



# CITY OF BURLINGTON

## ENGINEERING DEPARTMENT

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W. Todd Lambert, P.E.  
City Engineer

July 1, 2020

As approved and published by The City of Burlington City Council on December 3, 2019 in the 2020 Fees and Charges Schedules, the Infrastructure Plan Review and Inspections Fees are required for all Infrastructure / Construction Plans submitted for initial review after July 1, 2020. The published Infrastructure Plan Review and Inspections Fee Schedule shall be placed on the cover sheet of all Infrastructure / Construction Plans submitted for review. The Schedule shall be published on the City of Burlington's Engineering website and is attached for reference.

In summary:

The Infrastructure Plan Review and Inspections Fee shall include initial plan review, 1 follow-up review for revised plans based on Engineering redlines and comments, inspections of all public infrastructure and fire lines by the City of Burlington Engineering staff, and Certifications for public water and sewer permits. The review fee for each submittal after the 2<sup>nd</sup> review shall be 25% of the initial Plan Review and Inspection Fee.

The entire Plan Review and Inspection Fee shall be paid for all public infrastructure and fire lines shown on the approved plan at the time of plan approval.

Contractors / Developers shall be responsible for all testing, including but not limited to testing equipment and labor to perform required test. The COB Engineering Staff shall witness and approve all testing procedures and results.

Contractor / Developer shall be responsible to supply the Engineering Department with record drawings / as-builts for approval for all public infrastructure.

Following acceptance of record drawings / as-builts the Engineering Department shall submit permit certifications for public water and sewer permits along with record drawings / as-builts for permit satisfaction.

Contractor / Developer shall be responsible for all construction inspection, testing and certifications of private water, sewer, and storm drain systems.

The Infrastructure Plan Checklist for Plan Review, 9<sup>th</sup> Revision has been revised to include UDO references and other Plan requirements. The revised checklist shall be published on the Engineering website and is attached for reference.



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Revisions to the City of Burlington Engineering Specifications and Standard Details as follows:

The City of Burlington will allow PVC sewer collection pipe to be installed in areas that only serve residential property. PVC sewer may be used in residential developments where no offsite drainage can or could connect to the line. PVC shall have a minimum of 4' cover. PVC sewer shall have Class B bedding in accordance with SS-2 Trenching – Bedding – Backfill for PVC Sewer. PVC sewer shall be SDR-21 pipe with elastomeric gasket, push-on type. All PVC sewer locations shall be approved by the City Engineer.

ADD the following Details:

SS-2 Trenching – Bedding – Backfill for PVC Sewer

## PVC SEWER SPECIFICATIONS

### PART 1 GENERAL

#### 1.01 SCOPE

- A. This specification section includes all materials, equipment, labor, and incidentals required for the supply and installation of polyvinyl chloride (PVC) pipe and fittings, solid wall 8-inch diameter to 12-in diameter for use in non-pressure sewer applications.

#### 1.02 RELATED SECTIONS

- A. City of Burlington Engineering Specifications and Standard Details Section A – Materials
- B. City of Burlington Engineering Specifications and Standard Details Section B.2 – Sanitary Sewer

#### 1.03 REFERENCES

The Contractor and/or Pipe Manufacturer shall follow the standards listed below, except as otherwise specified herein. The latest revision or edition in effect at the time of bid opening shall be utilized.

- A. American Society for Testing and Materials (ASTM)
  - 1. D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds



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2. D2321 – Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity-Flow Applications
  3. D3034 – Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  4. D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
  5. F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe
  6. F679 – Polyvinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
  7. F1417 – Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
- B. American Water Works Association (AWWA)
1. M23 – PVC Pipe – Design and Installation
- C. Uni-Bell PVC Pipe Association
1. UNI-B-6 – Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe
  2. UNI-B-1 - Recommended Specification for Thermoplastic Pipe Joints, Pressure and Non-Pressure Applications
  3. UNI-PUB-6 – Installation Guide for PVC Solid-Wall Sewer Pipe (4 - 48 in.)
  4. UNI-TR-3 – Maintenance of PVC Sewer Pipe
  5. Handbook of PVC Pipe Design and Construction

### 1.04 QUALIFICATIONS

- A. The Pipe Manufacturer shall be a member of the Uni-Bell PVC Pipe Association.
- B. The pipe and fittings shall be designed, manufactured, and installed in accordance with industry standards and shall comply with the specification requirements herein.

