

**VILLAGE OF CARPENTERSVILLE  
ENGINEERING STANDARDS**

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**SECTION 1.00 – IMPROVEMENTS SUMMARY:**

Any development approved under the Village of Carpentersville Subdivision Code and any development intending to construct improvements which are addressed herein, shall comply with the required improvements stated in these Engineering Standards.

Subdividers and developers shall construct all public improvements to specifications and cause the completed improvements to be dedicated to the Village or appropriate agency or unit of government. All private improvements shall be completed as required and approved by the Village. Private improvements shall remain under the ownership of the developer and shall be continuously maintained. Private improvements shall be constructed to the same standards as Public Improvements.

## **SECTION 2.00 – GRADING, EROSION CONTROL, AND DUST CONTROL:**

Lot grading and erosion and sediment control measures shall be in accordance with the Subdivision Code Section 17.16.055.

- A. Timing: Erosion control measures shall be implemented prior to the beginning of construction. An initial erosion control inspection must be scheduled prior to commencement of construction activities.
- B. Maintenance: Erosion control measures shall be inspected weekly and any noted deficiencies shall be repaired immediately. Erosion control measures shall also be inspected after any significant rain event and any noted deficiencies repaired immediately. For the purposes of this chapter, a significant rain event shall be defined to be any rainfall accumulation of 1/2-inch (or equivalent snowfall) within a 24-hour period.
- C. Construction Care: Care shall be taken to not disturb the soil on any project site to a larger degree than is necessary. Tracking mud and soil debris off any site shall be avoided. Loose dirt and debris shall be knocked off equipment tires and truck beds. Tailgates shall be secured and trucks shall not be overloaded to the point that debris spills over during travel. Fully loaded trucks shall be tarped. In new subdivision construction on local streets, when debris is tracked off a site, it shall be cleaned up at regular intervals during the working day and at the end of the workday. Haul routes shall avoid established areas. On commercial projects or large scale subdivision work, containment areas shall be defined, demudding rock aprons shall be used, and trucks shall be washed as necessary before they leave the site to prevent tracking mud off of the site. If blowing dust occurs, the site shall be sprayed down with water.
- D. Temporary Seeding/Sodding: All stripped areas not anticipated to have construction take place within 7 days, including individual lots that do not have a complete perimeter erosion containment, shall be seeded or sodded immediately, weather and soil conditions permitting.
- E. Permanent Seeding/Sodding: Immediately after the completion of construction, permanent seeding or sod shall be planted unless weather prohibits this, in which case temporary seeding must be provided and the applicant must post a security to complete the planting at a later date. The applicant must submit an estimate of cost for the temporary seeding to be reviewed and approved by the Village Engineering Department.
- F. Retainage and Bond Reduction and Release: In order to be deemed completed, all public rights-of-way shall have permanent ground cover and all other areas shall have temporary seeding at a minimum.
- G. Dust Control: The developer and contractors shall use a water wagon or other acceptable means on the project site to control dust. Alternatively, polymer products such as COHEREX Dust Retardant may be used for dust control. All streets used by the developer, contractors or suppliers in or adjacent to the development shall be kept free of debris, dirt, dust, and mud. Streets shall be left in a clean condition at the end of each day's work.

**SECTION 3.00 PAVEMENT AND SIDEWALK CONSTRUCTION:**

- A. Public Roadways: All public roadways shall be constructed in accordance with Section 17.16.020 of the Village Subdivision Code and Table 3.00-1 in this section. The use of crushed concrete will not be permitted for sub-base material.

TABLE 3.00-1 MINIMUM PAVEMENT REQUIREMENTS	
Street Classification	Minimum Pavement Requirements
Arterial	12" Aggregate Subgrade 8" P.C. Concrete IDOT Standard Hinge Joint Pavement -or- 12" Aggregate Subgrade 9" Bituminous Base Course 2 1/4" Bituminous Conc. Binder Course, Hot Mix Asphalt, IL-19.0, N70 2" Bituminous Conc. Surface Course, Hot Mix Asphalt, Mix "D", N70
Collector – Industrial/Commercial Local – Industrial/Commercial	6" Aggregate Base Course 8" P.C. Concrete IDOT Standard Hinge Joint Pavement -or- 6" Aggregate Sub-base 8" Bituminous Base Course 2 1/4" Bituminous Conc. Binder Course, Hot Mix Asphalt, IL 19.0, N50 2" Bituminous Conc. Surface Course, Hot Mix Asphalt, Mix "C" N50
Local – Residential	12" Aggregate Subgrade -or- 6" Aggregate Sub-base -and- 6" Bituminous Binder Course Hot Mix Asphalt, IL-19.0, N50 2" Bituminous Conc. Surface Course, Hot Mix Asphalt, Mix "C", N50

<sup>1</sup> Materials shall conform to the IDOT Standard Specifications for Road and Bridge Construction, Latest Edition.

- B. Construction of private streets shall conform to the requirements for public streets in Table 3.00-1 regarding pavement design and specifications.
- C. Public Sidewalks: All public sidewalks shall be constructed in the following manner:
1. Dimensions. Sidewalks in residential subdivisions shall be not less than five feet in width, not less than five inches in thickness and not less than six inches in

thickness where they cross a driveway. Sidewalks for commercial and industrial lots shall be not less than five feet in width and not less than five inches in thickness, and not less than eight inches in the thickness where they cross a driveway.

