that may be placed upon it during the building of the structure. Beam sides, column forms, or forms for walls may be removed as soon as the concrete has attained sufficient strength to sustain its own weight; provided, that such action does not endanger any part of the structure, but in no case less than four days when standard cement is used, nor less than two days when high-early strength cement is used. (Ord. 1960-29 § NB-A(15).)

### **16.44.720 Concrete specifications - Defective work.**

Any concrete work that is not formed as shown on the plans or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the contractor at his expense unless the engineer grants permission to patch the defective area which shall be done in accordance with the best practice. Permission to patch any

## LAND IMPROVEMENTS

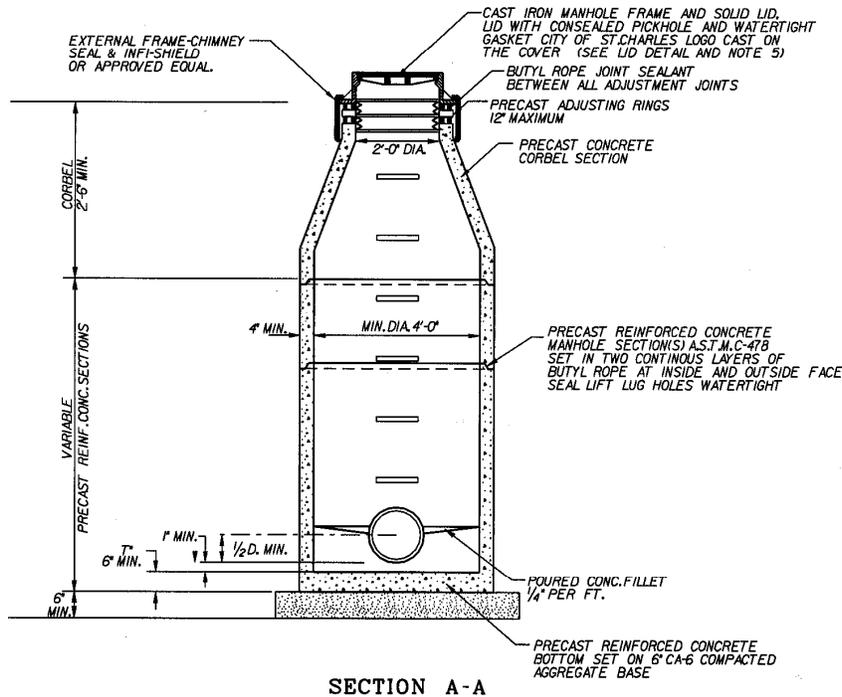
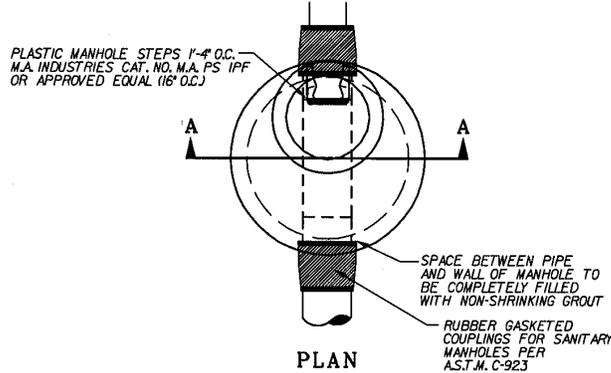
such area shall not be considered a waiver of the engineer's right to require complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality of the concrete and appearance of the surface. (Ord. 1960-29 § NB-A(16).)

### **16.44.730 Concrete specifications - Floor finish.**

The upper face of all floors shall be wood floated and twice steel trowelled to a smooth hard surface while the concrete is still in a plastic condition after pouring. This surface shall be obtained insofar as possible by flushing the mortar in the concrete to the surface, although small quantities of mortar may be spread upon the concrete to assist in obtaining the proper surface finish. In all cases, the mortar and concrete shall be placed in one continuous operation in order to prevent separation of the mortar surface from the concrete. On walkways subsequent to steel trowelling, surfaces shall be slightly roughened by dragging burlap across the surface in a zig zag motion, or by brushing with a stiff brush. (Ord. 1960-29 § NB-A(17).)

