City of Elk River Design Standards

Index

Section 2000 – Street Design Standards................................................................. 2
Section 2500 – Storm Drainage Design Standards.................................................. 6
Section 3400 - Watermain Design Standards......................................................... 7
Section 4000 – Sanitary Sewer Design ..................................................................... 19
Section 5000 – GIS Information Requirements....................................................... 23
Elk River As-built Review Checklist......................................................................... 24
Development Plan Requirements............................................................................. 25
Items Needed to Start Utility Construction............................................................... 26

Appendix: .................................................................................................................. Standard Plates

2000 – Surmountable and B618 Concrete Curb and Gutter
2001 – Concrete "V" Gutter
2002 – Depressed Curb with Driveway Apron
2005 – Catch Basin Frame Placement Surmountable Curb and Gutter
2007 – Rural Driveway Entrance
2009 – Standard Silt Fence
2010 – Typical Urban Residential Street Section
2011 – Typical Non-Urban Residential Street Section
2012 – Bituminous Trail Typical Section
2015 – Rock Construction Entrance
2500 – Shallow Catch Basin
2501 – Standard Manhole
2502 – Slab Top Manhole
2503 – Concrete Pipe Joint Ties
2504 – Trash Guard
2505 – Rip-Rap Installation
2506 – Standard Manhole Casting
2507 – Standard Inlet Casting
2509 – Grate Casting
2511 – Catch Basin Inlet Protection
2513 – Concrete Erosion Mat Outlet Installation Detail
3400 – Typical Water Layout
3401 – Pacer Hydrant Detail
3402 – Hydrant Restraint Detail
3403 – Typical Service Detail
3404 – Watermain Crossing
3405 – Class C Pipe Bedding
3406 – Class B Pipe Bedding
3408 – Tracer Wire Detail
3409 – Tracer Wire Layout Detail
4000 – Standard Manhole
4001 – Slab Top Manhole
4002 – Inside Drop Manhole (Two Feet or Less)
4004 – Outside Drop Manhole
4005 – Standard Air Relief Manhole
4006 – Class B Pipe Bedding
4007 – Typical House Service
4008 – Service Riser Section
Section 1000 - General

These design standards are intended to provide general requirements of the City of Elk River for the purpose of public improvements. This document does not contain all City requirements, but rather provides guidelines as to types of materials and design practices. The City of Elk River will review each proposed improvement project individually for compliance with these design standards, current City ordinances, City of Elk River general specifications, and general engineering practice. The City of Elk River reserves the right to modify these design standards and to require more stringent requirements on any public improvement. The City of Elk River general specifications are available upon request.

In addition to the standards detailed in this manual, all placement, testing and material requirements prescribed in the current versions of the MnDOT Standard Specifications for Construction and the City Engineers Association of Minnesota (CEAM) Standard Specifications shall be followed.

END OF SECTION 1000
City of Elk River Design Standards

Section 2000 – Street Design Standards

Design Criteria

1. Minimum street grade of 0.50%, maximum street grade of 8.00% in accordance with City ordinance. Rural street sections require a minimum grade of 0.75% within 100 feet of low points.

2. Maximum slope of approach grade tangent at street intersections of 1.00% for 100 feet from the edge of the cross street.


4. Cul-de-sac entrance radii of 35 feet to back-of-curb.

5. Minimum grade for circumference of cul-de-sac is 0.50%.

6. Horizontal and vertical curves should meet design standards detailed in the most current version of the MnDOT Roadway Design Manual for the corresponding design speed and roadway type.

7. Minimum design speed shall be 30 MPH unless otherwise approved by the City Engineer.

8. Cul-de-sacs shall have a diameter of 90 feet, face-of-curb to face-of-curb.

9. Urban (defined as those with public sewer and water systems) residential streets shall have 28” surmountable curb in accordance with Standard Plate No. 2000 and Standard Plate No. 2010. All other urban streets shall have B618 curb and gutter. B618 curb and gutter shall be constructed at all radii and catch basins with a ten-foot transition from surmountable curb to B618 curb and gutter.

10. Rural (defined as those without public sewer and water systems) residential streets, are allowed to follow design standards shown in Standard Plate No. 2011. This section allows the ability to create a less intensive section making use of roadside ditch for drainage management.

11. Street pavement sections shall be designed in accordance with the minimal thicknesses shown below:

   **Local Residential Street Section**
   - 8" Aggregate Base, Class 5
   - 2½” Non-wear Course Mixture SPNWB230C
   - 1½” Wear Course Mixture SPWEA240C

   Local residential streets are defined as those expecting to serve less than 1,000 vpd. All other streets shall be designed for 9-ton loading based on geotechnical evaluation of soil borings and the expected traffic demands. The minimum 9-ton section is as follows:

   **9-Ton Street Section**
   - 10" Aggregate Base, Class 5
   - 2½” Non-wear Course Mixture SPNWB330C
   - 2” Wear Course Mixture SPWEB340C

12. Minimum street width shall be 32-feet face of curb to face of curb. All residential streets will be reviewed for possible widening based on their anticipated uses.

13. All urban commercial or industrial zoned streets and all urban collector and arterial streets shall
City of Elk River Design Standards

have a six-foot wide concrete sidewalk on at least one side. Other streets shall have concrete sidewalk as directed by the City Council. Concrete sidewalk shall be located one foot from the property line.

14. All concrete sidewalks in new developments shall be 6” thick to allow for future driveway locations.

15. All concrete utilized in public right-of-way shall be MnDOT 3A32 or 3A32HE (High Early) mix with a specified air content of 6.5%. Testing procedures shall be consistent MnDOT’s Schedule of Materials Control for Concrete Field Testing. If the public concrete curb or sidewalk is damaged or there is need to replace during private construction, the private contractor is responsible for completion of repairs. The following conditions must be met before the replacement or repair will be accepted:
   A. All work in the public right-of-way requires the use of traffic control in accordance with MnDOT’s Temporary Traffic Control Layouts Field Manual.
   B. Damaged concrete shall be cut and removed. Straight line cut shall be made in the existing control joints, not mid-panel.
   C. Class 5 aggregate base shall be placed and compacted to a minimum uniform depth of 4 inches.
   D. Forms shall be set to full depth of the concrete section.
   E. Must set an inspection time with the City of Elk River 24 hours in advanced of the pour.
   F. Your testing company shall test the mix for proper air entraining prior to placement. City inspectors review the concrete ticket and observe the test. Failure of the test will result in mix rejection unless amended and retested.
   G. Concrete placement and finishing shall be in accordance with industry standards for external concrete. No steel troweling is allowed. The finished product shall be broom finished to match existing surfaces.
   H. White curing membrane shall be applied to all exposed surfaces, including the back of curb, within 1 hour of final finishing. Cold weather curing and protection procedures are required if freezing temperatures are forecasted within 1 week of placement.
   I. The concrete shall be protected from traffic use for a minimum of 7 days, or 3 days if high early concrete is used.

16. Temporary turnarounds with concrete curb and gutter shall be constructed at all dead-end streets which provide access to adjacent lots. Temporary turnarounds behind concrete curb and gutter will not be allowed.

17. Driveways on new residential properties shall have a maximum grade of 8.0%.

18. Bituminous trails shall be constructed as directed by the City Council. The bituminous surface shall be 10-feet in width. The trail section shall include, 6” of class 5 aggregate base, 2 ½” of wearing course bituminous (SPWEA240C). The aggregate base shall be placed and compacted to 1-foot beyond the edge of pavement to a total width of 12-feet. The constructed trail should have a tight finish with minimal voids. Depending on the site, conditions may warrant different construction techniques and typical section. All trails are subject to approval by the City Engineer.

19. Concrete pedestrian ramps shall be constructed at all locations where sidewalks and trails connect to a street having concrete curb and gutter. Pedestrian curb ramps shall be constructed with a red colored detectable warning (truncated dome type) panel. MnDOT Standard Plates shall be followed. Pedestrian ramps must meet all current ADA standards.
20. Cul-de-sac streets shall not exceed 700 feet from the center of the intersection to the center of the cul-de-sac.

21. “Eyebrow” cul-de-sacs will not be allowed.

22. Retaining walls are generally not allowed within the City right-of-way. Retaining walls must be reviewed and approved by the City Engineer and the following:
   A. Must conform to an engineered design if less than 4 feet in height (exposed face).
   B. Must be specifically designed for the site by a Licensed Professional Engineer if greater than 4 feet in height.
   C. Must have fence or railing if greater than 4-feet in height.

23. The City will impose a $1,000 maintenance fee for every patch location needed in the base course pavement. No patches are allowed in any wear course pavement.

24. All castings (manholes and valve boxes) must be raised to ½” below the finished asphalt base course elevation before paving of the asphalt base. Any cuts in the new base course pavement to adjust a casting to grade will be subject to the above described $1,000 maintenance fee. Adjustments to meet the final wear course elevation shall be accomplished using glue in steel adjusting rings.

25. Street signs, including regulatory and street names, shall be installed in new developments by the developer per City sign standards and the Minnesota Manual of Uniform Traffic Control Devices (MMUTCD). Street signs shall match City approved street names. “No Outlet” plates shall be installed along with street name signs where appropriate. Sign and post shop drawings shall be supplied to and approved by the Street division prior to order or installation.

26. Street name sign specifications:
   A. Street signs shall be E-450 SC/AL flat 0.080 aluminum plate single faced with 3M™ High Intensity Grade Prismatic Sheeting with screened white on green 6” Highway Gothic Font letters and a ½” white border. Plates shall be 9” wide by 36” or longer in length. Lettering shall not be all capital. Signs indicating numerical avenues should end in NW and signs indicating named streets should not include the NW.
   B. Plates shall be center saddle type. Stacking of street name plates should not exceed 3 plates.
   C. Street sign brackets shall be mounted on a 12-foot long galvanized tubular post, 23/8” outside diameter and a wall thickness of 0.080”. Install with an anti-rotation device to a minimum depth of 30”.