- a. Three (3) number five (5) reinforcing bars ten feet (10') long shall be placed in the sidewalk at all trench crossing locations.
  - b. Contraction joints, tooled using a 1/2" radius finishing tool, shall be placed at five foot (5') spacings.
  - c. Fiber expansion joints, 3/4" in thickness and full depth of the sidewalk, shall be placed every fifty feet (50').
  - d. Sidewalks shall be placed on a two-inch (2") well-compacted CA-6 base course.
  - e. Detectible warnings in accordance with the American Disabilities Act shall be placed at all locations where sidewalks intersects streets, alleys, or driveways as required. The detectable warning panel shall be East Jordan Iron Works 7005-7 Ultrawear Red or an approved equal.
- D. Curb and Gutter: All public curb and gutter shall be constructed in the following manner: Curb and gutter shall be concrete. Two (2) number four (4) reinforcing bars shall be placed continuously between expansion joints. Fiber expansion joints, 3/4" in thickness and extending the full dimension of the curb and gutter, shall be doweled and spaced at no more than one hundred five (105') on center and at tangent points of all radii. Contraction joints shall be provided at fifteen feet (15') on center and shall consist of either a tooled joint using a 1/2" radius-finishing tool, or a saw cut a minimum of one and one-half inches (1-1/2") deep.
- E. Driveway Approaches shall be constructed in accordance with the following specifications.
1. Driveway approaches for single-family residential buildings shall be constructed of:
    - a. Minimum six inch (6") concrete with a minimum four inch (4") compacted aggregate base course, or Minimum four-inch (4") bituminous concrete surface course, Hot Mix Asphalt, Mix C, N50, with a minimum eight inch (8") compacted aggregate base course.
    - b. Minimum one and one-half-inch (1½") bituminous concrete surface, Hot Mix Asphalt, Mix C, N50, and two and one-quarter (2¼") bituminous concrete binder course, Hot Mix Asphalt, IL-19N50, with a minimum six inch (6") aggregate base course.
  2. Driveway approaches for multi-family, commercial and industrial buildings shall be constructed of:
    - a. Minimum eight inch (8") concrete with a minimum four inch (4") compacted gravel aggregate base course; or
    - b. Minimum one and one-half-inch (1½") bituminous concrete surface, Hot Mix Asphalt, Mix C, N50, and two and one-quarter (2¼") bituminous concrete binder course, Hot Mix Asphalt, IL-19N50, with either a

minimum twelve inch (12") aggregate base course or a minimum six inch (6") bituminous base course.

3. For concrete driveways, full depth fiber expansion joints shall be installed between either the curb and the driveway approach or the driveway approach and the sidewalk.
- D. Bike Paths: The minimum construction of any bike path shall consist of a six inch (6") CA-6 aggregate base course with a two and a quarter inch (2 1/4") bituminous concrete binder course and 1 1/2" of bituminous concrete surface course. Bike paths shall have removable posts placed at all locations determined necessary by the Village Engineer to prevent vehicular traffic from entering the paths.
- E. Parking Areas: Parking areas shall be constructed in accordance with the following specifications:
1. Parking areas shall be designed and constructed in accordance with the Village Zoning Code, Subdivision Code and these Engineering Standards:
    - a. Minimum structural number shall be 2.0 for parking stalls areas and a minimum structural number of 2.5 for aisles and fire lanes;
    - b. Minimum thickness of aggregate base course shall be eight inches (8");
    - c. Minimum thickness of bituminous concrete binder course shall be two inches (2 1/4");
    - d. Minimum thickness of bituminous concrete surface course shall be two inches (2").
    - e. Parking stalls shall be a minimum of 9' by 18'. One-way drive aisles shall be a minimum of 12' in width. Two-way drive aisles shall be a minimum of 24' in width.
    - f. Combination concrete curb and gutter type B-6.12 or concrete barrier curb Type B shall be constructed around the perimeter of all parking lots and around all islands within parking lots.
    - g. Striping of the pavement surface to define each parking stall is required and shall be a minimum of four inches (4") wide white lines for the length of the stall. All areas designated as fire lanes shall be striped red. "No Parking" and handicap accessible stalls and unloading zones shall be striped with yellow stripes.
    - h. Any location within parking lots, intended for storage of trash containers, shall be constructed of concrete rather than bituminous surface and shall be enclosed with an approved screen or enclosure.
    - i. Driveways within a site shall be constructed to parking lot specifications at a minimum. Commercial driveways with high volume of truck traffic shall increase the structural strength of the pavement in accordance with commercial driveway specifications identified in this Engineering Standard in Section E.2.

## **SECTION 4.00 – SANITARY SEWER SYSTEM:**

- A. Sanitary Sewers shall be installed and constructed in accordance with the provisions of Illinois Environmental Protection Agencies Standard Specifications for Water and Sewer Main Construction in Illinois latest edition and these Engineering Standards.
- B. Approval and Permits: Construction of sanitary sewers and/or sewer service shall not commence until engineering plans and specifications have been approved by the Village and permits for construction of the sewers have been approved by the Village of Carpentersville and issued by the Illinois Environmental Protection Agency Division of Water Pollution Control.
- C. Inspection and Testing: It shall be the intention of these Engineering Standards to secure a sewer system with a minimum amount of infiltration. Maximum allowable infiltration shall be two hundred (200) gallons per inch of diameter of the sewer per mile per twenty-four (24) hour day at any time for any section of the system. The joints shall be tight and visible leakage in the joints, or leakage in excess of that specified above, shall be repaired at the contractor's expense by means approved by the Village Engineer.

### 1. Air Testing:

- a. Prior to Village approval of the sanitary sewer system and before any connections are made, the system shall have passed air tests conducted by the developer and witnessed by the Village of Carpentersville.
- b. The sewers shall be tested by the Air Testing method. Air testing techniques shall be in accordance with the latest ASTM standard practice for testing sewers lines by low-pressure air test method for the appropriate pipe material, except that the test pressure times shall not be less than that shown in the "Air Test Table" contained in Section 31-1.11C of the latest edition of the "Illinois Standards for Water & Sewer Main Construction in Illinois".

### 2. Deflection Test for Flexible Thermo Plastic Pipe:

- a. All sanitary sewers constructed of PVC or other flexible thermoplastic pipe shall be tested for deflection by the developer.
- b. The test is to be performed no sooner than 30 days after the sewer has been backfilled to subgrade.
- c. Perform the test by pulling a mandrel or rigid ball having a diameter equal to 95 percent of the inside diameter of the pipe through the pipe from manhole to manhole without using mechanical pulling devices.
- d. Allowable deflection limits: 5.0 percent of the base inside diameter of the PVC pipe or the average inside diameter of the ABS pipe.
- e. Wherever the deflection limitation is exceeded, uncover the pipe, carefully replace compacted embedment and backfill material, and retest for deflection.

### 3. Sanitary Manhole Testing:

- a. Test each sanitary manhole for leakage by vacuum testing no sooner than 30 days after installation.

- b. Plug all lift holes with a non-shrink grout.
- c. Do not place grout in horizontal joints before testing.
- d. Seal all inlet and outlet pipes with airtight plugs, taking care to securely brace plugs to prevent the plugs from being drawn into the manhole.
- e. Place the vacuum test equipment at the inside top of the cone section and inflate the seal to 40 psi.
- f. Draw a vacuum of 10 inches of mercury and shut the vacuum pump off.
- g. Close valves and measures the time for the vacuum to drop to 9 inches of mercury.
- h. Allowable limits: The manhole shall pass if the time for the vacuum reading to drop from 10 inches to 9 inches exceeds 60 seconds for a 48-inch diameter manhole, 75 seconds for a 60-inch diameter manhole, and 90 seconds for a 72-inch diameter manhole.
- i. Repair all manholes failing the initial test with a non-shrink grout.
- j. If a manhole fails the initial test, retest until a satisfactory test is obtained.
- k. Provide equipment, materials and labor necessary to conduct vacuum testing.
- l. Make tests in the presence of the Owner, giving the Owner at least 48 hours notice prior to testing.