**SANITARY MANHOLE**

STD. DRW. NO. 16.44.060.J  
DATE : 5-2-02



1. PROVIDE CA-6 COMPACTED OR CA-7 AGGREGATE BACKFILL AROUND MANHOLE TO SUBGRADE ELEVATION IN PAVED AREAS.
2. CONCRETE FILLETS SHALL BE MADE WITH ADDITIONAL MORTAR TO PROVIDE A SMOOTH TRANSITION BETWEEN THE CASTING AND ADJUSTING RINGS (OR TOP OF STRUCTURE)
3. INSTALL MANHOLE IN ACCORDANCE WITH ASTM C891.
4. MORTAR SHALL NOT BE USED TO DRESS UP INTERIOR JOINTS.
5. NEENAH FOUNDRY C.CAT.\* R-1712-B.E. JORDAN IRON WORKS CO. CAT.\* 1051-3 (EXTRA HEAVY DUTY COVER OR APPROVED EQUAL IN PAVED AREAS IN OTHER AREAS USE R-1772-B (NEENAH), 1022-1 (MED. COVER) (E. JORDAN), IN NON-PAVED AREAS SET FRAME IN BUTYL ROPE.
6. WHEN MANHOLE IS 12' OR LESS, T = 6"  
WHEN MANHOLE DEPTH IS OVER 12', T = 10"