27. No Outlet signs shall be E-450 SC/AL flat 0.080 aluminum plate single faced with 3M™ High Intensity Grade Prismatic Sheeting with screened black on yellow 6” Highway Gothic Font. The sign shall include a black border with the lettering NO OUTLET and a directional arrow. The No Outlet signs will be placed on the bottom of the street name stack and the stack should not be taller than a 3-plate maximum.

28. Stop signs (R1-1) shall be 0.080 aluminum plate with 3M™ High Intensity Grade Prismatic Sheeting, 30” x 30”, mounted on an 8-foot long, 3 pound per foot channel post bolted to a 8’ long, 3 pound per foot galvanized channel post stub that is driven into the ground a minimum of 3 feet. At intersections with street signs and a stop sign, the stop sign shall be mounted on the street signpost.

29. Speed limit (30 MPH) signs shall be posted at each entrance residential developments, unless
otherwise noted.

30. Placement and installation of all signs are to be in accordance with the MMUTCD and at subject to final approval from the Street Superintendent.

31. Street name signs other than the above specification require approval by the City Street Superintendent (763.635.1120).

END OF SECTION 2000
Section 2500 – Storm Drainage Design Standards

Storm design criteria and standards shall follow the requirements detailed in the Elk River Stormwater Program guide. Minor drainage facilities shall carry the 10-year recurrence runoff flows. Minor facilities include street gutter capacity, cross-culverts, storm sewers, and swales to the limits of easement and/or right-of-way.

Materials

1. Pipe for all storm sewer installations shall be reinforced concrete pipe. Reinforced circular pipe shall conform to ASTM C 76 for Wall B pipe. Reinforced Arch pipe shall conform to ASTM C 506. Plastic or HDPE pipe for storm sewer installations in green spaces (side or rear yard) may be considered on an individual basis.

2. Standard curb inlet castings shall be Neenah R-3067-V or approved equal. In developments with surmountable curb, the curb at catch basin inlets shall typically transition to a B-type curb as shown on Standard Plate 2005. When inlet castings do not align with a property line and surmountable concrete curb and gutter is being placed, inlet castings may be Neenah R-3501-TB provided written approval is obtained from the City prior to construction.

3. For new developments, stormwater outfall erosion prevention material shall be concrete articulated block (eg. Flexamat) or approved equal.

4. Driveway culverts located in city right-of-way shall be concrete or corrugated metal pipe. The culverts must be designed and sized to handle the expected drainage. Minimum allowable size for a driveway culvert shall be 12-inches.

5. Rip-rap shall be Class IV random rip-rap in accordance with Mn/DOT 2511 except that all rip-rap shall be made up of granite. Placement of rip-rap shall be as shown on Standard Plate 2505.

6. Rear yard inlets shall utilize a Neenah R-1733 casting with a type C grate. Ditch inlet castings shall be R-4341-A or R-4342.

END OF SECTION 2500
Section 3400 - Watermain Design Standards

Design Criteria

1. All Watermain design shall comply with the latest edition of the Ten States Standards for Water Works, APWA and Minnesota Department of Health standards.

2. Water System installation and testing shall be in accordance with CEAM standard specifications except as modified herein.

3. The minimum size of watermain shall be 8 inches. (Hydrant leads can be 6”).

4. Watermain pipe shall be ductile iron in accordance with AWWA C151.

5. The minimum bury depth of watermain shall be 7’ - 6” to top of pipe.

6. The minimum size of water service lines and corporations shall be 1 inch. When water service lines exceed 200-feet, the service line and corporation shall be 1½”.

7. No dead-end mains shall be constructed. All watermains shall be looped.

8. Water looping outside of the Right of Way shall be HDPE, valved at each end with no connection/services in between.

9. Temporary dead-end mains shall be equipped with a fire hydrant for flushing purposes.

10. Hydrants shall be spaced so that all portions of a building or residence to be protected are within a 250-foot radius of a hydrant. (Final review will be made by the Fire Chief and City Engineer)

11. Each hydrant lead shall be equipped with a resilient seated valve for shut-off purposes and installed in accordance with the standard detail.

12. Valves shall be placed throughout the distribution system so that each portion may be isolated with the least interruption of service. Valves shall be placed at each roadway intersection or the intersection of watermains. (Final review will be made by the Water Superintendent and City Engineer)

13. A "Hydrafinder" locating device shall be installed on each hydrant installed and shall be mounted on the upper flange of the hydrant with a straight mounting bracket as indicated in Elk River Standard Plate 3401. For every five hydrant locating devices installed, one extra hydrant locating device shall be delivered to the Elk River Municipal Utilities.

14. All hydrants and leads shall be restrained from the main to the hydrant using threaded rods or Megalug restraint glands in accordance with the standard detail plates.

15. To allow the hydrant to drain after use, the hydrant bottom shall be surrounded by Coarse Filter Aggregate (Mn/DOT 3149.2H) or ¾” – 1½” clear drain rock covered with plastic material as indicated on Standard Plate 3402.

16. All watermain valves shall be operated only by Elk River Municipal Utility forces (763.635.1361).
1. The materials used in this work shall be new, conforming to the requirements of the referenced specifications for class, kind, type, size, and grade of material as specified below and other details indicated in the contract.

2. Watermain pipe shall be ductile iron pipe Special Class 52 and shall conform to the requirements of AWWA C151 (ANSI A21.51).

3. "Hydrafinder" hydrant locating devices, as manufactured by RoDon Corporation, shall be five feet in length and furnished with a "flat" steel mounting bracket and the MIL SPEC spring mount.

4. Pipe bends and fittings requiring restraining devices shall be restrained with Series 1100 Megalug mechanical joint restraint fittings as manufactured by EBBA Iron, Inc. or equal. ALPHA single bolt restrained joints, or equal may be used for hydrants and valves.

5. All pipe and fittings shall be furnished with cement mortar lining meeting the requirements of AWWA C104 (ANSI A21.4) for standard thickness lining. All interior and exterior surfaces of the pipe and fitting shall have a tar or bituminous seal coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.

6. Tapping Sleeves: Tapping sleeves shall be Smith-Blair 622 or 662, as shown in the table below, or approved equal.

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Model 622 shall have the following characteristics. Body shall be 3/8” carbon steel ASTM 285, Grade A. Flange shall be AWWA C207 Class D, ANSI 150 lb drilling. Gasket shall be grade 60 concave wedge gaskets. Bolts and nuts shall be high strength low alloy steel, AWWA C111, ANSI A21.11.

Model 662 shall have the following characteristics. Body shall be full circumference band, 18-8 type 304 stainless steel. Flange shall be AWWA C207 Class D, ANSI 150 lb drilling, epoxy coated finish. Gasket shall be Grade 60 concave wedge gasket. Bolts and nuts shall be 18-8 type 304 stainless steel.

7. Service Pipes and Fittings
   A. Corporation fittings
      • LF 1 CC X PE PJ BALL CORP (HDPE)
        ▪ Ford Meter Box Company Part FB10014NL or Equal
      “OR”
      • LF 1 CC X FLR BALL CORP (Copper)
        ▪ Ford Meter Box Company Part FB6004NL or Equal
      “IF REQUIRED”
City of Elk River Design Standards

- LF FCTH X PE COMP COUP (HDPE adapter)
  - Ford Meter Box Company Part C0644NL or Equal

B. Curb Stop
- LF 1 BALL CURB ST PE PJ (HDPE)
  - Ford Meter Box Company Part B66444MNL or Equal
- LF 1 BALL CURB ST FLR X FLR (Copper)
  - Ford Meter Box Company Part B22444MNL or Equal

C. Curb Box
- 1-1/4 X 8 X 1 ½ MINN CURB BOX (HDPE OR COPPER)
  - AY McDonald Part 5614 or 5615 or Equal
- 72 STNRY ROD (HDPE OR COPPER)
  - AY McDonald Part 566072” Rod

D. Service Pipes
- 1” IPS SIDR 7 HDPE BLUE PIPE
  - ENDOT Industries
    - ENDOPURE Water Service Pipe (IPS) – ASTM D2239 (SIDR 7) or Equal
      - Size: 1”
      - Nominal OD: 1.359
      - Nominal ID: 1.049
      - Minimum Wall: .150
  - Poly Technology
    - Blue Ultra Water Service Pipe – ASTM D2239 (SIDR 7) or Equal
      - Size: 1”
      - Nominal OD: 1.349
      - Nominal ID: 1.049
      - Minimum Wall: .150

“OR”
- 1” TYPE K SOFT COPPER TUBE
  - Type K Soft Copper Tube must meet the standards set forth in ASTM B88

8. Fire Hydrants
   A. Fire hydrants shall meet or exceed ANSI/AVWWA C502, latest revision and shall be certified by NSF to comply with the criteria of NSF/ANSI 61-G. Rated working pressure shall be 250 psig. The production test pressure shall be 500 psig.
   B. Hydrant nozzle section and standpipe shall be prime coated with an epoxy coating. Hydrant top coat shall be a catalyzed two-part red polyurethane. The polyurethane coating shall achieve a 58 Adhesion rating per ASTM D 3359, Test Method "B" (Cross-Cut Tape), shall exhibit no salt spray corrosion at 500 hours per ASTM 8117, provide an initial minimum specular gloss rating per ASTM 8523 of 90 (at beam axis60) and 80 (at beam axis 20), retain 80% of initial gloss rating per ASTM 2565 with an overall change of Delta 3.0 or less. Fusion bond epoxy on the upper barrel is not allowed. Lower hydrant barrel shall be constructed of centrifugally cast ductileiron and shall be coated with an asphalt varnish. The
City of Elk River Design Standards

hydrant shoe shall also be constructed of ductile iron and shall be fusion bond epoxy coated inside and out prior to assembly for corrosion resistance.