4. Televising:

Any public sanitary sewers shall be televised in accordance with the requirements of the Section 6.00 (Sanitary and Storm Sewers Televising Inspection Standards) of these Engineering Standards. The televised inspections shall be done in the presence of a representative of the Village Engineer. All deficiencies noted during the televised inspection shall be repaired or replaced by the contractor at his expense by means approved by the Village Engineer.

D. Excavation and Foundation:

- 1. The trench shall be excavated so that the flow line of the finished sewer shall be at the depth and grade shown on the approved plans. The trench for the pipe shall be excavated at least twelve inches (12") wider than the external diameter of the pipe. The width of the trench shall not exceed the external diameter of the pipe by more than eighteen inches (18") at the top of the pipe.
  - a. If the excavation has been made deeper than necessary, the foundation shall be brought to proper grade by the addition of well-compacted bedding material where a firm foundation is not encountered at the grade established, due to soft, spongy or other unsuitable soil, (unless other special construction methods are called for on the plans or in the special provisions), all such unsuitable soil under the pipe and for the width of

the trench shall be removed and replaced with well-compacted bedding material.

2. Maximum sanitary sewer depth shall be 25 feet deep as determined from the proposed surface elevation to the proposed invert elevation of the sanitary sewer, unless greater depths are approved by the Village Engineer.
3. Pipe Laying:
  - a. Pipe shall be laid uniformly straight both horizontally and vertically between manholes.
  - b. Pipe laying and joining shall be done in accordance with the pipe manufacturer's recommendations and the latest edition of the "Standard Specifications for Water & Sewer Main Construction in Illinois", and the requirements of this section.
  - c. Pipe shall not be dropped from delivery vehicles. All pipe shall be lowered into the trench with a suitable apparatus. In no case shall the pipe be dropped or thrown.
4. Connections:
  - a. Connections to the sewer main shall be done by means of a wye or tee fitting installed in the main. All wyes and tees shall be rotated upwards and an additional wye installed, so that the invert of the sanitary sewer connection is approximately at, and no lower than, the crown of the sanitary sewer main.
  - b. When sewer mains are deeper than ten feet (10'), risers shall be installed at connections such that service pipe shall be no more than ten feet (10') deep.
  - c. Unused wye or tee fittings shall have socket ends sealed by watertight rubber stoppers suitably fastened or braced to prevent dislodging by backpressure from the main line.
  - d. Connections to existing sewer mains shall be made by installing a new wye or tee fitting or by use of a circular saw cut by proper tools ("sewer tap" machine or similar) and installation of a wye saddle in accordance with manufacturer's recommendations. All such connections shall be done and inspected in the presence of a representative of the Village Engineer.
  - e. Construction Records – The Contractor shall keep a record of the following information for all sewer services:
    - (1) Distance measurement to the nearest downstream manhole
    - (2) Configuration and length of all risers
    - (3) Length of service line from wye to end of stub.

Such records shall be delivered to the Village Engineer at the completion of the work and shall be incorporated into the final as-built drawings.

5. Backfilling:

- a. Backfilling shall not be done until installation of the sewer has been inspected and approved by the Village Engineer.

E. Allowable Materials:

1. Sewer Pipe:

- a. Ductile Iron Pipe: Complying with the requirements of ANSI A21.S1. Thickness Class 52 with joints complying with ANSI A21.11 and cement lining complying with ANSI A21.4, standard thickness.
- b. PVC Pipe: PVC pipe installed 12' deep or less shall comply with the requirements of ASTM D-3034, SDR 26 for Type PSM polyvinyl Chloride (PVC) sewer pipe and fittings of minimum wall thickness SDR 26. Installations between 12' and 20' deep shall be SDR 21 and all installations over 20' deep shall be class 52 ductile iron as described in 1.a above or C-900 PVC. Sewer installations exceeding 25' in depth are strongly discouraged.
- c. Service Saddles: Service saddles shall be Cascade Waterworks CSWRT for taps to existing sewers.
- d. Service Connections: All service connections shall be made via Tee-Wye or Wye with 1/8 bend.
- e. Couplings: Where required, all couplings will be non-shear type.
- f. Pipe joints: Shall be either solvent weld type complying with ASTM D2564 and ASTM D2855 or elastomeric gasket type complying with ASTM F477 and ASTM 3212.

2. Force Main:

- a. Ductile Iron Pipe – Complying with ANSI A21.S1, thickness 52 with rubber gasket complying with ANSI A21.11 and cement lining complying with ANSI A21.4, standard.
- b. PVC plastic pressure pipe – Class 12454A or B polyvinyl chloride complying with ASTM-D1784. Use 160 psi pressure rating complying with ASTM D-2241 with a standard dimension ratio of 26. For underground pipe joints provide push-on bell and spigot type joints with rubber ring joint seal gaskets provided by the pipe manufacturer, for exposed joints, provide solvent-welded socket type, threaded type or flanged joints.

3. Casing Pipe for Auguring or Tunneling:

- a. Steel Casing Pipe shall be new and comply with the requirements of the construction permit issued by the appropriate authorizing agency (i.e. KDOT or IDOT). Steel casing pipe for casings installed beneath Village of Carpentersville jurisdiction roadways shall comply with the KDOT requirements.

4. Manholes:

- a. Precast reinforced concrete manhole sections, bottoms, and flat top slabs complying with ASTM C-478 and ASTM C-443 (latest edition). Design flat slab top for H-20 loading.
- b. Adjustment: Three adjustment rings totaling 8" in height may be used. Rings shall be Ladtech HDPE. The top ring in paved areas with crown adjustments shall be rubber and does not need to be within the 8" ring adjustment height. For paved areas with no crown and unpaved areas, the adjustment top ring will be the chimney seal.
- c. Pipe Seals: All pipe connection openings shall be provided with flexible rubber, gasket collar pressed into or cast into the precast pipe opening.
- d. Chimney Seal: Provide an internal/external chimney seal by Adaptor, Inc. or approved equal.
- e. Frame Seal: Provide ADCO WT-64 butyl sealant or approved equal. Trowel mastic over full surface between adjusting rings, and cones and rings.
- f. Manhole Joint Seal: For joints on the precast manhole sections use butyl rubber joint sealants by EZ-Stik or approved equal.
- g. Bottom Sections: All bottom sections shall be monolithically precast including bases and invert flow lines.