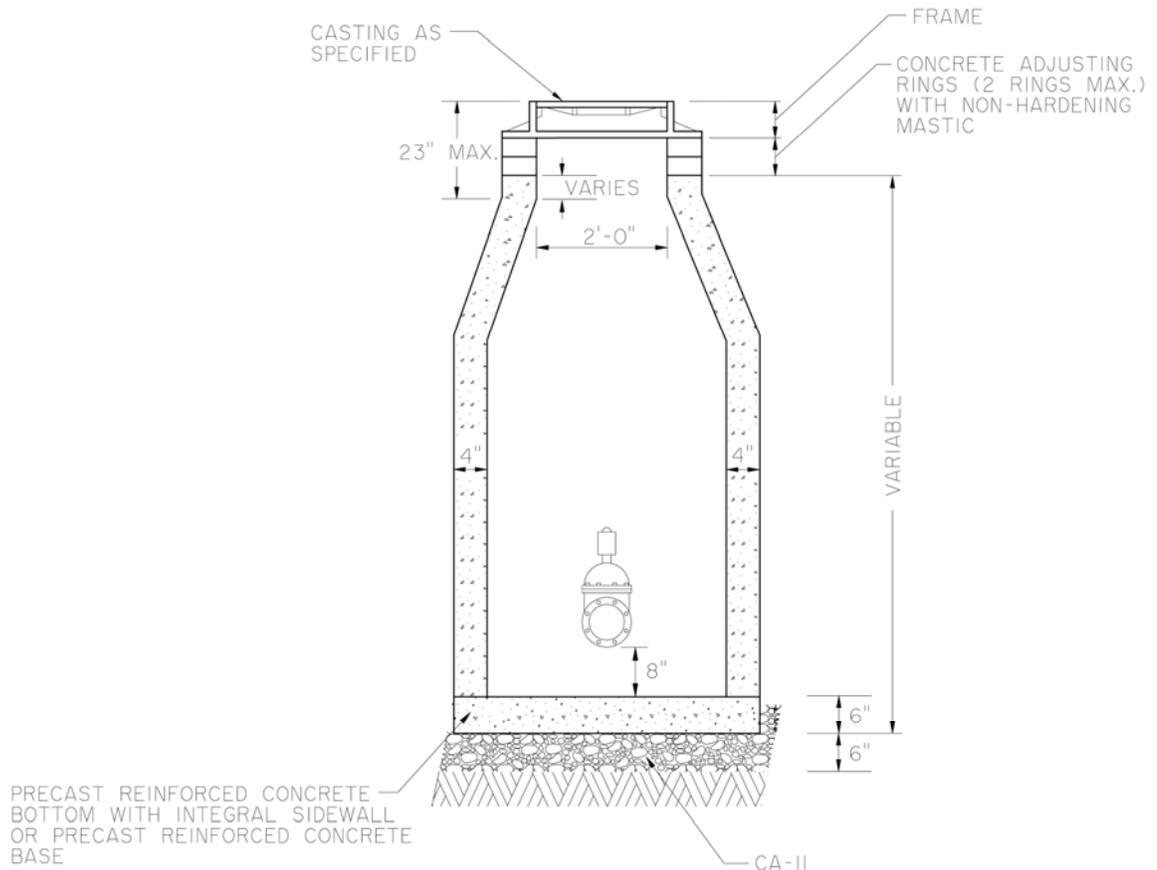
CITY OF ST. CHARLES

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(Ord. 2002-M-30 § 1.)

STD. DRW. NO.  
DATE: 10-1-2007

# VALVE VAULT



**NOTES:**

- 1.) PROVIDE SELECT GRANULAR BACKFILL CA-7 OR CA-II TO SUBGRADE WHEN IN PAVED AREAS
- 2.) ALL INTERIOR JOINTS SHALL BE DRESSED WITH NON-SHRINK MORTAR
- 3.) 4"-8" VALVES SHALL BE IN 4' DIAMETER VAULTS. 10" AND LARGER VALVES SHALL BE IN 5' DIAMETER VAULTS.

CITY OF ST. CHARLES

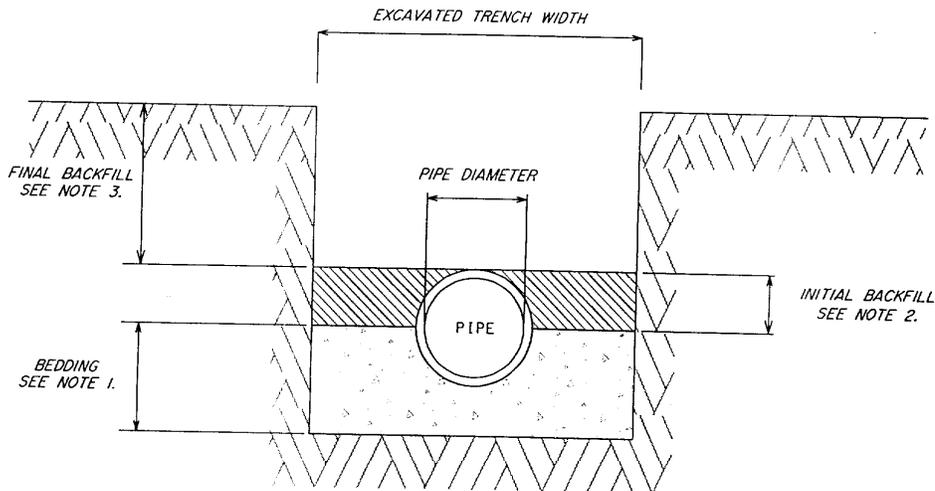
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(Ord. 2007-M-89 § 2.)