C. The main valve closure shall be of the compression type, opening against the pressure and closing with the pressure. Nozzle section to be designed for easy 360-degree rotation by the loosening of no more than four bolts.

D. The valve opening diameter shall be 5 % -inch. The hydrant must be designed so that removal of all working parts can be accomplished without excavating. The bronze seat shall be threaded into mating threads of bronze for easy field repair.

E. All hydrants shall have a minimum 5-1/4" diameter valve opening. All hydrants shall be configured, unless otherwise noted to have (2) 2-%" hose nozzles and (1) 4-W’ steamer nozzle, 1-%" pentagon bronze operating nuts, 6" diameter mechanical joint (MJ) inlet connection. Nozzles shall be retained by a ductile iron collar. Retention of the nozzle by set screws is not allowed. Caps shall be furnished with non-kink chains. All hydrant bolting materials shall comply with the applicable portions of Paragraph3.2.17 of ANSI/AWWA C-502 requiring compliance with ANSI 818.2.1. Metric bolts are not allowed. All bolting below-grade shall be stainless steel.

F. The draining system of the hydrant shall be bronze and be positively activated by the main operating rod. Hydrant to be furnished with a sliding bronze drain valve. Sliding drain valves made of rubber, plastic, composition material or leather will not be allowed.

G. Hydrant must have an internal travel stop nut located in the top housing of the hydrant. All hydrant operating threads to be factory lubricated. 0-rings shall be furnished to help keep operating threads lubricated and protected from line fluid and from the weather.

H. Hydrant must have a traffic flange design allowing for quick and economical repair of damage resulting from a vehicle’s impact.

I. All depth of bury lines shall be clearly and permanently marked on the lower barrel of the hydrant. All extensions shall have the ability to be installed without need to shut off the water and limited to one per hydrant. To insure proper fit and tolerances all extensions shall be manufactured by the original hydrant manufacturer. After market extensions and/or parts will not be allowed.

J. All fire hydrants shall be the 5 %-" Waterous Pacer Model W867-250, as manufactured by AMERICAN Flow Control, or Engineer pre-approved equal.

9. Valves

A. Valves 2" - 12" shall be of the Resilient Wedge Gate Valve type design. All gate valves shall be rated for 250 psig cold water working pressure, with zero leakage. The rating shall be indelibly marked on the casting. The valves shall comply fully, in all applicable sizes, with the latest edition of ANSI/AWWA C-515, as well as all requirements detailed herein. The manufacturer shall provide drawings and/or an affidavit detailing compliance with all applicable standards and specifications, if so requested by the Engineer. All valves shall be of the same manufacturer and shall clearly bear the manufacturer’s name and valve size.

B. Valves larger than 12-inch shall be butterfly valves.

C. All ferrous components of the valve shall be constructed of ductile iron. All valves shall be cast with the words "DI" or "Ductile Iron". The wrench nut shall be constructed of ductile iron, shall have four flats at stem connection to insure even transfer of torque to the stem.

D. The wedge shall be ductile iron. It shall be fully encapsulated with EPDM rubber, symmetrical in design and shall seat equally well with flow in either direction. In sizes 4" - 48" the wedge shall incorporate the use of guides encapsulated with an engineered plastic. Double disc, metal style solid wedge valves, or designs employing a metal plow style design are not allowed. The valve body guide track shall be of shallow rectangular trough-style design. Guide tracks employing multiple tracks or of a male type design are not allowed. The wedge to stem design on 4" - 48" shall employ the use of an independent stem nut.
City of Elk River Design Standards

An integral stem nut design in those sizes is not allowed.

E. All body to body bolting material shall be Type 304 SS, develop the physical strength characteristics of ASTM A307 and shall have the dimensional requirements of AWWA C-515 and ANSI 18.2.1. All body to bonnet bolting shall be of the same size and length. All bolts shall have square or hexagonal heads. Metric bolts, socket head cap screws, or recessed alien-head type bolts filled with hot-melt type wax will not be allowed.

F. Designs employing two-piece independent thrust collars will not be allowed. All stem diameters and the prescribed number of turns to open shall be as detailed in the applicable portions of Table 4 of AWWA C-515. The stem o-rings above the thrust collar shall be replaceable with the valve fully open and while subjected to full working pressure. 0-rings set in a cartridge type design will not be allowed. Valve shall be equipped with thrust washers above and below the thrust collar to reduce the operating torque of the valve.

G. All internal and external surfaces of the valve shall be coated prior to assembly, with epoxy. All valve body gaskets shall be of a pressure energized o-ring design.

H. All valves 14" and larger shall be equipped with lifting lugs or eyebolts for lifting. All valves 16" and larger shall be equipped with bevel gearing for horizontal or spur gearing for vertical installation to reduce operating torque. Valves equipped with bevel gears shall be equipped with flushing ports on each wedge guide channel. Where allowable, valves should be installed in the vertical position. Valves employing the use of an external and/or integral by-pass for torque reduction are not allowed.

I. Valves shall be manufactured by a company domiciled in the United States, as well as have a history in manufacturing Resilient Wedge Gate Valves greater than 25 years. All Resilient Wedge Gate Valves shall be American Flow Control Series 2500 or Engineer pre-approved equal.

J. Valve boxes shall be 5¼” diameter shaft suitable for 7’-6” of cover over the top of the watermain. Boxes shall be cast iron screw type two-piece boxes with the word “WATER” on the lid. Valve boxes shall be Tyler 6850 with 5¼” Drop Lid, or equal.

K. All valve boxes shall be installed upon the valve with the use of a Gate Valve Adaptor as manufactured by Adaptor Inc. or approved equal. The adaptor shall be considered incidental to the valve box installation.

10. Trace Wire

A. Open Trench - Trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450lb. break load, with minimum 30 mil HDPE insulation thickness.

B. Directional Drilling/Boring - Trace wire shall be #12 AWG Copper Clad Steel, Extra High Strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.

C. Trace wire – Pipe Bursting/Slip Lining - Trace wire shall be 7 x 7 Stranded Copper Clad Steel, Extreme Strength with 4,700 lb. break load, with minimum 50 ml HDPE insulation thickness.

Construction

1. Wet Tap with Valve

The tapping sleeve and resilient seated gate valve assembly shall be installed on the watermain pipe after thoroughly cleaning the pipe to be tapped. The sleeve shall be assembled on the pipe and the bolts tightened per the manufacturer’s specifications.

Shell cutters shall be the maximum size allowed for the tap being made. Size on size taps shall utilize an inch undersized shell cutter.

Electrical conductivity straps shall be provided to bypass the tapping sleeve assembly.
Upon completing the installation all exposed bolts and nuts shall be completely coated with an approved bituminous rust preventative coal tar material. The entire tapping sleeve and valve assembly shall be polyethylene encased.

2. Water Service Installation
Water service lines shall be installed in accordance with Minnesota Department of Health standards. Where water service lines are installed alongside of sanitary or storm sewer service lines, installation shall maintain the minimum specified clearances between pipelines and provide proper and adequate bearing for all pipes and appurtenances.

Unless otherwise specified, installation of water service lines shall provide for not less than seven- and one-half feet of cover over the top of the pipe and for not less than 18 inches of clearance between pipelines. Also, at least 6 inches of clearance shall be maintained in crossing over or under other structures. Where the service pipe may be exposed to freezing due to insufficient cover or exposure from other underground structures, the water pipe shall be insulated as directed by ERMU.

Service trenches shall be restored and compacted as specified for pipelines.

A. No dry tapping shall be allowed. Unless otherwise indicated, tap service piping may be laid directly on any solid foundation soil that is relatively free of stones and hard lumps.

Tap service piping shall be installed in one piece without intermediate joint couplings between the corporation stop at the watermain tap and the curb stop. All copper pipe and appurtenances shall be joined by means of approved flared type threaded couplings.

Connection of tap service lines to the watermain shall be made with an approved corporation stop, with the watermain tap being made from horizontal to an angle of not more than 15 degrees from the horizontal. (2:30 and 9:30). Expansion loops shall be directed horizontally, not vertically from the tap. A minimum of 3 full threads of the corporation stop must engage in ductile iron watermain or a saddle must be used for the connection as noted in the following table.
The flaring of copper tubing ends shall be accomplished only with the use of the proper size and type of tools as designated for the purpose, and will provide accurate sizing and rounding of the ends. Tubing shall be cut squarely and all edge roughness shall be removed prior to flaring. All couplings shall be tightened securely, so the flared end fits snugly against the bevel of the fitting without leakage. The flared joint couplings shall be made up without the use of jointing compounds.

Unless otherwise indicated, tap service lines shall be installed on a straight line at right angles to the watermain or property line. The service line shall be terminated with a curb stop and box at the property line. When the service lines are to be terminated beyond the curb stop and box at the property line, then the service line extension shall be terminated with a compression fitting and cap, suitable to pressure test against. This longer service line may be required to avoid future sidewalk disruption or conflicts with utility lines within the utility easement along the front of the lot line.

The service pipe and curb stop coupling depth shall be such as to maintain not less than 7.5-foot minimum cover, or in locations where conflict may occur with storm sewer, service pipe shall be placed at least 3 feet below the storm sewer invert or shall be insulated.

