

ITEM 14

PVC PIPE

1.0 DESCRIPTION. The Contractor shall furnish polyvinyl chloride (PVC) pipe in accordance with these material specifications. In general, this work shall include the furnishing and laying of all straight PVC pipe and PVC fittings required in the construction of sewers. Gravity and pressure pipe applications are covered herein.

2.0 SUBMITTALS. The contractor shall submit the following information:

A. Reference Standards. Latest revisions:

1. ASTM D1784 - cell classification of 12454.
2. ASTM D3034, F1336 and/or F679.
3. ASTM D3212.
4. ASTM F477 & F913.
5. ASTM D2241 and ASTM D3139.
6. AWWA C900.

B. Shop Drawings.

1. All shop drawings submitted electronically for review and approval shall be returned within two weeks either approved or marked up for further design.
2. After examination of such drawings by the Engineer and the return thereof, the Contractor shall make corrections to the shop drawings, as have been indicated and shall furnish the Engineer with electronic corrections.
3. Shop drawings shall be complete in details and indicate all materials as specified herein, including:
 - a. Pipe size.
 - b. Dimensionality (SDR). Note pressure sewer SDR requirements per plan.
 - c. Pressure Class per applicable standard.
 - d. Color.
 - e. Recommended minimum bending radius.
 - f. Recommended maximum safe pull force.
4. Manufacturer's catalog or general web-site information will not be sufficient to fulfill shop-drawing requirements.
5. For fused PVC, post-construction submittals, "as-recorded" data:
 - a. Fusion joint documentation containing the following:
 - i. Pipe size and thickness.
 - ii. Machine size.
 - iii. Fusion technician identification.
 - iv. Job identification.
 - v. Fusion joint number.
 - vi. Fusion, heating, and drag pressure settings.

- vii. Heat plate temperature.
- viii. Time stamp.
- ix. Heating and cool down time of fusion.
- x. Ambient temperature.

C. Calculations. This section is not applicable.

D. Certifications.

1. Certification of Compliance:
 - a. Obtained from the pipe manufacturer, stating that all pipe and associated fittings have been manufactured and tested in accordance with these specifications and the current standards.
 - b. Submit results of factory testing and inspection regardless of whether or not they were witnessed by the Engineer.
2. Certificates of Qualification:
 - a. Certification from pipe and/or the fusion machine manufacturer that Contractor is qualified to join, lay, and handle pipe.

3.0 MATERIALS. Only materials approved by the Stark County Metropolitan Sewer District may be used for this project.

A. General.

1. All pipe, fittings and appurtenances shall be compatible with one another for tight assembly per manufacturers' directions and tested for fit in presence of County Project Representative.
2. Testing and inspection of pipe supplied under this specification shall be as set forth in referenced standards.
3. Pipe shall be marked as follows:
 - a. Nominal pipe size.
 - b. Dimension Ratio, Standard Dimension Ratio, or Schedule.
 - c. Extrusion production-record code and AWWA/ASTM standard designation number.
 - d. Trademark or manufacturer name.
 - e. Cell Classification may also be included.
4. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.
5. Uniformity shall be met as commercially practical in color, opacity, density, etc.
6. The Sanitary Engineer, at his option, may send his inspector to observe the manufacture and testing of materials supplied for this specification and, as such, the manufacturer shall give ample notice of a production run.
7. All fittings shall be molded or fabricated by the manufacturer. No Contractor fabricated fittings shall be used unless approved by the Engineer.

8. Unless otherwise directed by the Engineer and in gravity pipe applications, pipe of dissimilar materials shall be connected with stainless steel shielded sewer couplings.
9. For special situations, PVC 1120 Type 1 Grade 1 with cell class in accordance with ASTM D1784 pipe material may be permitted by the SCMSD.
10. PVC gravity sewer shall be suitable for conveying domestic sanitary sewage and industrial wastes.
11. Pipe diameter and SDR rating in accordance with detail drawings.
12. 14'-0" Minimum lengths.
13. Approved manufacturers include:
 - a. Pacific Plastics.
 - b. JM Eagle.
 - c. IPEX.
 - d. Engineering approved equal.

B. Fusible PVC Pipe (for either HDD or Open-Cut Installation). Contractors may use fusible PVC for horizontal directional drilling installation.