STD. DRW. NO. 16.44.070.03  
 DATE : 03/09/1999

# WATER MAIN TRENCH CROSS-SECTION

( TYPE FIVE LAYING CONDITION PER  
ANSI/AWWA C600 / A21.50 SECTION 3.3.7 )



**NOTES:**

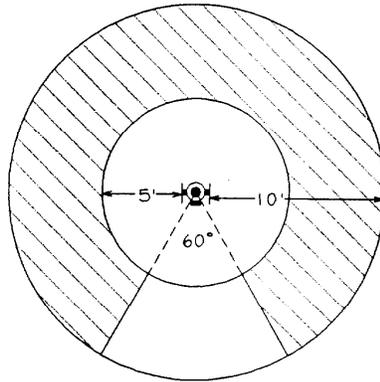
- 1.) BEDDING SHALL CONSIST OF COMPACTED GRANULAR MATERIAL (CA-6 OR FA-6) FROM A MINIMUM 4 INCHES BELOW THE PIPE TO THE CENTERLINE OF THE PIPE. BEDDING SHALL BE COMPACTED TO A MINIMUM OF 90% OF MODIFIED PROCTOR DENSITY IN ACCORDANCE WITH ASTM D-2049.
- 2.) INITIAL BACKFILL SHALL BE COMPACTED GRANULAR MATERIAL (CA-6 OR FA-6) WHEN THE PIPE TRENCH LIES UNDER OR WITHIN TWO FEET OF A CURB OR HARDSURFACED AREA. SELECT EXCAVATED MATERIAL MAY BE USED WHEN THE PIPE TRENCH IS NOT UNDER OR WITHIN TWO FEET OF A CURB OR HARDSURFACED AREA. INITIAL BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 90% OF MODIFIED PROCTOR DENSITY IN ACCORDANCE WITH ASTM D-2049.
- 3.) FINAL BACKFILL UNDER HARDSURFACED AREAS OF WHERE THE TRENCH LIES WITHIN TWO FEET OF CURB OR HARDSURFACED AREA SHALL BE IDOT CA-6 OR FA-6 (AG-LIME IS NOT PERMITTED) COMPACTED. MINIMUM DEPTH OF FIVE (5) FEET.

CITY OF ST. CHARLES

FILE: IDTL\WATER\TRENCH\CDTL

(Ord. 1999-M-29 § 1; Ord. 1997-M-103 § 1.)

PLANTING GUIDELINES



VEGETATION HEIGHT LIMITS ARE FOR MATURE PLANTS

NOTES:

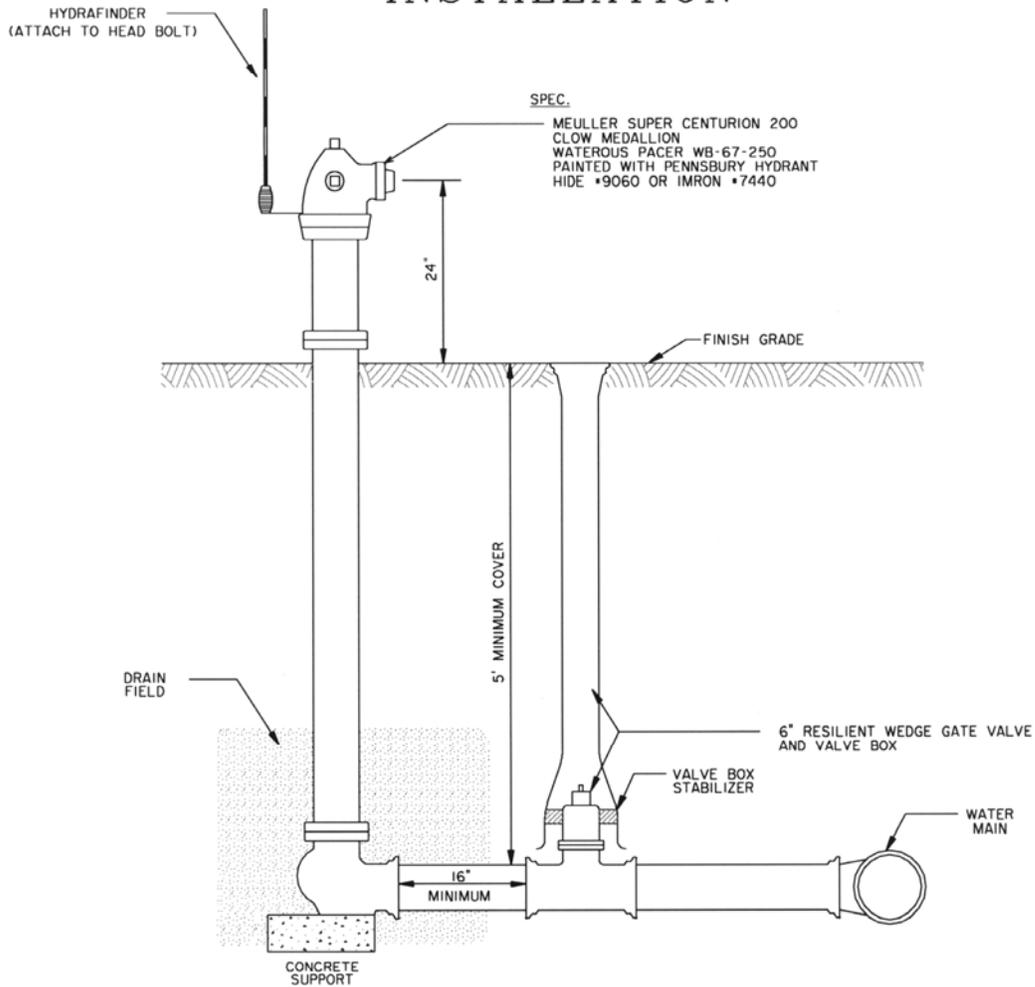
VEGETATION RESTRICTIONS

1. AN AREA AROUND THE HYDRANT 5 FEET IN RADIUS SHALL REMAIN FREE OF ALL VEGETATION EXCEPT FOR GRASS.
2. AN AREA AROUND THE HYDRANT FROM 5 FEET TO 10 FEET MAY HAVE VEGETATION WITH A 24" TO 30" HEIGHT EXCEPT FOR THAT PORTION OF THE AREA IN FRONT OF THE HYDRANT CREATING A 60° ARC.

CITY OF ST. CHARLES

STD. DRW. NO.  
DATE : 1-11-01

# TYPICAL HYDRANT INSTALLATION



**NOTES:**

- 1.) THE NOZZELS SHALL NOT BE CLOSER THAN 2 FEET FROM BACK OF CURB OR SIDEWALK.
- 2.) ALL JOINTS FROM THE HYDRANT TO THE MAIN SHALL BE RESTRAINED WITH MEGA-LUG OR UNI-FLANGE RESTRAINING DEVICE OR APPROVED EQUAL IN ACCORDANCE WITH THE CITY CODE OR TIE THE AUXILIARY VALVE TO THE TEE AND THE HYDRANT TO THE AUXILIARY VALVE WITH MINIMUM 3/4" STAINLESS STEEL RODS, NUTS AND WASHERS
- 3.) ALL BELOW GRADE FACTORY INSTALLED BOLTS SHALL BE STAINLESS STEEL GRADE 304
- 4.) HYDRANTS MAY ONLY HAVE ONE (1) EXTENSION KIT.

CITY OF ST. CHARLES

FILE: IDTL\HYDRANTS.DTL

(Ord. 2001-M-18 § 1; Ord. 1997-M-103 § 1.)

WATER MAIN RESTRAINT

Minimum Restrained Lengths (in feet) back from both sides of fitting							
Fitting type/nominal size	4"	6"	8"	10"	12"	16"	
90 Degree Bend	17	25	32	38	45	59	
45 Degree Bend	7	10	13	16	19	24	
22.5 Degree Bend	3	5	6	8	9	12	
11.25 Degree Bend	2	2	3	4	4	6	
Dead End	39	55	73	87	103	134	
Top Side Vertical Offset * (45 Degree)	16	23	30	36	43	55	
Bottom Side Vertical Offset * (45 Degree)	4	6	8	10	11	15	
Tee Run X Branch **	6' by	1	17				
Tee Run X Branch **	8' by	1	5	34			
Tee Run X Branch **	10' by	1	1	24	49		
Tee Run X Branch **	12' by	1	1	15	41	65	
Tee Run X Branch **	16' by	1	1	1	26	52	95
Reducer ***	6' by	28					
Reducer ***	8' by	52	30				
Reducer ***	10' by	71	54	29			
Reducer ***	12' by	90	75	55	51		
Reducer ***	16' by	123	113	97	94	54	
* Vertical offset with MINIMUM 10' of solid pipe between upper and lower bend.							
** Tee with MINIMUM 10' solid pipe on both sides of run. Number indicates length of branch to be restrained.							
*** Length back from Large Eng of Reducer.							