The service box shall be screwed onto the curb stop coupling and be firmly supported on a concrete block. Service boxes shall be installed plumb and be braced effectively to remain vertical during and after completion of backfilling. The service boxes shall be brought to final surface grade when the final ground surface has been established.

3. Setting Valves, Hydrants, and Fittings

Hydrants shall be installed plumb. The large pumper nozzle shall be oriented squarely facing the street. If the hydrant installation results in the pumper nozzle not facing the street, the hydrant head shall be rotated accordingly. The traffic flange of the hydrant shall be set with the bottom of the flange 2 inches above finish grade. When a hydrant barrel extension is installed the traffic flange shall be adjusted to remain at 2 inches above the finish grade.
A drainage pit of a minimum volume of one cubic yard shall be constructed around the hydrant base and filled with 3/4 to 1.5-inch drain rock firmly compacted under and around the hydrant base and to 6 inches above the hydrant drain hole. The drain rock shall be covered with geotextile fabric, 6 mil polyethylene, or two layers of tar paper prior to backfilling. Hydrant drain holes shall normally be left open. Hydrants located where the groundwater is above the drain hole shall have the outlet factory plugged to ensure proper plug installation. The hydrant shall have a permanent tag attached stating "Pump After Use". The pumper nozzle shall be factory painted in accordance with the City standard to identify the hydrant as having a plugged drain hole and needing to be pumped out after use.

New hydrants shall have hydrant locating devices and flags.

Valves shall have a piece of geotextile fabric, 4 feet by 4 feet, placed centered over the valve body, prior to installing the bottom section of the valve box, to prevent soil migration into the valve box assembly. The valve box shall be centered over the operating nut of the valve, installed plumb, and the box cover set to finish grade in accordance with the pavement requirements. Valve boxes shall be installed so as to not transmit shock or stress to the valve. The Contractor shall take extra care in backfilling and compacting around the valve box assembly to ensure plumbness and ease of keying the valve upon final installation.

Valve boxes installed independent of a hydrant outside the paved roadway shall be marked with a 4-foot-high signpost with a 4 x 8-inch reflectorized marker with a GV labeling on it. The marker post shall be installed two feet back of and facing the valve box, to allow operation of the valve wrench without hitting the marker post.

All dead-end lines shall be terminated with a plug or cap and restrained, rodded, or thrust blocked. If the pipe size is reduced near the end of the line, restraints shall be sized for the pipe size prior to the reduction. A 4-inch x 4-inch x 6-foot wood post marker shall be installed at the end of the line. The marker shall be installed with 4 feet buried in the ground and 2 feet exposed above the ground.

4. Tracer Wire
Tracer Wire Requirements: Tracer wires shall be installed along all nonmetal mainline pipe runs and all services unless noted otherwise.

A. Connectors
   a. All mainline tracer wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
   b. Direct bury wire connectors – shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure.
   c. Non-locking friction fit, twist on or taped connectors are prohibited.

B. Termination/Access
   a. All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
   b. All grade level/in-ground access boxes shall be appropriately identified with “sewer”
or “water” cast into the cap and be color coded.

c. A minimum of 2 ft. of excess/slack wire is required in all trace wire access boxes after meeting final elevation.

d. All trace wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection.

e. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

f. Service Laterals on public property - Trace wire must terminate at an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway.

g. Service Laterals on private property - Trace wire must terminate at an approved above-ground trace wire access box, affixed to the building exterior directly above where the utility enters the building, at an elevation not greater than 5 vertical feet above finished grade, or terminate at an approved grade level/in-ground trace wire access box, located within 2 linear feet of the building being served by the utility.

h. Hydrants – Trace wire must terminate at an approved above-ground trace wire access box, properly affixed to the hydrant grade flange. (affixing with tape or plastic ties shall not be acceptable)

i. Long-runs, in excess of 500 linear feet without service laterals or hydrants - Trace wire access must be provided utilizing an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway. The grade level/in-ground trace wire access box shall be delineated using a minimum 48” polyethylene marker post, color coded per APWA standard for the specific utility being marked.

C. Grounding

a. Trace wire must be properly grounded at all dead ends/stubs.

b. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) specifically manufactured for this purpose and buried at the same elevation as the utility.

c. When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.

d. When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lug connector.

e. Where the anode wire will be connected to a trace wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

D. Installation

a. Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.

b. Trace wire systems must be installed as a single continuous wire, except
where using approved connectors. No looping or coiling of wire is allowed.
c. Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
d. Trace wire must be properly grounded as specified.
e. Trace wire on all service laterals/stubs must terminate at an approved trace wire access box located directly above the utility, at the edge of the road right-of-way, but out of the roadway. (See Trace wire Termination/Access)
f. At all mainline dead-ends, trace wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the trace wire. (See Grounding)
g. Mainline trace wire shall not be connected to existing conductive pipes. Treat as a mainline dead-end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the trace wire.
h. All service lateral trace wires shall be a single wire, connected to the mainline trace wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline trace wire.
i. In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors, and shall be properly grounded at the splice location as specified.
j. A mainline trace wire must be installed, with all service lateral trace wires properly connected to the mainline trace wire, to ensure full tracing/locating capabilities from a single connection point.
k. Lay mainline trace wire continuously, by-passing around the outside of valves and fittings on the North or East side.
l. Trace wire on all water service laterals must terminate at an approved trace wire access box color coded blue and located directly above the service lateral at the edge of road right of way.
m. All conductive and non-conductive service lines shall include tracer wire.

E. Testing
a. All new trace wire installations shall be located using typical low frequency (512Hz) line tracing equipment. This verification shall be performed prior to final acceptance of the project.
b. Continuity testing in lieu of actual line tracing shall not be accepted.

Testing

1. Hydrostatic Testing of Pressure Pipe
   Each section of watermain that can be isolated by valving shall be subjected to a separate two-hour pressure test. Testing for the two-hour duration for watermain shall be with hydrants closed, and valves on hydrant leads and dead-end lines open for watermain. When service lines have stubs extending beyond the curb stops or valves, the curb stops or valves shall be in the open position and the pressure test conducted against the capped extension. Once this portion of the test is completed, the valve on the hydrant leads and dead-end water lines shall be closed and hydrants opened. The specified test pressure shall be applied, and the test repeated for 15 minutes to establish the condition of the hydrant lead valves.
When watermain is constructed, separated from the active system, the Contractor shall still be required to chlorinate, pressure test, and flush the new work in accordance with the specifications. This may require additional work operation to fill and flush the system.

The Contractor shall furnish the pump, pipe connections, gauges, and measuring equipment, and shall perform the testing in the presence of ERMU. The pressure gauge for the test shall be an Ashcroft Model 1082 with 4 1/2-inch dial face at 1 psi increments or approved equal. Where permanent air vents are not provided, the Contractor shall provide and install corporation cocks at the high points as needed for release of air as the line is filled with water.

Any defective joints, pipe, fittings, valves, or hydrants revealed during the testing or before final acceptance of the work shall be satisfactorily corrected and the tests shall be repeated until the specified requirements have been met.

A. Pressure Test: The section being tested shall be slowly filled with water and the specified test pressure shall be applied after all air has been expelled from the pipe. A hydrostatic pressure of 150 pounds per square inch, gauge pressure, measured at the lowest point of elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner.

The gauge pressure shall be checked after a minimum of two hours. A pressure drop of 1 psi or less over a 2 hour period shall be considered acceptance for the test section. If the pressure drop is greater than 1 psi the Contractor shall investigate the cause and take corrective action. The Contractor must make every effort to expel all air in the test section which may be causing a test failure. This may require the Contractor to tap a corporation at a high point of the main on the top of the pipe to release trapped air.

Service pipe shall typically be tested in conjunction with the main line testing. However, services may be tested separately at 100 psi, with the corporation stops open.

The Contractor may have to perform additional pressure testing if during the flushing operation there is evidence of debris being flushed out of the system. This may be due to poor construction practices and result in valves not closing tight after having done the original pressure test. Retesting shall be at the discretion of the Water Superintendent.

2. Disinfection of Watermains
Before being placed in service, the completed watermain installation shall be disinfected and flushed, and after the final flushing the water shall be tested for bacteriologic quality and found to meet the standards prescribed by the Minnesota Department of Health. The disinfection materials and procedures and the collection and testing of water samples shall at a minimum be in accordance with the provisions of AWWA C651, Disinfecting Watermains, and as well as meet the requirements of the Minnesota Department of Health.

Where an existing watermain is cut for the installation of a hydrant, for lowering the watermain, or for reasons determined by the Engineer, the pipe and fittings proposed to be installed shall be disinfected prior to installation as follows:

(1) The interior of the pipe and fittings shall be cleaned of all dirt and foreign material.
(2) The interior of the pipe and fittings shall be thoroughly swabbed or sprayed with a 1 percent minimum hypochlorite solution.
A. **Flushing:**

After the applicable retention period, heavily chlorinated water shall not remain in prolonged contact with the pipe. Chlorinated water shall be flushed from the main until chlorine concentration is no higher than generally in the system for domestic use.

The environment to which the chlorinated water is to be discharged shall be inspected. The Contractor shall be responsible to ensure that the receiving area is not damaged by the chlorinated water and shall use a reducing agent for neutralization when necessary.

B. **Bacteriological Tests:**

After final flushing and before the watermain is placed in service, samples of water shall be collected from the end of the main and each branch line for testing for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform organisms. Samples shall be at a rate of one per every 1000 feet of pipe. One sample shall be taken a minimum of 24 hours after flushing. A higher rate of sampling may be required to include all branch line. If water in the pipe does not meet the Minnesota Department of Health requirements, disinfection procedure shall be repeated until meeting the requirements. The pulling of all samples shall be witnessed by a representative of Elk River Municipal Utilities.