5. Castings:

- a. Manhole frame and cover – Neenah No. R-1713 or approved equal, with self-sealing lid, recessed pick holes, and embossed "SANITARY" and "Carpentersville".
- b. Manhole steps shall be copolymer polypropylene plastic with continuous 1/2-inch steel reinforcement as manufactured by M.A. Industries Inc. or equal.
- c. Frames and covers for manholes located within floodplain areas and having a rim elevation below the flood protection elevations shall be a bolted and gasketed water tight frame and cover – Neenah R-1916-C.
- d. Bedding, crushed gravel or crushed stone complying with the requirements of Section 1004, Illinois Department of Transportation, "Standard Specifications for Road and Bridge Construction", latest edition: The gradation shall be either CA-7, CA-8, CA-11 or CA-13. The pipe shall be laid so that it will be uniformly supported and the entire length of the pipe barrel will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade. Bedding shall be required for all sewer construction, and shall be a minimum thickness of four inches (4") under the pipe barrel and two inches under pipe bells.
- e. Backfill to one foot (1') above the top of the pipe shall be done with acceptable bedding material as indicated in paragraph E.5.d above or crushed gravel or stone complying with gradation CA-6 of the Illinois

Department of Transportation's Standard Specifications for Road and Bridge Construction. Placed in six inch (6") lifts compacted to ninety-five percent (95%) maximum density as determined according to ASTM D1557.

- f. Excavations for sewers which are beneath any existing or proposed pavements, driveways and sidewalks and any trenches where the inner edge is within two feet (2") of such areas shall be backfilled with CA-6 material in nine-inch (9") lifts compacted to ninety-five percent (95%) maximum density as determined according to ASTM D1557.
- g. Excavations for sewers not beneath or within two feet (2') of existing or proposed paved areas shall be backfilled from one foot (1') above the sewer with material excavated from the trench, unless such material is determined to be unsuitable by the Village Engineer. The material shall be unfrozen and free from clods and rocks and shall be placed in twelve-inch (12") lifts and compacted.

#### F. Lift Stations

1. General Criteria and Standards: The purpose of these standards is to specify the type of equipment as well as construction methods and design standards to be followed for the design and construction of any sanitary sewer lift station to be constructed in the Village of Carpentersville which may be owned and operated by the Village. This information is not intended to provide complete or final detailed specifications for such construction, but does establish the general requirements of the Village to be followed for the design of these facilities. Each lift station shall be designed by a registered professional engineer and shall be reviewed by the Village Engineer for each separate project. The Village reserves the right to require changes, additional equipment and/or changes to the detailed specifications prior to any final approvals for each individual request.
2. General Construction: A sewage lift station shall be of the flooded suction wet well/dry well type. The dry well shall be of factory-built steel or cast in place concrete type. The wet well shall be a cast in place or pre-cast concrete. The pumps shall be of the vertical built-together type pump. The drywell shall include a superstructure that is compatible with the architecture of the development. The superstructure shall house all electrical controls and a stationary emergency standby power generator (natural gas fired). The dry well, and its superstructure, shall be completely separated from the wet well. Structure and dimensions shall be shown on the design drawings.
3. Piping: Piping suction and discharge shall be concrete-lined ductile iron, special thickness Class 52. All piping shall be supported. Each pump shall have a plug valve on the suction side of the pipe located in the dry well. Each pump shall have a check valve and plug valve on the discharge side of the pump located in the dry well. Check valve shall be a full opening flap type valve with stainless steel shaft, outside arm and spring. The shut off valve shall be eccentric plug type.
4. Impression Current Anode System (Required on prefabricated steel drywell Only): The structure guard shall be built with solid state circuitry to automatically adjust the applied anode voltage, providing cathodic protection regardless of soil resistivity. The system shall utilize two (2) cast iron high silicone anodes.

A separate silicone rectifier module shall be provided for each anode and each module shall feed a constant current of 100 milliamps to the anode it serves.

An indicator light shall allow for check of anode operation. The system shall operate on 120 volt, A, 60 hertz power with less than one (1) amp draw. The system shall be protected by a type 3AG fuse, which shall have a light that glows if the fuse is blown.

5. Pump-Motor Construction: Each pump shall be capable of handling raw, unscreened sewage with two (2) port non-clog type impellers. All pumps must be Hydromatic brand. No substitutions. Each motor shall be driven by a separate and independent variable frequency inverter type drive.
6. Electrical Control Panel (Controls by pump supplier): Control panel shall have Allen-Bradley or Square-D components only. A circuit breaker shall be provided for each pump and magnet starter with three (3) leg overload protection shall be supplied for each pump. An alternating relay shall be provided to alternate pumps on each successive cycle of operation. Starters shall have auxiliary contacts to operate both pumps on override condition. An interlock relay shall be provided to automatically reconnect the control circuit in case of circuit breaker trip on one pump. H-O-A switches and run lights shall be supplied for each pump. Terminal strip shall be provided for connecting pump and control wires. Pump control box shall be mounted on panel stand at the station or remote as required. Elapsed time meters shall be furnished for each pump and installed in panel. Panel shall also include automatic transfer switch, phase monitor, phase protection with indicator lights, seal failure lights and heat sensors. Full voltage surge/lighting arrestor shall be installed across main incoming power feed.

Each pump shall have seal failure indicator light to indicate the presence of moisture in the seal housing. Each pump motor shall include thermal sensors imbedded in the top of the motor winding which shall trip out magnetic starter due to motor overheating. Each pump motor shall be designed to be non-overloading throughout the pump-capacity head curve. Control panel shall include a convenience outlet with 20 amp ground fault breaker. All electrical components shall be by Allen-Bradley or Square D.