CITY OF ST. CHARLES

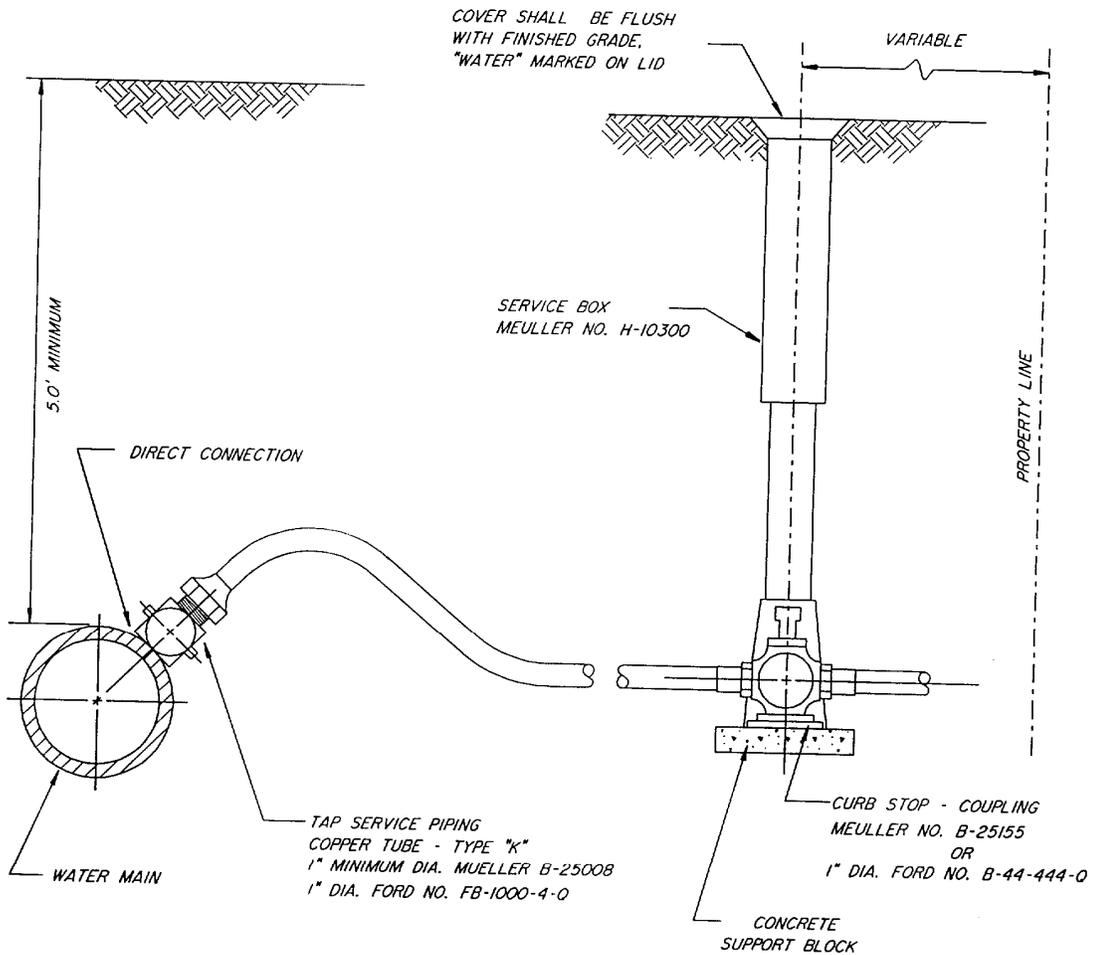
FILE: IDTL\WATER\RESTRAIT.DTL

(Ord. 1999-M-29 § 1.)