3. **Electrical Conductivity Tests**

A conductivity test within one week after completion of pressure testing of the watermain on all ductile iron pipe watermain will be required.

On watermain reconstruction projects, the Contractor shall perform the conductivity test prior to service line reconnections to ensure main line isolation from house services.

The system (pipeline, valves, fittings and hydrants) shall be tested for electrical continuity and current capacity. The electrical test shall be made after the hydrostatic pressure test and while the line is at normal operating pressure. Backfilling shall have been completed. The line may be tested in sections of convenient length as approved by ERMU.

Direct current of 350 amperes plus or minus 10%, shall be passed through the pipeline for 5 minutes. Current flow through the pipe shall be measured continuously on a suitable ammeter and shall remain steady without interruption or fluctuation throughout the 5-minute test period.

Insufficient current or intermittent current or arcing, indicated by large fluctuation of the ammeter needle, shall be evidence of defective contact in the pipeline. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested as a unit and shall meet the requirements.

Sources of D.C. for these tests may be motor generators, arc welding machines, or other approved sources. All such equipment shall be furnished by the Contractor.

Cables from the power source to the section of system under test should be of sufficient size to carry the test current without overheating or excessive voltage drop.

Electrical conductivity testing shall not be performed on plastic or HDPE watermain. Tracer (location) testing of all watermain shall be completed after all service installations have been completed.

END OF SECTION 3400
Section 4000 – Sanitary Sewer Design

Design Criteria

1. Sanitary sewer design shall conform to the latest edition of the Ten State Standards, APWA, and MPCA standards.

2. Sanitary Sewer System installation and testing shall be in accordance with CEAM standard specifications except as modified herein.

3. Sanitary sewer extensions shall consider each residence to include 3.3 people on the average.

4. Sewage flow design rates shall be 110 gallons per person per day.

5. Minimum flow velocities for sanitary sewer shall be 2.5 fps; maximum flow velocities shall be 10.0 fps.

6. Commercial and industrial developments shall consider design flows on a case-by-case basis.

7. All sanitary sewer extensions shall be laid as low as practical to minimize the need for future lift stations.

8. Connections to existing sanitary sewer manholes shall be core drilled and fitted with watertight elastomeric rubber boots.

9. All drop sanitary sewer manholes over two feet shall be constructed as outside drops; inside drops will be allowed on a case-by-case basis as approved by the City Engineer. Only IntraFlow® inside drops will be considered.

10. Sanitary sewer manholes shall be located on street centerline whenever possible. When manholes are not located on centerline, a station/offset shall be shown on the Plans to ensure that manholes are not located within wheel paths.

11. Sanitary sewer manholes will not be allowed in rear or side yards.

12. Sanitary sewer manholes shall have a 1-foot section under the cone.

13. Sanitary sewer services shall not be extended from manholes.

14. Sanitary sewer manholes shall be provided with a minimum 0.10-foot drop from inlet to outlet pipe.
City of Elk River Design Standards

Materials

1. Pipe and fittings for non-pressure gravity sewers and services shall conform to the requirements of ASTM D 1784 and D 3034, or ASTM F 789 and D 3034, and have push-on joints with elastometric gaskets, as follows:
   A. SDR 35 for depths up to 18-ft.
   B. SDR 26 for depths 18-ft to 30-ft.
   C. Ductile Iron Pipe, as specified below, for depths greater than 30-ft.

2. Pipe and fittings for pressure forcemains shall conform to the requirements of ASTM D 1784 and the following supplementary provisions:
   A. For pipes 12” in diameter and smaller, the pipe, fittings and accessories shall be C900 and have a minimum dimension ratio (DR) of 18 corresponding to a working pressure of 150 psi. For pipes 14” in diameter and larger, the pipe, fittings and accessories shall be C905 and have a minimum dimension ratio (DR) of 25 corresponding to a working pressure of 165 psi.
   B. Joints shall be push-on type with elastometric gaskets.
   C. Forceman pipe shall have location tracer wire placed with it. Location wire shall be 8-gauge plastic jacket type TW or THW. Splices shall be made using 3M cast kits and shall not occur more frequently than one per 250 feet of pipe.

3. All ductile iron pipe shall conform to the requirements of AWWA C 151 (ANSI A21.51) and as follows:
   A. CL 52 for depths 30-ft to 60-ft.
   B. CL 54 for depths greater than 60-ft.

4. For service pipe placed at a depth of 30 feet or greater, the pipe material shall match the mainline pipe as called for in item B3 above. Service pipe placed shallower than 30 feet of depth shall be SDR 26.

Lift Station

1. Site
   A. Drainage: the top slab of the wet well and valve vault should be set high enough to allow drainage away from the lift station structure.
   B. Access: an access driveway that is 12’ wide x 20’ long shall be provided for the lift station.
   C. A hydrant should be located within 50 feet of the lift station.
   D. A streetlight should be installed at each lift station.

2. General Configuration – the plan must indicate the proposed location of the Control Panel which is subject to approval by the Wastewater Superintendent and City Engineer.

3. Structures
   A. Minimum Size – 72” is to be a minimum diameter for both the wet well and valve vault. Depending on the size of the pumps, the wet well may need to be larger.
   B. The bottom of the valve vault is to be provided with 4” of slope across the vault to the drain outlet. The drain line should exit the valve vault horizontally through the wall instead of vertically through the floor. A backflow check valve needs to be installed on the drain line to prevent backflow of water and gas from the wet well to the valve vault. A trap should also be located in the drain line as a back up to the check valve for preventing gas flow back into the vault.
   C. All pipe work and fittings shall be contained within the valve manhole. Short-radius 90-
degree bends and tee should be use.
D. A 4-inch drain with grate from the valve manhole to the lift station shall be provided. A threaded Zurn Z-509 outlet and Zurn Z-1099 ball float type backwater valve or approved equal is required.
E. The vent pipe for the wet well needs to be cast into the concrete top slab.

4. Access Hatch
   A. Minimum Size – 30’’ x 48’’
   B. Access hatch frames should be angle frame-type with hasp and staple for a padlock.

5. Piping and Valves - Resilient wedge gate valves and the external lever and weight type check valves should be supplied.

6. Pumps
   A. Acceptable pump manufacturers shall be KSB.
   B. A lifting hook or approved equal should be provided for pulling the pumps.

7. Controls and Control Panel
   A. Simple Floats and Relays should be specified for small stations.
   B. Floats should be hanging type – not anchored.
   C. Five Floats should be provided (include low level alarm float).
   D. Run-time meters (¼” minimum size) – hour meters, no minute meters.
   E. Control Panels are to be stainless steel.
   F. Light in panel should be porcelain incandescent lamp.
   G. A reel strobe light alarm with buzzer shall be included on top of the control panel with reset switch. The reset switch shall be located inside the control panel. A battery backup with charger shall be provided for the alarms.
   H. No alarm horn should be included with the panels.
   I. Use tape type heaters in the panel.
   J. Auto Dialer – In the lift station panel design, leave a 16” x 20” space for the auto dialer box.
   K. An outlet needs to be included on the front side of panel.
   L. Magnetic fasteners for the inside dead-front panel shall be supplied.
   M. Installation of SCADA systems and equipment in accordance with City system.

Testing

1. Low-Pressure Air Test
   All gravity sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by Others. Each test section of the sewer shall be subjected to exfiltration testing by the ASTM F1417 (low pressure air) test method regardless of pipe material.

The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test. All testing shall be performed by the Contractor without any direct compensation being made therefore, and the Contractor shall furnish all necessary equipment and materials, including plugs and standpipes as required.

The sewer pipe section under test shall be clean at the time of testing but the pipe may be wetted. Pneumatic balls shall be used to plug the pipe ends at manholes. Low pressure air shall be introduced to the plugged line until the internal air pressure reaches three and one half (3.5) psi greater than the average back pressure of any ground water pressure that may submerge the pipe. At least two (2) minutes shall be allowed for the air temperature to stabilize before readings are taken and the timing started. During this time the Contractor shall check all plugs.
to detect plug leakage. If plugs are found to leak, air shall be bled off, the plugs shall be
retightened, and the air shall be reintroduced into the line.

The formula below calculates the specified minimum time required for a 1.00 psig pressure
drop from a starting pressure of 3.5 psig to a final pressure of 2.5 psig using a leakage rate of
0.0015 cubic feet/minute/square foot of internal surface.
Calculate all test times by the following formula:

\[ T = 0.085 \frac{DK}{Q} \]

where:

- \( T \) = shortest time allowed for the air pressure to drop 1.0 psig, sec.
- \( K = 0.000419 \) DL but not less than 1.0,
- \( Q \) = leak rate = 0.0015 CFM/SF,
- \( D \) = measured average inside diameter of sewer pipe, in., and
- \( L \) = length of test section, ft.

2. **Mandrel Deflection Test**

Deflection tests shall be performed on all plastic gravity sewer pipes. The test shall be
conducted after the sewer trench has been backfilled to the desired finished grade and has
been in place for thirty (30) days.

The deflection test shall be performed by pulling a rigid ball or nine-point mandrel (MnDOT
Technical Memorandum 98-24-B-01 or latest revision) through the pipe without the aid of
mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to ninety
five percent (95%) of the actual inside diameter of the pipe. The maximum allowable deflection
shall not exceed five percent (5%) of the pipe's internal diameter. The line will be considered
acceptable if the mandrel can progress through the line without binding. The time of the test,
method of testing, and the equipment to be used for the test shall be subject to the approval of
the Engineer.