### 1.05 SUBMITTALS

- A. Conform to the requirements of the City of Burlington Engineering Department.
- B. Submit product data on pipe, fittings, gaskets and appurtenances as required to ensure products meet the requirements of this specification.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Pipe shall be shipped so as to not bend, dent, or otherwise damage the pipe during transport.
- B. Contractor shall take all necessary precautions to prevent damage to pipe and fittings during delivery and unloading.
- C. Owner shall observe and inspect unloading of pipe to ensure proper unloading procedures are followed.
- D. Under no circumstances will pipe be allowed to be rolled, pushed, or dropped off from any height for delivery, storage, or installation. Any pipe found to have been damaged



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- due to improper handling procedures truck will be immediately marked for identification and removed from the jobsite at the Contractor's expense.
- E. Stacking of pipe shall be performed in accordance with Pipe Manufacturer's recommendations.
  - F. Once pipe has been unloaded, it shall be stored as near to its point of installation as possible. Contractor shall limit moving or restacking of pipe prior to installation.
  - G. Where necessary, because of ground conditions, store pipe on wooden sleepers, spaced suitably and of such widths as not to allow deformation of pipe at point of contact with sleeper or between supports.
  - H. Pipe shall not be stored close to heat sources or hot objects such as heaters, boilers, steam lines, and engine exhaust.
  - I. If pipe is to be exposed to direct sunlight for extended periods (in excess of two years from the date of manufacture), then Contractor shall cover/shade pipe utilizing canvas or other opaque materials. Black plastic will not be acceptable as a shading material.
  - J. Gaskets shall be protected from exposure to excessive heat, prolonged direct sunlight, and oil and grease.
  - K. Material storage shall be performed in accordance with Pipe Manufacturer's recommendations.

### **PART 2 PRODUCTS**

#### **2.01 PIPE**

- A. Pipe shall be manufactured and supplied in accordance with ASTM D3034 (4-Inch to 15-Inch).
- B. Pipe shall have lay lengths between 12 and 22 feet unless otherwise specified by the Owner.
- C. The pipe shall be made of PVC compound having a cell classification of 12454 or 12364 in accordance with ASTM D1784.
- D. Pipe shall be homogenous throughout, free of voids, cracks, inclusions, and other defects.
- E. Pipe shall have markings at intervals of 5ft or less including:
  - 1. Manufacturer's name or trademark and code
  - 2. Nominal pipe size
  - 3. PVC cell classification
  - 4. Legend (" SDR-21 PVC Sewer Pipe")
  - 5. ASTM Designation
  - 6. Gasketed pipe shall be marked with an insertion depth mark on the spigot end
- F. Pipe for wastewater uses shall be green or white in color.
- G. Pipe outside diameters shall be equal to those of cast iron unless otherwise specified by the Owner.



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### 2.02 PIPE DESIGN

- A. Pipe shall be supplied to meet the external loading requirements of the project as follows:
1. Maximum calculated deflection of 5%
  2. Live loads as calculated per AWWA M23 based on the profile shown on the plans
  3. Depth of cover as shown on the plans
  4. Trench width as shown on the plans
  5. Modulus of soil reaction ( $E'$ ), bedding constant ( $K$ ), and soil density ( $\gamma$ ) shall be based on design and site conditions.

### 2.03 FITTINGS

- A. Fittings shall be manufactured and supplied in accordance with ASTM D3034 (8-Inch to 12-Inch). Molded and fabricated fittings may be supplied in accordance with ASTM F1336.
- B. Fittings shall be made of PVC compound having a cell classification of 12454 or 13343 in accordance with ASTM D1784.
- C. Pipe used in fabricated fittings shall have a wall thickness equal to or greater than the wall thickness of the pipes to which the fitting (or that part of the fitting) will be joined.
- D. Molded and fabricated fittings shall have markings including:
1. Manufacturer's name or trademark
  2. Nominal size
  3. Material designation (e.g. "PVC")
  4. ASTM Designation
- E. Fittings may also be supplied as ductile iron fittings in accordance with AWWA C110 and/or C153.

### 2.04 PIPE JOINTS

- A. Joints shall be gasketed push-on type conforming to ASTM D3212.
- B. Gasket materials shall meet requirements of ASTM F477.
- C. Joint lubricant shall be approved by the Pipe Manufacturer and shall have no detrimental effect on the gasket or pipe.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Install pipe, fittings, specials, and appurtenances in accordance with ASTM D2321, UNI-PUB-6 and/or in accordance with the Pipe Manufacturer's recommendations.
- B. Lay pipe to the lines and grades as indicated on the Plans.