7. Level Controls: A stainless steel encased and intrinsically safe submersible transducer shall be provided for the primary control of pump and alarm signals. Sealed float type mercury switches shall be supplied as a back-up system to control pump operation. The mercury tube switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have heavy neoprene jacket and a weight shall be attached to cord above the float to hold the switch in place in sump. Weight shall be above the float to prevent sharp bends in the cord when the float operates under water. The float switches shall hang in the sump supported only by the cord that is held to the wiring channel. Three (3) float switches shall be used to control level. One for pump turn-on, one for pump turn-off and one for both pumps turn-on. A fourth switch shall be provided for high level alarm.
8. Remote contacts shall also be provided for high water and power failure alarms.
9. Operation of System: On sump level rise, a level switch shall be energized and start lead pump. With lead pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. Alternating relay shall index on stopping of pump so that lag pump will start on next operation. If sump level continues to rise when lead pump is operating, override switch shall energize and start lag pump.

Both lead and lag pump shall operate together until low level switch turns off both pumps. If level continues to rise when both pumps are operating, high level switch shall energize high level arm. If one pump should fail for any reason, the second pump shall operate on the override control. All level switches shall be adjustable, for level setting, from the surface.

10. Emergency Generator Equipment: Each lift station to be owned and operated by the Village of Carpentersville is required to be capable of being operated at full capacity with a stationary generator. The generator shall be natural gas fired and housed in the stations super structure.

11. Accessories:

- a. Provide power failure and high water alarm contacts.
- b. Provide means of flow metering.
- c. Automatic telephone dialer system with battery backup.
- d. A 110 duplex outlet provided at the exterior of the super structure.
- e. One exterior yard/area light at lift station.
- f. A spare pump shall be supplied with pump station. Four (4) complete sets of operating manuals, parts lists and wiring diagrams shall be provided.
- g. All lift stations shall have a suitable access road, including a three-inch (3") bituminous concrete over an eight-inch (8") gravel base, at least twelve feet (12') in width. All necessary final grading, topsoil and seeding to complete landscaping at the site. Maximum grade around the lift station shall be 1:6.
- h. Start-up services are to be provided and Village personnel must be present and proper notification given prior to start-up.
- i. Special Note: Plans and specifications for any proposed pumping station shall be submitted for review to the Village Engineer for approval prior to IEPA permit submittal. Approval by the Village Engineer and the IEPA is required prior to any construction.

**SECTION 5.00 – STORM SEWERS AND DRAINAGE:**

A. Storm Sewers shall be installed and constructed in accordance with the provisions of Illinois Environmental Protection Agencies Standard Specifications for Water and Sewer Main Construction in Illinois latest edition, the Village Subdivision Code and these Engineering Standards. For detention basin design requirements, please see the Kane County Stormwater Ordinance and Section 17.20.120 (Storm sewers) of the Subdivision Code.

B. Allowable Materials:

1. Storm sewers shall be reinforced concrete pipe conforming to ASTM C-76, Class IV round pipe or ASTM C-507, Class HE-111 for elliptical pipe. Class of pipe shall conform to section 542 of the "Standard Specifications for Road and Bridge Construction" Illinois Department of Transportation.

Alternate storm sewer materials may be allowed upon review and approval of the Village Engineer.

2. Pipe joints shall be "O" ring joints conforming to ASTM C-361.
3. Manholes, catch basins and inlets shall be precast reinforced concrete conforming to ASTM C-478.
  - a. Provide eccentric cone sections.
  - b. Provide monolithic bases.
  - c. Use flat tops only where grade limitations prevent using cone sections. Flat tops shall be designed for H-20 loading.
4. Joints between manhole, catch basin, and inlet sections shall be filled with butyl rubber joint sealant of sufficient size to completely seal the joint.
5. Castings:
  - a. All castings shall be made of gray cast iron.
  - b. Manhole frames and lids are to be Type 1 with either open or closed lids. Type 1 frames and closed lids shall be heavy duty with indented top solid lid and stamped with the words "STORM" and "CARPENTERSVILLE", Neenah R-1713 or approved equal. Type 1 frames and open lids shall be heavy duty Neenah R-2504 with Type D grates or approved equal.
  - c. Inlet and catch basin frames and grates in paved areas shall be a Neenah R-2504 with Type D grates, or approved equal. Curb inlets for 6-inch barrier curb shall be a Type 11, Neenah R-3281-AL (vane grate) or approved equal. Curb inlets for a 3-inch to 4-inch mountable curbs shall be a Type 12, Neenah R3501-P or approved equal.
  - d. Beehive type grates shall be use in grassed areas and shall be a Neenah R-4340-B or approved equal.

- e. Manhole steps shall be copolymer polypropylene plastic with a continuous ½-inch steel reinforcement as manufactured by M.A. Industries Inc. or approved equal.
- f. Bedding, crushed gravel or crushed stone complying with the requirements of Section 1004, Illinois Department of Transportation, "Standard Specifications for Road and Bridge Construction", latest edition: The gradation shall be either CA-7, CA-8, CA-11 or CA-13. The pipe shall be laid so that it will be uniformly supported and the entire length of the pipe barrel will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade. Bedding shall be required for all sewer construction, and shall be a minimum thickness of four inches (4") under the pipe barrel and two inches under pipe bells.
- g. Backfill to one foot (1') above the top of the pipe shall be done with acceptable bedding material as indicated in paragraph D.3.b above or crushed gravel or stone complying with gradation CA-6 of the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction. Placed in six inch (6") lifts compacted to ninety-five percent (95%) maximum density as determined according to ASTM D1557.

C. Construction:

- 1. Storm sewers shall be constructed in accordance with the "Standard Specifications for Road and Bridge Construction" Illinois Department of Transportation, Standard Specifications for Water and Sewer Main Construction in Illinois, the pipe manufacturer's recommendations, and these Engineering Standards.
  - 2. Trenches for storm sewers located under or within two feet (2') of a paved area shall be backfilled with trench backfill and compacted by mechanical means in loose lifts not to exceed 9 inches to ninety-five percent (95%) of maximum dry density as determined according to ASTM D1557.
  - 3. Adjustment: Three adjustment rings totaling 8" in height may be used. Rings shall be Ladtech HDPE. The top ring in paved areas with crown adjustments shall be rubber.
  - 4. When adjusting rings are required on structures, provide a double ring of a preformed bituminous plastic gasket between the adjusting rings and the manhole.
  - 5. Lifting holes in structure sections and sewer pipe shall be plugged with appropriate sized concrete lift plugs and coated with bituminous material.
- D. All public storm sewers shall be televised in accordance with the requirements of the Section 6.00 (Sanitary and Storm Sewers Televising Inspection Standards) of these Engineering Standards. The televised inspections shall be done in the presence of a representative of the Village Engineer. All deficiencies noted during the televised inspection shall be repaired by the contractor at his expense by means approved by the Village Engineer.