All testing shall be performed by the Contractor at his expense without any direct compensation
being made therefore, and he shall furnish all necessary equipment and materials required.

3. **Televising**

Sewer line televising is required, at the cost of the Contractor, for all newly constructed lines.
The full video reports shall be submitted to the city via USB flash drive.

**END OF SECTION 4000**
Section 5000 – GIS Information Requirements

All developments that are constructed are required to submit electronic data based on as-built information in addition to hard copies of the as-builts. A development’s 2-year warranty period shall not begin until all required information is received. The information will be used to update the City of Elk River’s GIS map. The required electronic data consists of:

1. As-built record drawings of each plan sheet. The as-built drawings shall conform to the attached “Checklist for Elk River as-built review.” Drawing files shall be in Tagged Image File Format (TIFF) or ADOBE PORTABLE DOCUMENT FORMAT (PDF).
2. An overall map of the development that labels all applicable items with the I.D. Number assigned. I.D. Numbers should be assigned as detailed below. An 11” x 17” plan set needs to be submitted for review with the electronic data. Once approved, a 22” x 34” Mylar set of as-builts will be submitted.
3. AutoCAD drawing file containing all Right of Way, Lot Lines, Street Lines, Storm Sewer, Sanitary Sewer, and Water Main.
4. Field collected coordinates of all watermain appurtenances including valves, hydrants, curb stop boxes, tracer wire boxes, etc. shall be provided as part of the as-built records.

END OF SECTION 5000
Elk River As-built Review Checklist

1. All sheets must show “record plan” with signature and date.

2. Cover sheet must list general contractor and utility contractor and developer.

3. Sanitary sewer and water main sheets must show ties to all services, curb stops, clean outs, and valves.

4. Sanitary sewer and water main sheets must show rim and invert elevations, size, slope, and length on each pipe, riser height, invert elevation of all sanitary services, and all service lengths.

5. All changes to fittings on water main must be shown.

6. All wye locations must be shown.

7. Storm sewer sheets must show rim and invert elevations, slope, size and length on each pipe.

8. Any drain tile must be shown.

9. Any variation from the typical section must be shown on the street construction sheets.
Development Plan Requirements

1. Lot and block numbers.

2. Street names.

3. Storm sewer alignment with top and invert elevations. Also Flared ends with invert elevations.

4. Centerline Street elevations at 100 foot stations with high and low points.

5. Centerline street percent grades.

6. Cul-de-sac percent grade along curb.

7. Building setback lines.


9. All proposed driveway slopes.

10. House pads with house style and elevations.

11. Front and rear lot corner elevations.

12. Spot elevations at the rear of the house pads if the drainage is to be directed around the house pad to the front.

13. Typical lot detail indicating where lot and house elevations are shown to.

14. Legend with type of house styles and grade difference for garage floor to walkouts or lookouts.

15. Lot dimensions to the nearest foot.

16. Typical street section.

17. Drainage arrows at high points and major grade changes.

18. Existing and proposed easements.

19. Emergency overflows should be labeled and shown with spot elevations and drainage arrows. Emergency overflows must be established for catch basins in the street and in rear yards. Areas along rear lot lines which are below emergency overflows elevations shall be designated as drainage easement on the final plat.

20. Wetland boundaries must be accurately shown.

21. Development plan must be signed by a registered Land Surveyor or Engineer.
Items Needed to Start Utility Construction

1. Site grading is completed.
2. Approved construction plan.
3. Approved construction specifications.
4. Hold preconstruction meeting.
5. SWPPP approved and signed.
6. NPDES permit for grading.
7. MPCA permit.
8. MDH water permit.
9. County access permit (if necessary).
10. Erosion control is in place.
11. Developer’s agreement has been executed.
12. Permit fees paid to City.
13. Surety posted with City.
14. Cost of Public Improvements provided to City broken down into 4 categories:
   A. Sanitary sewer
   B. Watermain
   C. Storm sewer
   D. Street construction
28" SURMOUNTABLE CONCRETE CURB AND GUTTER

B618 CONCRETE CURB AND GUTTER
BELLY FLOW CHANNEL TO FORM SMOOTH TRAFFIC CROSSING, NOT AN ABRUPT TRANSITION.

3-NOS. 4 BARS @ 15" O.C.
3/4"/FOOT
3/4"/FOOT

18" 3 1/2" 3" 3"

3/4"/FOOT

SECTION A-A

SECTION B-B

PROPERTY LINE

EXPANSION JOINTS

A 4'

A A A

EXPANSION JOINTS

A A A

QUADRANT TO BE POURED INTEGRALLY WITH CURB

PLAN

CONCRETE "V" GUTTER

REV: 3/2006

STANDARD PLATE NO. 2001
DRIVEWAY

12’ MINIMUM
24’ MAX. RESIDENTIAL
32’ MAX. COMMERCIAL

1/2” EXPANSION JOINT

CONCRETE APRON
CONTRACTION JOINT
DEPRESSED CURB

PLAN

FACE OF CURB

12’ MINIMUM
5 1/4”
3/4” LIP

GUTTER LINE

ELEVATION

3/4” RISE

4’ MINIMUM
MIN. SLOPE = 1%
MAX. SLOPE = 10%

6” CONC. RESIDENTIAL
8” CONC. COMMERCIAL

Curb and Gutter

SECTION

APPROVED SUBGRADE

1/2” EXPANSION JOINT

DEPRESSED CURB
WITH DRIVEWAY APRON

REV: 4/2021

STANDARD PLATE NO.
2002
SURMOUNTABLE CURB AND GUTTER

EXPANSION JOINT
BEGIN TRANS. TO TYPE B618 CURB AND GUTTER

FRAME, GRADE AND CURB BOX: NEENAH R-3067-V, ESS S-330 HC OR EQUAL

FRAME TIPPED TO MATCH STREET GRADE PROFILE

PLAN

10'-0"  36 1/2"  10'-0"

2-N0. 4 BARS

DESIGN GUTTER LINE GRADE

EXP. JOINT

G = GUTTER FLOW LINE

*WHEN BASE OF FRAME IS LEVEL TRANSVERSELY, 1" SUMP FROM LOWLINE RESULTS

SECTION A-A

2-N0. 4 BARS

11"

FRONT TOP EDGE OF FRAME
FRONT TOP EDGE OF GUTTER

EXP. JOINT

SECTION C-C

PLAN RIM ELEVATION
MATCH EDGE OF GUTTER

NON-SHRINK MORTAR MEETING CORPS OF ENGINEERS SPEC.
CRD-C-621 REQUIRED IF SHIMS ARE USED. SEE SPECIFICATIONS.

SECTION B-B

REV: 2/2017

CATCH BASIN FRAME PLACEMENT
SURMOUNTABLE CURB AND GUTTER

STANDARD PLATE NO. 2005
PAVED DRIVEWAY ENTRANCE

EDGE BITUMINOUS PAVEMENT
EDGE GRAVEL SHOULDER

20' RADIUS - PAVEMENT
15' RADIUS - GRAVEL BASE
TAPER TO MATCH EXISTING AT R/W

GRAVEL DRIVEWAY ENTRANCE

EDGE BITUMINOUS PAVEMENT
EDGE GRAVEL SHOULDER

25' 25' 2'
15' RADIUS - GRAVEL BASE
TAPER TO MATCH EXISTING AT R/W

CUT SECTION
VAR. 0.5'
USE 6:1 SIDE SLOPES
ROAD APPROACH - 50'(25' MIN.)
FARM ENTRANCE - 25'(15' MIN.)
FIELD ENTRANCE - 15' MIN.

FILL SECTION
0.5'
CULVERT IF NECESSARY

RURAL DRIVEWAY ENTRANCE

REV: 3/2006

STANDARD PLATE NO.
2007
NOTE:

1. SILT FENCES CONSTRUCTED WITH SUPPORT FENCES, POSTS SHALL BE SPACED AT 10’ OR LESS, AND DRIVEN AT LEAST 2’ INTO THE GROUND.

2. SILT FENCES CONSTRUCTED WITHOUT SUPPORT FENCES, POST SHALL BE SPACED AT 4’ OR LESS, AND DRIVEN AT LEAST 3’ INTO THE GROUND.
NOTE:
*8618 CONCRETE CURB AND GUTTER SHALL BE PLACED AROUND RADII AND AT STORM SEWER STRUCTURES.
**SILT FENCE & BLANKET SHALL BE INSTALLED BEHIND THE CURB DURING CONSTRUCTION BEFORE CLASS 5
AGGREGATE BASE IS CONSTRUCTED.

TYPICAL URBAN RESIDENTIAL
STREET SECTION

REV: 2/2017
STANDARD PLATE NO.
2010
BOULEVARD DRAINAGE AWAY FROM ROADWAY

BOULEVARD DRAINAGE TO ROADWAY

NOTE:
*B618 CONCRETE CURB AND GUTTER SHALL BE PLACED AROUND RADIUS AND AT STORM SEWER STRUCTURES.
**SILT FENCE & BLANKET SHALL BE INSTALLED BEHIND THE CURB DURING CONSTRUCTION BEFORE CLASS 5 AGGREGATE BASE IS CONSTRUCTED.
RESTORE DISTURBED AREA WITH 4" TOPSOIL (MINIMUM). SEEDING, FERTILIZING, AND PLACEMENT OF EROSION CONTROL BLANKET. SEED MIX TO BE TYPE 50A WITH APPLICATION RATE OF 50 LBS/ACRE OF RY SEED.