### 3.02 PIPE HANDLING

- A. Handle pipe and piping materials with care to avoid damage.



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- B. Prior to installation, each pipe length shall be carefully inspected for damage.
- C. All pipe, fittings, and appurtenances shall be thoroughly cleaned before installation and shall be kept clean until installation and backfilling has completed.
- D. Use only nylon ropes, slings, or other lifting devices that will not damage the surface of the pipe.
- E. Keep the pipe clean and free of debris, dirt, animals, and trash during and after laying operations.
- F. At the close of each operating day, seal the open end of the pipe using a gasketed night cap.
- G. Before, during, and after installation, plastic pipe and fittings shall be protected from exposure to sunlight and any environment that would result in damage to or deterioration of the material. Pipe shall be covered with opaque plastic film. Solvents, solvent compounds, lubricants and any similar materials required to install the plastic pipe shall be stored in accordance with the manufacturer's recommendations and shall be discarded if the storage period exceeds the recommended shelf life.

### 3.03 PIPE INSTALLATION

- A. Do not drag pipe over gravel or rock. Avoid striking rocks or hard objects when lowering pipe into the trench.
- B. Placement of pipe and fittings into the trench should be done with ropes and skids, slings on a backhoe bucket, or by hand.
- C. Pipe or fittings shall not be thrown into the trench and no part of the pipe shall be allowed to take an unrestrained fall onto the trench bottom.
- D. Joint sockets shall be carefully cleaned before pipes are lowered into trenches.
- E. Pipe trenches and excavation shall be kept free of water during pipe laying operations and other related work. If high groundwater levels are expected or encountered, Contractor is to ensure that a minimum depth of cover of 1.5 times the pipe diameter will be maintained over the pipe once it has been installed or provide other methods approved by the Owner and Pipe Manufacturer of preventing flotation of the pipe.
- F. Where the subgrade is found to be unstable or to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed to a minimum of 3-inches, or to the depth ordered by the Engineer, and replaced with a foundation and bedding of crushed stone, suitably graded, and acting as an impervious mat into which the unstable soil or unsuitable material will not penetrate. The depth of crushed stone used for foundation and bedding shall depend upon the severity of the condition of the trench bottom soil or material. The amount of crushed stone to be used by the Contractor shall, in all cases, be designated by the Engineer. Carefully prepare bedding so that the pipe after installation will be true to line and grade. Surface grade the bedding stone beneath the pipe to provide a uniform and



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continuous support beneath the pipe at all points between bell holes or pipe joints. Densify bedding stone beneath the pipe. After each pipe has been brought to grade, aligned, and placed in final position, deposit and densify sufficient bedding material under the pipe haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations. Bedding material shall be uniformly and simultaneously deposited on each side of the pipe to prevent lateral displacement.

- G. Sewer laterals shall connect to the main with a sewer pipe wye. Saddles shall not be allowed on new installations.

### 3.04 JOINT MAKING

- A. Install push-on joints in accordance with Pipe and Fittings Manufacturer's recommendations.
- B. Inspect the gasket, pipe spigot bevel, gasket groove, and sealing surfaces for damage or deformation. In cases when gaskets are supplied separately from pipe, Contractor is to ensure that gaskets supplied are designed for the pipe in use.
- C. Clean the gasket of all extraneous matter.
- D. Apply a thin film of joint lubricant to the inside of the gasket and the outside of the spigot prior to entering the spigot into the bell. Lubricated spigots ends shall not come in contact with soil or backfill material.
- E. Insert the spigot end of the pipe carefully into the bell until the reference mark on the spigot is flush with the bell. If two reference marks are present, the mark closest to the spigot end shall be considered the minimum insertion mark, and the second mark shall be considered the maximum insertion mark. Under no circumstances will the spigot be inserted into the bell past the reference mark or maximum insertion mark.
- F. For small diameter pipe, use the bar-and-block method for joint assembly or other method approved for use by the Owner and Pipe Manufacturer.
- G. For large diameter pipe, use mechanical assistance such as hydraulic pipe pullers, jacks, pulleys, come-alongs, or a backhoe bucket. Observation by a spotter will be required when assembling joints for large diameter pipe to prevent over-insertion.
- H. When using a field cut plain end piece of pipe, bevel the end with a beveling tool, wood rasp, or power sander to the same angle and length as provided on the factory-finished pipe. Redraw the insertion line on the spigot using a factory-marked spigot as a guide.
- I. Angular changes in pipe alignment shall be achieved by either fittings, joint deflection, or longitudinal bending of the pipe.
- J. Joint deflection shall not exceed the Pipe Manufacturer's recommendation.
- K. Field assembly of pipe fittings shall follow the Pipe Fittings Manufacturer's recommendations.