## **SECTION 6.00 – SANITARY AND STORM SEWER TELEVISION INSPECTION STANDARDS**

A. All public storm sewers and sanitary sewers shall be internally inspected by televising with a closed circuit television system at the following three times:

1. Upon completion of construction
2. Prior to acceptance of the storm sewer into the maintenance period
3. Prior to expiration of the maintenance guarantee

B. Internal Sewer Inspection Equipment

1. General:

- a. Provide a closed circuit television (CCTV) and audio-video recording system for internal inspection of mainline sewer capable of producing picture quality to the Village of Carpentersville's satisfaction.
- b. Provide blowers or other means of dissipating steam or fog.

2. Television Camera:

- a. Provide a television camera designed and constructed for sewer inspection with the following capabilities:
  - (1) High-resolution color-chip camera and monitor.
  - (2) Adequate and adjustable lighting to allow a clear picture of the entire periphery of the pipe.
  - (3) Provide auxiliary lighting for sewers larger than 12-inch diameter.
  - (4) Operable in 100 percent humidity conditions.
  - (5) Pan-and-Tilt.
  - (6) Remote or manually propelled.
  - (7) Electronic footage counters accurate to less than 1 percent error over the length of the particular sewer being inspected.

3. Audio-Video Recording System

a. General:

- (1) Provide the total audio-video recording system and procedures as required to produce a high quality video and audio production of bright, sharp, clear pictures with accurate colors, free from distortion, tearing, rolls, or other forms of picture imperfection. The audio portion shall have proper volume and clarity and shall be free from distortion.

b. Video Record Equipment:

- (1) Provide and record on a SVHS video recorder in the televising truck during inspection with voice overlay.
- (2) Provide video capture and video clips.
- (3) SVHS videotapes to be burned on CD-ROM.

4. Contractor shall obtain a hydrant meter from the Village of Carpentersville, and pay all applicable fees for such meter. This meter shall be used to meter the amount of water taken from the Owner's system for preparatory cleaning of sewers and the contractor shall provide a written water use log to the Owner at the end of each project.

C. Internal Sewer Inspection

1. Begin each tape with current date, project name, and owner: followed by the general locations, manhole segment and direction of viewing and beginning footage count superimposed on the video signal. Provide continuous footage counter and manhole segment on all video recordings.
2. Professionally label all videotapes showing the Owner's name, the sewer lines recorded on the tape, Quadrant section number (from Owners Utility Atlas), the date and Contractor's name.
3. Set video recorder to standard play (SP) mode.
4. Move the camera at a speed no greater than 30 feet per minute. Stop at all defects and points of infiltration and pan as necessary to permit proper documentation of the sewer's condition.
5. Inspect the entire length of the sewer section.
6. Stop at all service connections, and pan and look up.
7. Pan and look up all manholes.
8. Stop televising if camera becomes submerged. Use high pressure jetting or other means to lower the water level to below the camera.
  - a. Provide temporary plugs if necessary or directed by the Village of Carpentersville.
  - b. Perform by-pass pumping if necessary or directed by the Village of Carpentersville.
9. Documentation:
  - a. Inspection Logs – Computer generated reports to be in PACP codes.
    - (1) Provide inspection logs with the following information:
      - Owner's Name
      - Inspector's Name
      - Crew Chief's Name

Date  
Street/Address  
From Quadrant and MH No. to Quadrant and MH No.  
Direction of flow  
Type of Pipe  
Joint Spacing  
Manhole Material (Block/Brick/Concrete)  
Section Length  
Pipe Size  
Depth of Upstream and Downstream Manholes  
Direction of Inspection (camera movement)  
Surface Conditions

- (2) Document the footage and clock orientation of all pipe defects, change in pipe material, infiltration, building service connections and any other abnormal conditions.
- (3) Use terminology generally accepted by the industry.
- (4) Computer generated reports using PACP codes.
- (5) Complete inspection log in the field.

b. Provide an audio track recorded by the inspection technician during the actual inspection describing all information documented in the Inspection Log.

#### D. Documentation of Internal Sewer Inspection

1. Television Inspection Logs: All inspections are to be generated on Flexidata Software from Pearpoint, Inc., using PACP codes for all observations.

Technicians should have a minimum of three years experience and be familiar with NASSCO Specifications Guidelines, tenth edition. Computerized records shall be kept by the Contractor, which will clearly show the location in relation to the upstream manhole of each infiltration point, structural problems, and root problems observed during inspection. Hand written logs will not be accepted. The condition of each manhole will also be recorded as specified.

The start of each manhole segment shall be indexed using the VHS Index Search System. Each log shall be identified by upstream and downstream manhole numbers (preceded by the Quadrant number), with the upstream manhole listed first, and shall contain the videotape number and index number of the manhole segment video recording. Copies of the logs, for each television tape, shall be filed in a 1 / 2 inch capacity 3-ring loose-leaf binder, Zip disk backup in Flexidata Software by Pearpoint Inc. The loose-leaf binder shall be labeled with the tape number, CD number, quarter section number, sections televised, location and counter positions.

A separate master index shall be provided in a 1 / 2 inch capacity 3-ring loose-leaf binder identifying the road, quadrant number and start manhole, quadrant number and finish manhole, length televised, tape number, and CD number.

2. Photographs: Software on TV trucks will be equipped with Video Capture and have the capability of Video Clips to identify for the Village any immediate

problems that are identified by the Contractor for each major structural, I/I or root problem.

3. Videotape Recordings: The purpose of tape recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Videotape recording and playback shall be in the SP mode. Slow motion or stop motion playback features may be supplied at the option of the Contractor. Television tapes shall be T-120 VHS format cassette tapes. Videotape cassettes shall be provided to the Village at the end of each week. Each tape shall include a typewritten or printed index (handwritten index will not be accepted) of the sections televised on a 6" X 4" card. Index shall identify tape number, section I.D. (Upstream manhole – downstream manhole), start and stop counter positions for each section and the physical location of each section. After the completion of each VHS tape it will then be burned on CD-ROM drive for Village computer data collection system.
4. Television tapes: They shall be sequentially numbered and an index shall be provided to the Village at the completion of the work listing each tape number, Quadrant number, the manhole segments contained on each tape, and the indexed location of each segment on a cassette.
5. Computer printed reports and videotapes shall be duplicated on CD-ROM and backed up on zip disks.