2.5" BITUMINOUS WEAR COURSE
6" CLASS 5 AGGREGATE BASE
APPROVED, COMPACTED SUBGRADE

TRAIL
TYPICAL CROSS SECTION

PROPOSED GRADE
2.0% MAX
2:1 MAX
4:1 PREFERRED

TRAIL
TYPICAL SECTION

0.6% TO 5.0% ALLOWABLE LONGITUDINAL GRADE IF WHEELCHAIR ACCESSIBLE. 8% ABSOLUTE MAXIMUM ALLOWABLE LONGITUDINAL GRADE.

REV: 4/2021
PUBLIC ROAD (HARD SURFACE)

TO GARAGE (30' MAX.,)
10' MINIMUM INITIAL

6" MIN.

1 1/2" TO 2" WASHED ROCK

NOTE:

ROCK ENTRANCE NEEDS TO BE IN PLACE (MIN 10' IN LENGTH) WITH ENOUGH MATERIAL ON HAND AT SITE TO COMPLETE TO GARAGE AFTER BACKFILL IN ORDER TO PASS INITIAL INSPECTION.
CASTING

CHIMNEY SEAL AROUND RINGS

GROUTED IN PLACE 2" CONCRETE ADJUSTING RINGS—MINIMUM 2 RINGS MAXIMUM 5 RINGS

WALLS TO BE CONSTRUCTED OF PRECAST SECTIONS OR CONCRETE SEWER BLOCK. BLOCK SHALL BE PLASTERED ON INTERIOR AND EXTERIOR.

6" CONCRETE BASE Poured IN PLACE OR 4" MINIMUM PRECAST BASE.

NOTE:
REINFORCING SHALL CONSIST OF A SINGLE LINE OF STEEL WIRE FABRIC HAVING AN AREA OF NOT LESS THAN 0.17 SQ. IN. PER FOOT OF HEIGHT.

REV: 2/2017

SHALLOW CATCH BASIN

2500
GROUTED IN PLACE – 2"
CONCRETE ADJUSTING RINGS –
MINIMUM 2 RINGS
MAXIMUM 5 RINGS

STANDARD CASTING

2"

CHIMNEY SEAL COLLAR AROUND
RINGS

SECTION A–A

PRECAST ECCENTRIC
CONE

1' BARREL SECTION
 BELOW CONE

PRECAST CONCRETE

THIS AREA MAY BE
PRECAST OR BLOCK

MANHOLE FLOOR SHALL BE
SLOPED TO PROVIDE SMOOTH
FLOW FROM INLET TO OULET.

CONCRETE SLAB—CRETEX
TYPE II OR EQUAL

REV: 2/2017

STANDARD MANHOLE

STANDARD PLATE
NO.
2501

City of
Elk
River
CONCRETE SLAB — CRET EX TYPE II OR EQUAL

STANDARD CASTING

CHIMNEY SEAL AROUND RINGS

GROUTED IN PLACE 2" CONCRETE ADJUSTING RINGS — MINIMUM 2 RINGS MAXIMUM 5 RINGS

WALLS TO BE CONSTRUCTED OF PRECAST SECTIONS.

VARIABLE

16" MAX

16" O.C.

16" O.C.

16" MAX

16" O.C.

OFFSET STEPS AROUND PIPE. MAXIMUM DISTANCE FROM FLOOR TO BOTTOM STEP = 16"

CONCRETE SLAB — CRET EX TYPE II OR EQUAL

MANHOLE FLOOR SHALL BE SLOPED TO PROVIDE SMOOTH FLOW FROM INLET TO OUTLET.

NOTE:
THIS TYPE MANHOLE SHALL BE USED WHEN SPECIFIED OR WHEN THE MANHOLE DEPTH IS LESS THAN EIGHT FEET.

REV: 2/2017

SLAB TOP MANHOLE

STANDARD PLATE NO. 2502
<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>THREAD DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>5/8&quot; ROLLED THREADS (SEE NOTE 4)</td>
</tr>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
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<td></td>
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<tr>
<td>24</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>3/4&quot; CUT OR ROLLED</td>
</tr>
<tr>
<td>33</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>54</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1&quot; CUT OR ROLLED</td>
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<tr>
<td>66</td>
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</tr>
<tr>
<td>72</td>
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<tr>
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</tbody>
</table>

**Canopy Tie**

32" (Adj. ±1 1/2" Min.)

**U Bolt Tie**

32" ± AS REQUIRED FOR ACCEPTABLE JOINT

WELDED EYE OR APPROVED EQUAL

**Eye Bolt Tie**

32" (Adj. ±1 1/2" Min.)

**NOTE:**

1. HOLES SHALL BE CAST-IN OR DRILLED 16" FROM OUTSIDE EDGE OF JOINT.
2. NUTS AND WASHERS ARE NOT REQUIRED ON INSIDE OF PIPE WITH 27" DIAMETER OR LESS.
3. TIES ARE NOT REQUIRED FOR BELL PIPE 24" AND SMALLER. ON OTHER SIZES, TIE MAY BE INSERTED FROM INSIDE.
4. CUT THREADS MAY BE USED IF WASHER AND NUT ARE USED.
5. PIPE SIZES LISTED ARE INSIDE DIAMETER OF ROUND PIPE OR EQUIVALENT DIAMETER OF PIPE ARCH.

**PlACEMENT OF HOLES**

**Tapered Holes Permitted When Precast**

**Round Pipe**

**Arch Pipe**

**EDGE OF OUTSIDE JOINT**

60° 60° 60° 60° R2 R2

**CONCRETE PIPE JOINT TIES**

REV: 3/2006

STANDARD PLATE NO.

2503
3/4" STEEL BARS – TRANSVERSE AND LONGITUDINAL. WELD EACH INTERSECTION.
TABLE OF QUANTITIES
RIPRAP AT RCP OUTLETS

<table>
<thead>
<tr>
<th>DIA. OF ROUND PIPE (IN.)</th>
<th>24&quot; DEPTH RPRAP (CU. YDS.)</th>
<th>12&quot; DEPTH GRANULAR FILTER (CU. YDS.)</th>
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<td>5.5</td>
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<td>5.8</td>
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<td>21.7</td>
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<tr>
<td>48</td>
<td>20</td>
<td>25.8</td>
</tr>
</tbody>
</table>

NOTE:
GRANITE SHALL BE USED AS RIP-RAP.

NOTE:
RIP-RAP SHALL BE INSTALLED TO PROVIDE EASY REMOVAL OF TRASH GUARD.

FILTER BLANKET

SECTION B-B

SECTION A-A

RIP-RAP INSTALLATION

REV: 3/2006

STANDARD PLATE NO.

2505
POSITIONING LUG IS NOT REQUIRED

SOLID LID WITH TWO CONCEALED PICK HOLES

CASTING SHALL BE NEENAH R-1733 OR EQUAL

REV: 3/2006

STANDARD MANHOLE CASTING

STANDARD PLATE NO.

2506
INSTALL CAP SCREWS WITH BOLT HEADS EXPOSED

CASTINGS SHALL BE NEENAH R-3067-V OR EQUAL

REV: 3/2006

STANDARD INLET CASTING

STANDARD PLATE NO.

2507
CASTING SHALL BE NEENAH R-1733-C OR EQUAL FOR YARDS

CASTING NEENAH R-4342 OR R-4341-A (HIGH FLOW) FOR DITCHES

REV: 3/2006

GRATE CASTING
CONSTRUCTION NOTES:

1. Grade outfall area so that water will flow down the center of the channel and be contained to the channel. All subgrade surfaces prepared for placement of mats shall be smooth and free of all rocks, sticks, roots, other protrusions, or debris of any kind. The prepared surface shall provide a firm unyielding foundation for the mats with no sharp or abrupt breaks in the grade.

2. Apply seed directly to the prepared soil prior to concrete mat installation. Use seed per project specifications.

3. Prior to installing headwall, anchor trench initial leading edge of mat 18", fill and compact anchor trench. Install headwall over mat.

4. Install concrete mat rolls. Available widths are 5.5', 8', 10', 12', & 16' available in custom lengths. A concrete saw shall be used to cut the mat to exact size and shape.

5. Applications where outfalls flow into retention ponds, extend concrete mat a minimum of 3' below low water elevation.

REV: 2/2017
CURB BOX AND STOP TO UTILITY EASEMENT
SEE SERVICE DETAIL

PROPERTY LINE

10'

VALVE

CROSS

10'

VALVE

CORPORATION COCK

PROPERTY LINE

VALVES ON ALL MAINS LEAVING INTERSECTIONS

TEE

SEE HYDRANT DETAIL

TYPICAL WATER LAYOUT
**NOZZLE SECTION**

**OPERATING NUT - 1" PENTAGON**

2 1/2" HOSE CONNECTION (THREAD SIZE 3 1/16" O.D., 7 1/2" T.P.I.)

4 1/2" PUMPER CONNECTION (THREAD SIZE 5 9/16" O.D., 4” T.I.P.)

**NUT CAP TYPE WITH CHAINS**

**NOZZLE ARRANGEMENT**

TWO 2 1/2" NOZZLE PLUS PUMPER NOZZLE WITH 1" PENTAGON OPERATING NUTS

**STANDPIPE**

**BOTTOM**

12 1/4”

9 1/2”

7/8” ROUND HOLES

**NOTE:**

1. 16" BREAKOFF SECTION
2. LEFT HAND OPERATING NUT (1 1/2" POINT TO FLAT)
3. PAINT BARREL SECTION RED TO GRADE.
4. DO NOT PLUG DRAIN HOLES.

NOTE: "HYDRAFINDER" HYDRANT LOCATING DEVICES REQUIRED – SEE SPECIFICATIONS.