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- L. Mechanical joints shall be assembled per the Pipe and/or Fittings Manufacturer's recommendations as well as the recommendations of the mechanical joint supplier.

### 3.05 LONGITUDINAL PIPE BENDING

- A. Longitudinal pipe bending is not allowed. Pipe shall be installed in a direct, straight line from manhole to manhole.

### 3.06 FIELD TESTING

- A. After pipe has been installed and backfilled, deflection testing shall be performed in accordance with ASTM D3034 and/or F679, PVC Pipe Handbook, and the specifications herein. Deflection testing shall utilize a "go/no-go" rigid ball or mandrel for measurement of pipe deflection. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. As an alternative to waiting 30 days to permit stabilization of the soil-pipe system, the Division will accept certification from a soil testing firm verifying that the backfill of the trench has been compacted to at least 95% maximum density. No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, replacement or correction shall be accomplished in accordance with requirements in the approved specifications. The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, to which the pipe is manufactured. The pipe shall be measured in compliance with ASTM D 2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The test shall be performed without mechanical pulling devices.
- B. All finished installations for non-pressure applications shall be tested via low-pressure air testing in accordance with ASTM F1417, UNI-B-6, and the specifications herein. All planned services shall be installed prior to testing.
- C. Isolate the section of non-pressure sewer line to be air tested by inflatable stoppers or other suitable test plugs/caps.
- D. Ends of all branches, laterals, tees, wyes, and/or stubs in the test section shall be plugged or capped to prevent air leakage. One of the plugs/caps shall have an inlet tap or other method for connecting the air hose to an air control source.
- E. Test ends should be restrained and/or braced during air testing.
- F. Add air slowly to the test section until the pressure reaches 4.0 psi. After the test pressure is obtained, regulate the air supply so that the pressure is maintained between 3.5 and 4.0 psi for at least 2 minutes until the air temperature stabilizes and is in equilibrium with the temperature of the pipe walls.
- G. After equilibrium is achieved, determine the rate of air pressure loss by either the constant pressure method or the time-pressure drop method as outlined in ASTM F1417.