## **SECTION 7.00: WATER DISTRIBUTION**

- A. Water mains shall be installed and constructed in accordance with the provisions of Illinois Environmental Protection Agencies Standard Specifications for Water and Sewer Main Construction in Illinois latest edition and these Engineering Standards.
- B. Allowable Materials
  - 1. Water Main Pipe:
    - a. All water main pipe shall be ductile iron pipe C-104 complying with ANSI/AWWA C151/A21.51.
    - b. Pipe shall have a minimum thickness Class 52 complying with ANSI/AWWA C150/A21.50.
    - c. All pipe shall have a minimum laying length of eighteen feet (18').
    - d. Pipe joints shall be push-on joints or mechanical joints complying with ANSI/AWWA C111/A21.11.
    - e. All pipe and fittings shall be cement-mortar lined in accordance with ANSI/AWWA C104/A21.4.
    - f. All ductile iron pipe shall be encased in polyethylene sheets of not less than 8 mil thick and complying with ANSI/AWWA C105/A21.5 at the discretion of the Village Engineer, but only if required based upon corrosive soil conditions. This is to be determined from information that is to be provided by the Developer.
  - 2. Water Main Fittings:
    - a. All water main fittings shall be ductile iron fittings with mechanical joints complying with ANSI A21.10 or A21.53 SSB-Compact.
    - b. Fittings shall be cement-lined in accordance with ANSI/AWWA C104/A21.4.
    - c. All ductile iron fittings shall be encased in polyethylene sheets of not less than 8 mil thickness and complying with ANSI/AWWA C105/A21.5. (only if the pipe is also to be encased as described above)
  - 3. Valves:
    - a. Valves 3-inch through 16-inch shall be gate valves designed in accordance with AWWA C515 with a ductile iron body, and seat type with non-rising stem and O-ring packing.
    - b. Valves installed in vaults or valves buried with boxes shall have ANSI Class mechanical joint ends.

- c. Valves greater than 16 inches shall be butterfly valves designed in accordance with AWWA C504 for pressure Class 150B with a cast iron body, rubber-seated, tight closing type suitable for buried service.
- d. Butterfly valves installed in vaults shall have standard flange ends complying with ANSI Class 125 or Victaulic coupling ends. Butterfly valves buried shall have mechanical joint ends.
- e. Each butterfly valve shall be provided with a Type 304 stainless steel valve shaft extended through the valve disc and body and a fully enclosed, sealed, grease-packed integral geared manual operator with a 2-inch square operation nut.

4. Valve Vaults:

- a. Valve vaults shall consist of precast reinforced concrete sections meeting ASTM C478 standards.
- b. .Adjustment: Three adjustment rings totaling 8" in height may be used. Rings shall be Ladtech HDPE. The top ring in paved areas with crown adjustments shall be rubber and does not need to be within the 8" ring adjustment height.
- c. Valve vault steps shall consist of a copolymer polypropylene plastic with a continuous 1/2-inch steel reinforcement as manufactured by M.A. Industries, Inc. or approval equal.
- d. Frame and grates for valve vaults shall be Neenah R-1713 or approved equal, with recessed pick holes, and embossed "WATER" and "Carpentersville".

5. Fire Hydrants:

- a. Fire hydrants shall be dry barrel type with breakaway type flange and auxiliary gate valves and shall conform to AWWA C502.
- b. Fire hydrants shall have two (2), two and one-half inch (2-1/2") hose outlets and one four and one-half inch (4-1/2") national standard thread outlet.
- c. Fire hydrants shall have a main valve opening of five and one-quarter inches (5-1/4").
- d. Fire hydrants shall have a 6-inch auxiliary resilient seat type gate valve of the type specified under paragraph D.3 of this section. The auxiliary valve box shall be a Tyler 664-S and shall include a valve box stabilizer.
- e. Fire hydrants shall be painted factory red. Fire hydrants shall also be repainted prior to the end of the maintenance period using spray applied Coronado-Corogard Superthane Aliphatic Acrylic Urethane 827-245A Red Base with matching converter 827-1B.
- f. Fire hydrants shall be Clow Medallion F2545. The fire hydrant shall have a male Mechanical Joint shoe

6. Service Connections:

- a. All water service lines 2 inches in diameter and smaller shall be constructed of Type K soft temper seamless copper tubing complying with ASTM B-88 with compression type fittings.
- b. Service connections to water main for services 2 inches in diameter and less shall be with an A.Y. McDonald 4701BT or 4701BQ (Ball Type) corporation stop. Water services of 1¼ to 2 inches shall require a swivel nut, McDonald 4750 Street. Service connections to ductile iron water main shall be direct tap. Service connections to existing cast iron or asbestos cement water main shall require a sleeve.

Service connections to the water main for services four inches in diameter or larger shall be made with ductile iron fittings conforming to the water main fitting specification.

- c. Each service 2 inches in diameter or less shall have an A.Y. McDonald 6104BT (Ball Type, Minneapolis pattern) curb stop and an A.Y. McDonald 5614 (Minneapolis pattern) curb box. The upper section of the curb box for ¾ and 1-inch diameter services shall be 1¼-inch in diameter.

Services 4-inch diameter and larger shall have gate valves conforming to water main gate valve specification.

7. Bedding, crushed gravel or crushed stone complying with the requirements of Section 1004, Illinois Department of Transportation, "Standard Specifications for Road and Bridge Construction", latest edition: The gradation shall be either CA-7, CA-8, CA-11 or CA-13. The pipe shall be laid so that it will be uniformly supported and the entire length of the pipe barrel will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade. Bedding shall be required for all water main construction, and shall be a minimum thickness of four inches (4") under the pipe barrel and two inches under pipe bells.
8. Backfill to one foot (1') above the top of the pipe shall be done with acceptable bedding material as indicated in paragraph B.7 above or crushed gravel or stone complying with gradation CA-6 of the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction. Placed in six inch (6") lifts compacted to ninety-five percent (95%) maximum density as determined according to ASTM D1557.
9. All materials shall be domestic.

10. Thrust Blocks:

Meg-A-Lug pipe restraints shall be used to protect water main piping from moving at change of directions, plugs, caps, tees, valves, fire hydrants and bends of 11¼ degree or greater. In addition to the Meg-A-Lug Pipe Restraining System, pre-cast concrete thrust blocks shall be used.