REV: 3/2006

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**PACER HYDRANT DETAIL**

**STANDARD PLATE NO.**

3401
NOTE:
ALL HYDRANT LEADS SHALL BE RESTRAINED FROM THE MAIN TO THE HYDRANT THROUGH THE USE OF THREADED RODS OR MEALUGS AS RESTRAINTS IN ACCORDANCE WITH THE STANDARD DETAIL PLATES.
DRAINAGE AND UTILITY EASEMENT
10' BEYOND THE RIGHT-OF-WAY LINE

2" X 4" WOOD MARKER
WITH STEEL FENCE POST
PAINTED BLUE

C STREET

7.5' MINIMUM COVER
CURB BOX AND STOP
7.5' MINIMUM COVER
SERVICE PIPE
CONCRETE BRICK
1' COPPER "PIGTAIL" CRIMPED

WATERMAIN

PROVIDE ONE - 1.0' HORIZONTAL
LOOP IN SERVICE LINE

1'
SERVICE PIPE
WATERMAIN

NOTE: TRACER WIRE NOT SHOWN. INSTALL
PER PLATES 3408 & 3409

PLAN

REV: 2/2017

TYPICAL SERVICE DETAIL

3403
INSTALL ONE LENGTH OF WATERMAIN PIPE WITH THE APPROPRIATE MATERIAL ADAPTORS. CENTER AT CROSSINGS.

3" RIGID FOAM INSULATION

MEGALUGGED BENDS AS REQUIRED

PROPOSED WATERMAIN

WATERMAIN INSTALLATION UNDER SANITARY OR STORM SEWER

CENTER ONE LENGTH OF WATERMAIN AT CROSSING

TRANSITION TO SPECIFIED DEPTH (TYP.) INSTALL VERTICAL BEND AS REQUIRED

MEGALUGGED BENDS AS REQUIRED

PROPOSED WATERMAIN

3" RIGID FOAM INSULATION

SEE NOTE

24" O.D. 24"

PROPOSED SEWER

COMPACTED SAND

8" MIN.

8" MIN.

WATERMAIN INSTALLATION OVER SANITARY OR STORM SEWER

NOTES:

WHEN WATERMAIN COVER IS LESS THAN 7.5 FEET, INSTALL WATERMAIN UNDER SANITARY SEWER.

REV: 2/2017
THE BOTTOM OF THE TRENCH SHALL BE SHAPED TO FIT THE PIPE BARREL FOR AT LEAST 50% OF THE OUTSIDE DIAMETER. THE REMAINDER OF THE PIPE IS SURROUNDED TO A HEIGHT OF AT LEAST 6" ABOVE ITS TOP BY SELECT FILL MATERIALS, PLACED BY HAND TOOLS AND COMPACTED TO COMPLETELY FILL ALL SPACES UNDER AND ADJACENT TO THE PIPE.

NOTE: ALL COSTS OF EXCAVATION BELOW GRADE AND PLACEMENT OF GRANULAR BEDDING SHALL BE INCLUDED IN THE BID PRICES FOR PIPE ITEMS.
NOTE: ALL COSTS OF EXCAVATION BELOW GRADE AND PLACEMENT OF GRANULAR BEDDING SHALL BE INCLUDED IN THE BID PRICES FOR PIPE ITEMS.
GRADE LEVEL IN GROUND TRACER WIRE ACCESS BOX AND DRIVE-IN MAGNESIUM GROUNDING ANODE (SEE DETAIL 3408)

WATER MAIN

12 AWG COPPER CLADSTEEL BLUE (TYP)

1.0' MAX

MAINLINE TO LATERAL LUG CONNECTOR

SERVICE SADDLE

WATER SERVICE CURBSTOP BOX

TAPE OR PLASTIC TIE (TYP)

1.5' MAX

FINISHED GRADE

CURBSTOP BOX

12 AWG COPPER CLADSTEEL RED FACTORY CONNECTED TO GROUND ROD

DO NOT SECURE WIRES TO CURB STOP BOX AS TO ALLOW FOR ADJUSTMENTS WITHOUT DAMAGING WIRE

DRIVE IN MAGNESIUM GROUNDING ANODE ROD

WIRE CONTINUES WITH WATER SERVICE AND CONNECTS TO MAIN LINE (WIRE SEE PLAN VIEW ABOVE)

WATER SERVICE SECTION VIEW

REV: 2/2017

3408
NOTE:
Wires shown away from pipe for clarity. Wire shall be installed on the bottom side of the pipe below the spring line. The wire shall be fastened to the pipe with tape or plastic ties at 5' intervals.

REV: 2/2017

TRACER WIRE LAYOUT DETAIL

STANDARD PLATE NO. 3409
GROUT BOTTOM TO SLOPE TOWARD PIPE AS SHOWN BY ARROWS

NEENAH CASTING R-1733 OR EQUAL. COVER SHALL HAVE TWO CONCEALED PICK HOLES.

CONCRETE ADJUSTING RINGS MINIMUM 2 RINGS MAXIMUM 5 RINGS

CHIMNEY SEAL SECTION A–A

ECCENTRIC CONE

1" BARREL SECTION BELOW CONE WALLS TO BE CONSTRUCTED OF PRECAST SECTIONS WITH CX4 JOINTS

STEPS AS PER SPECIFICATIONS

1" MIN. FLOW

INTEGRAL BASE

REV: 2/2017

STANDARD MANHOLE

4000
NEENAH CASTING R-1733 OR EQUAL
COVER SHALL HAVE TWO CONCEALED
PICK HOLES

SLAB SHALL BE
CRETEX TYPE II

CHIMNEY SEAL
AROUND RINGS

CONCRETE
ADJUSTING RINGS
MINIMUM 2 RINGS
MAXIMUM 5 RINGS

STEPS AS PER
SPECIFICATIONS

WALLS TO BE
CONSTRUCTED OF
PRECAST SECTIONS
WITH CX4 JOINTS

27"

16"

48"

VARIABLE

BASE

INTEGRAL BASE

MANHOLE INVERT SHALL
BE SLOPED TO PROVIDE
SMOOTH FLOW FROM
INLET TO OUTLET.

NOTE:
THIS TYPE MANHOLE SHALL BE USED
WHEN SPECIFIED OR WHEN THE MANHOLE
DEPTH IS LESS THAN EIGHT FEET.

REV: 2/2017

SLAB TOP MANHOLE

STANDARD PLATE NO.
4001
NEENAH CASTING R-1733 OR EQUAL. COVER SHALL HAVE TWO CONCEALED PICK HOLES.

CONCRETE ADJUSTING RINGS
MINIMUM 2 RINGS
MAXIMUM 5 RINGS

CHIMNEY SEAL AROUND RINGS

27"

16"

4'-0"

1' BARREL SECTION BELOW CONE

WALLS TO BE CONSTRUCTED OF PRECAST SECTIONS WITH CX4 JOINTS

STEPS AS PER SPECIFICATIONS

INSTALL PVC CUT IN HALF TO MAINTAIN FLOW

FILL WITH GROUT

INTEGRAL BASE

MANHOLE INVERT SHALL BE SLOPED TO PROVIDE SMOOTH FLOW FROM INLET TO OUTLET

GROUT BOTTOM TO SLOPE TOWARD PIPE AS SHOWN BY ARROWS

SECTION A-A

ECCENTRIC CONE

INSIDE DROP MANHOLE
(TWO FEET OR LESS)
2" SCREENED GOOSENECK VENT

NEENAH CASTING R-1758-E (FROST RETARDANT CASTING) OR EQUAL

CHIMNEY SEAL AROUND RINGS

CONCRETE ADJUSTING RINGS MINIMUM 2 RINGS MAXIMUM 5 RINGS

STEPS AS PER SPECIFICATIONS

WALLS TO BE CONSTRUCTED OF PRECAST SECTIONS WITH Cx4 JOINTS

1/2" SHUT OFF VALVE

QUICK DISCONNECT COUPLING

BACK FLUSHING HOSE

AIR & VACUUM VALVE (APCO MODEL 400)

1" BLOW OFF VALVE

2" SHUT OFF VALVE

CRUSHED ROCK

MANHOLE SLAB SHALL BE CRETEX TYPE II

REV: 2/2017

STANDARD AIR RELIEF MANHOLE

STANDARD PLATE NO. 4005
COMPACTED SUITABLE MATERIAL (FINE GRAINED)

6" OR 1/4 Bc WHICHEVER IS LARGER (12" MAXIMUM)

SPRING LINE

4" OR Bc/8 WHICHEVER IS LARGER

COMPACTED GRANULAR BEDDING

NOTE: ALL COSTS OF EXCAVATION BELOW GRADE AND PLACEMENT OF GRANULAR BEDDING SHALL BE INCLUDED IN THE BID PRICES FOR PIPE ITEMS.

REV: 3/2006

CLASS B PIPE BEDDING

STANDARD PLATE NO.

4006
10' PAST PROPERTY LINE
TO DRAINAGE AND UTILITY ESMT

2" X 2" WOOD MARKER WITH
STEEL FENCE POST PAINTED GREEN

10'

5'

5'

PLUG

SERVICE PIPE

45° BEND

1% MIN. SLOPE

45° BEND

THIS SECTION OF PIPE
ON UNDISTURBED SOIL

4" OR 6" AS SPECIFIED

45° BEND

GRANULAR BEDDING
(CONCRETE IF OVER 15' OF DEPTH)

TEE OR WYE AS SPECIFIED

SEWER MAIN

TO BE USED AS SERVICE CONNECTIONS ON DEEP LINES

REV: 2/2017

SERVICE RISER SECTION

STANDARD PLATE NO.
4008