STD. DRW. NO. 16.44.070.H

DATE : 03-09-1999

# SERVICE TAP AND CONNECTION



**NOTES:**

- 1.) EVERY WATER SERVICE LINE FROM THE CORPORATION TO THE CURB STOP SHALL BE INSPECTED BY THE WATER DIVISION FOREMAN OR HIS DESIGNEE. ALL INSPECTIONS SHALL BE OPEN TRENCH. CONTRACTORS REQUESTING SERVICE LINE INSPECTIONS SHALL CONTACT THE WATER DIVISION 48 HOURS PRIOR TO REQUESTED INSPECTION TIME.

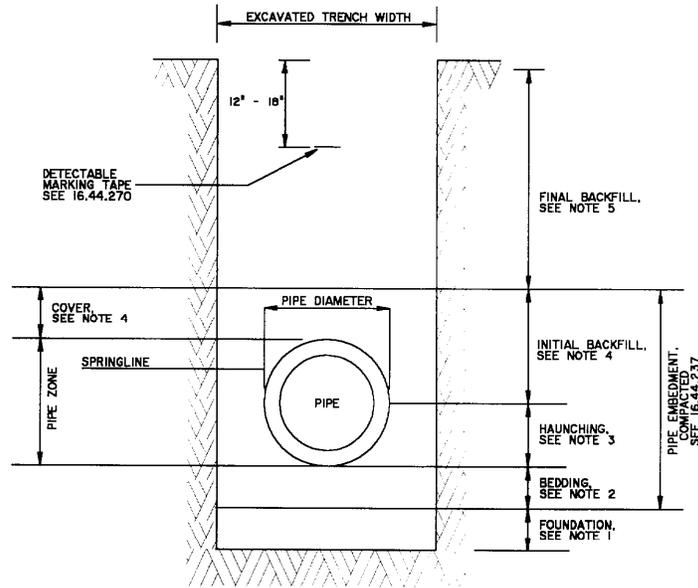
CITY OF ST. CHARLES

FILE: IDTL\WATER\SERV\TAP.DTL

(Ord. 1997-M-103 § 1.)

STD. DRW. NO.  
DATE : 12-18-97

# SANITARY SEWER TRENCH CROSS-SECTION



**NOTES:**

- 1.) FOUNDATION IS REQUIRED WHEN DEEMED NECESSARY BY THE ENGINEER.
- 2.) BEDDING SHALL CONFIRM TO IDOT GRADATION CA-7 OR CA-II IN ACCORDANCE WITH ASTM 2321 CLASS I. THICKNESS SHALL BE EQUAL TO 1/4 OF PIPE DIAMETER BUT SHALL NOT BE LESS THAN 4" IN EARTH EXCAVATION AND 6" IN ROCK EXCAVATION, COMPACTED.
- 3.) HAUNCHING SHALL BE IDOT CA-7 OR CA-II IN ACCORDANCE WITH ASTM 2321 CLASS I, COMPACTED.
- 4.) INITIAL BACKFILL SHALL BE IDOT CA-6 OR CA-II IN ACCORDANCE WITH ASTM 2321 CLASS I COMPACTED TO A MINIMUM COVER OF 12".
- 5.) FINAL BACKFILL UNDER HARDSURFACED AREAS SHALL BE IDOT CA-6 OR FA-6 (AG-LIME IS NOT PERMITTED) COMPACTED IN 8"-9" LIFTS TO 95% MODIFIED PROCTOR DENSITY PER ASTM D-15557.

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file: IDTL\SANITARY\TRENCH.DTL

(Ord. 1993-M-49 §1.)