C. Construction:

1. Water Mains: Water mains and appurtenances shall be installed in conformance with AWWA C-600, the material manufacturer's recommendations, the Standard Specifications for Water and Sewer Main construction in Illinois and this Section.
2. Trench Backfill: Trench backfill shall be required in all locations where the water main trench is under or within two feet (2') of existing or proposed pavements including but not limited to streets, sidewalks and driveway. The trench backfill shall be placed in lifts no exceeding eight inches (8") and shall be mechanically compacted to do not less than ninety-five percent (95%) of the standard laboratory density.
3. Water in Trench: Where water is encountered in the trench, it shall be removed during pipe-laying and joint operations. Trench water shall not be allowed to enter the pipe at any time.
4. Water System Connections: All connections to the existing water system shall be made under full water service pressure unless otherwise approved by the Village Engineer.
5. Butterfly Valves: All butterfly valves shall be attached to the water main with a flange connector to facilitate removal of the valve. The valve vault shall be of sufficient size to accommodate the valve and connector.
6. Fire Hydrants:
  - a. Fire hydrants shall have a minimum of one (1) cubic yard of one-quarter (1/4) to three-quarters (3/4) inch of washed river stone placed at the base of the fire hydrant to provide drainage at the barrel. The top of the stone shall be covered with eight- (8) mil thick polyethylene plastic prior to backfilling around the fire hydrant.
  - b. Auxiliary valves shall be connected to fire hydrants.
  - c. The break line flange of fire hydrants shall be not less than one inch (1") nor more than three inches (3") above finished ground elevation. Fire hydrants in street rights-of-way shall be placed not less than three feet (3'), nor more than five feet (5') from the back of curb.
7. Required Water Main Locator: Secure an insulated No. 6 AWG, single strand, single conductor, locator wire to the top of the all water mains. The locator wire shall be brought up inside the valve so no person shall have to enter the valve vault to attach the pipe locator. The locator wire shall be brought up inside the valve vaults, and fastened to the inside of the top of the cone so that no person shall have to enter the valve vault to attach the pipe locator. Locator wire connections must be connected by wire connectors approved by the Village Engineer. A locator box shall be installed at all changes in direction of the main where valve vaults are not required. Continuity testing and documentation of the locator wire must be performed with satisfactory results prior to acceptance into the maintenance period and again prior to the expiration of the maintenance period. In addition, brass wedges are to be installed at all required locations to provide electrical continuity between all pipe and fittings.
8. All newly laid pipe shall be subjected to a hydrostatic pressure of one hundred fifty (150) pounds per square inch for a duration period of two hours. Each valve

isolated section of pipe shall be filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe. Before applying the specified test pressure, all air shall be expelled from the pipe. The pipe must be pressurized and stabilized at a minimum of 150 PSI when the two hour test begins. If no PSI drop is recorded at the end of the first hour the test is complete with a passing result. However, if a pressure drop is recorded the test will continue for the duration of the two hours. Allowable make-up water will be determined by the Village representative according to the AWWA standard listed below for allowable leakage per 1000 feet in gallons per hour.

**(Linear footage X GPH X 2 Hours)/1000**

Pipe Size	3	4	6	8	10	12
GPH	.28	.37	.55	.74	.92	1.1-

If the required amount of make-up water is less then the allowable amount of make-up water the test is complete with a passing result.

NOTE: If at any time after the test begins, a drop of 5 PSI or greater is recorded, the test is complete with a failing result regardless of the allowable make-up.

Leakage is defined as the quantity of water required to be supplied to the newly laid pipe necessary to re-establish the specified leakage test pressure.

All leaks shall be repaired until tight. Any cracked or defective pipes, fittings, valves, or fire hydrants discovered as a result of this pressure test shall be removed and replaced and the test repeated until satisfactory results are obtained.

All pressure tests shall be done in the presence of a representative of the Water Superintendent.

D. Preliminary Flushing: Prior to chlorination, the main shall be flushed as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure test is made. It must be understood that such flushing removes only the lighter solids and cannot be relied upon to remove heavy material allowed to get into the main during laying. If no fire hydrant is installed at the end of the main, a tap should be provided large enough to effect a velocity in the main of at least 2.5 feet per second.

E. Disinfection:

Water main disinfection will be in accordance with the State of Illinois Rules and Regulations Title 35, Subtitle F. Chapter II, Section 652.203 of the Technical Policy Statement.

The following procedures will be followed when disinfection of new water main is required.

1. The contractor shall provide and install corporation cocks with a copper-tube goose-neck assembly for the purpose of sample collection. Fire hydrants shall not be used as sample points. Corporation cocks will be located at a point not more than 10 feet from the beginning of the new main and approximately every 1,000 feet thereafter. Branch and dead end mains less than 1000 feet shall also have corporation cocks not more than 10 feet from the end of the main. The Water Superintendent may require additional corporation cocks at various locations depending on the configuration of the system. All contractors are

advised to contact the Water Superintendent prior to installing corporation cocks for testing.

2. Water from the existing distribution system shall be made to flow at a constant rate into the new main.
3. At a point not more than 10 feet downstream from the beginning of the new main the water entering the new main will receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/l free chlorine.
4. During the application of chlorine, valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours, and at the end of the 24 hour period the treated water in all portions of the main shall have a residual of not less than 10 mg/l free chlorine.
5. After the applicable retention period, heavily chlorinated water shall be flushed from the main until chlorine residuals are consistent with that of the existing system.
6. The environment to which the chlorinated water is to be discharged shall be inspected. If there are any questions that the chlorinated discharge will cause damage to the environment, then an approved neutralizing agent shall be applied to the water being wasted to thoroughly neutralize the chlorine residual in the water.
7. A minimum of twenty-four hours after the final flush and before the water main is placed into service, 1 set of samples shall be collected from approved sample points. Each sample will be tested for bacterial quality, and show the absence of coliform organisms. If all samples tested for bacterial quality are satisfactory the main may be placed into service.
8. If at any sample point the bacterial quality is unsatisfactory, that sample point will be required to resample. The system may be flushed prior to resampling. Resampling will consist of two consecutive samples collected 24 hours apart. Each sample will be tested for bacterial quality and show the absence of coliform organisms. If all samples tested for bacterial quality are satisfactory the main may be placed in service. If samples are unsatisfactory repeat resampling procedures.
9. All system flushing, chlorine injecting and sampling will be done in the presence of a representative of the Water Superintendent. A representative of the Water Superintendent will deliver all samples to a certified lab of the Village's choice.

**SECTION 8.00: STREET LIGHTING**

Please see Section 17.20.130 (Street Lighting) of the Subdivision Code for design and construction requirements for streetlights.