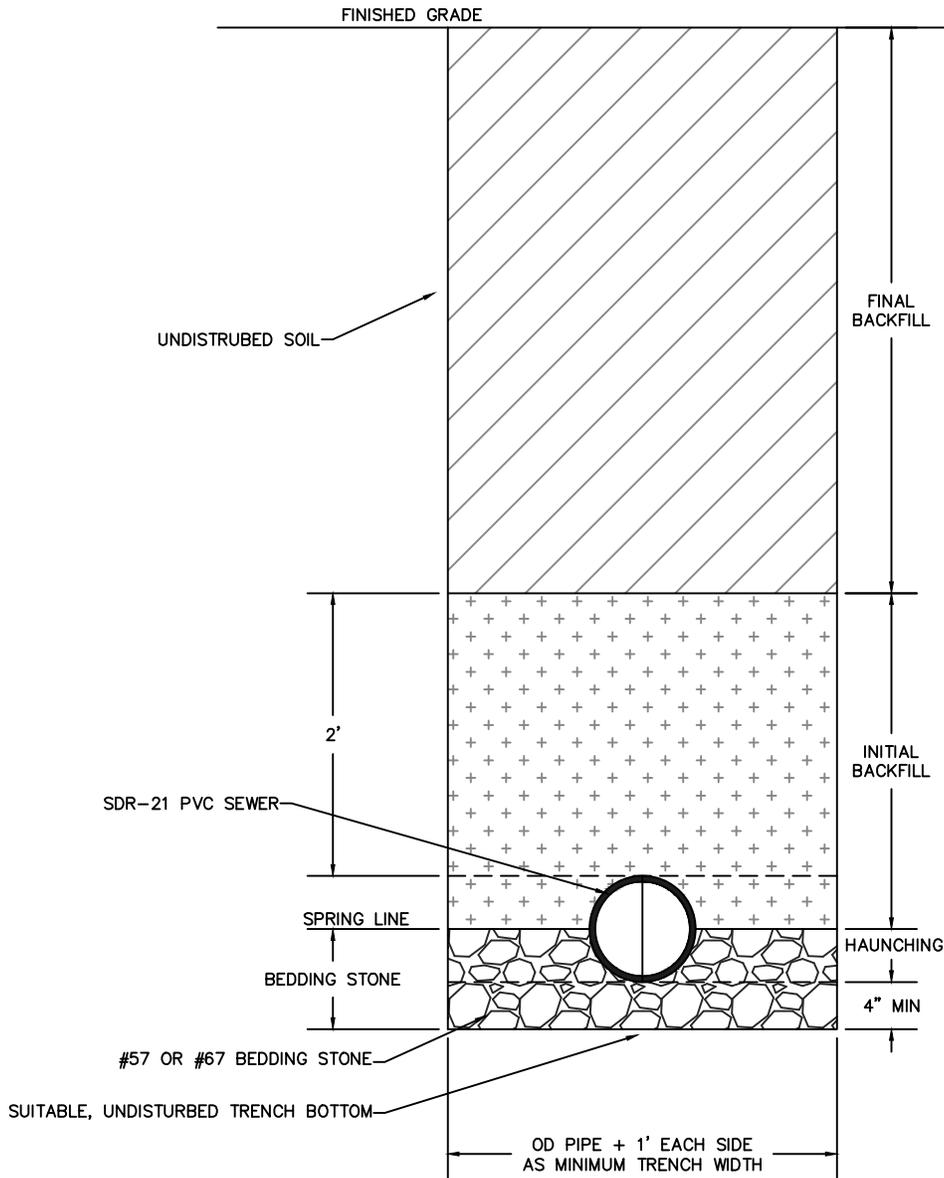
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- H. Upon completion of the test, open the bleeder valve and allow all air to escape. Caps/plugs shall not be removed until all air pressure in the test section has been reduced to atmospheric pressure.
- I. The contractor will be responsible for performing a video inspection of the sewer line once it is completed and cleaned. Television inspection information will be provided to the City of Burlington Engineering Department for all public mains and connecting services. The Engineering Department shall be provided a report with each section identified and linked to either a DVD disc or digital media file with all inspection footage included for each section. Quality of video inspection will be to industry acceptable standards clearly showing any potential defects. Sewer lines under proposed pavement are not considered ready for TV until any required pavement binder is in place and manhole rims are adjusted to grade with the sewer lines cleaned out. Every foot of main shall be recorded with zero beginning at the first manhole and ending with next manhole. Video taping of mains shall be done after any cleaning or jetting operation is complete and immediately after water has been introduced into the main. In the event that repairs are required, affected segment or segments of line will need to be retested and reinspected by means of the video inspection process for final approval. The camera should have pan and tilt capabilities to viewing the pipe at 360 degrees with on screen print out of data. A report form for every segment of line shall be submitted, this should include the firm submitting the report, date, project, upstream and downstream invert elevations, manhole depths, length between manholes, pipe diameter and material type. Any video inspection report that doesn't clearly show the line and connecting service laterals and not meet the above requirements will be rejected.



NOTES:

1. BEDDING SHALL BE THE FULL WIDTH OF THE TRENCH WHERE SHORING AND BRACING IS REQUIRED.
2. ALL BACKFILL SHALL BE FREE AND CLEAR OF STONES GREATER THAN 2".
3. ALL BACKFILL MATERIAL SHALL BE SUITABLE, NATIVE MATERIAL APPROVED BY CITY OF BURLINGTON.
4. BACKFILL SHALL BE PLACED AND COMPACTED IN 6" LIFTS.
5. DEFLECTION TESTING SHALL TAKE PLACE 30 DAYS AFTER BACKFILL OPERATIONS ARE COMPLETE. IN LIEU OF WAITING 30 DAYS, COMPACTIONS TESTING MAY BE COMPLETED SHOWING 95% TRENCH COMPACTION.
6. UNSUITABLE TRENCH BOTTOM MATERIAL SHALL BE REPLACED WITH FOUNDATION MATERIAL TO THE SATISFACTION OF THE CITY ENGINEER.
7. INITIAL BACKFILL SHALL BE HAND WORKED AND TAMPED.



DATE 07/01/20	REVISED	SCALE NOT TO SCALE	DETAIL SS-2
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TRENCHING, BEDDING, AND BACKFILL REQUIREMENTS FOR PVC SEWER  
 CITY OF BURLINGTON, NORTH CAROLINA  
 ENGINEERING DEPARTMENT