1. Pipe shall be manufactured with 100% virgin resin. Pipe shall also have 0% recycled plastics content, and shall not consist of any rework compound, even that obtained from the manufacturer's own production using the same formulation.
2. Fusible polyvinylchloride pipes shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
3. Fusible polyvinylchloride pipe shall be manufactured in a standard 20', 30' or 40' nominal lengths.
4. Fusible polyvinylchloride pipe shall be green in color.
5. Pipe shall be marked per AWWA C900 or AWWA C905, and shall include as a minimum:
 - a. Nominal size (example; 6").
 - b. Dimension ratio, Standard Dimension Ratio or Schedule.
 - c. AWWA pressure class or rating (example; PC 305).
 - d. AWWA Standard designation number.
 - e. ANSI/AWWA C900-07 (or latest edition).
 - f. Extrusion production-record code.
 - g. Manufacturer's Name or Trademark.
 - h. Cell Classification 12454 and/or PVC material designation code 1120 may also be included.
 - i. Seal (mark) of the testing agency verifying the suitability of the pipe material for potable water service.
 - j. Seal (mark) of the certifying agencies which have tested and approved the pipe for use in fire protection.
6. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

7. Unless otherwise specified, fusible polyvinyl chloride pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written instructions for this procedure.
8. Joint strength shall be equal to the pipe as demonstrated by testing requirements. All fusion joints shall be completed as described in this specification. Fusible PVC pipe shall be manufactured under the trade names:
 - a. Fusible C-900.
 - b. Fusible C-905.
 - c. FPVC, for Underground Solutions, Inc. Poway, CA, (858) 679-9551.
 - d. Engineering approved equivalent.

C. Long and Short House Assemblies: Long and short house assembly materials shall be in accordance with the PVC materials and appurtenances listed within this specification.

D. PVC Riser Stacks. PVC Riser Stack materials shall be in accordance with:

1. Harco Deep Bury Sewer Riser Kits "complete", by the Harrington Corporation for 4, 6, or 8" lateral service stacks as indicated on detail drawing.
2. SCSE approved equal.

E. Tracer Wire System. All wiring and material requirements for the provision of the tracer wire system on all non-ferrous water and sewer pressure pipe (force mains, HDD, jack & bore and pipe burst) applications shall conform with SCSE Specification Item 60 "Tracer Wire for Water & Wastewater Non-ferrous Pipe".

F. Polyethylene Tape Marker.

1. The contractor shall furnish 3" wide printed "SEWER" tape where open-cut installation is utilized, regardless if pipe is ferrous or non-ferrous material.
 - a. 5 mil thickness.
 - b. Inert 100% low density acid and alkali resistant polypropylene film with solid aluminum foil core.
 - c. Color Green indicating "buried sewer line below".
 - d. NTSB-PSS-73-1.
 - e. OSHA 1926.956 (c) (1).
 - f. APWA Uniform Color Code.

4.0 EXECUTION. All installation for the below referenced materials shall refer to and be in accordance with Item 15; Open Cut Pipe Installation, Item 17; Pipeline Casing; Item 18; Horizontal Directional Drilling or Item 49; Pipe Bursting Gravity Sewers.

A. Fusion Process for Fusible PVC.

1. Fusible pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's recommendations.

2. Fusible pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.
 - a. Training records for qualified fusion technicians shall be available to the Engineer upon request.
3. Each joint fusion shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine.
 - a. Joint data shall be submitted as part of the “as-recorded” information, in accordance with this specification.
4. The fusible pipe will be installed in a manner so as not to exceed the recommended bending radius.
5. Where pipe is installed by pulling in tension, the recommended Safe Pulling Force, according to the pipe supplier, will not be exceeded.
6. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process.
 - a. Fusion machines must incorporate the following properties, including the following elements:
 - i. Heat plates shall be in good condition with no deep gouges or scratches within the pipe circle being fused.
 - ii. Plates shall be clean and free of any contamination. Heater controls shall properly function, and cord and plug shall be in good condition.
 - iii. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier’s recommendations
 - iv. Carriage shall travel smoothly with no binding at less than 50 psi.
 - v. Jaws shall be in good condition with proper inserts for the pipe size being fused.
 - vi. Insert pins shall be installed with no interference to carriage travel
 - vii. Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.
 - viii. The machine shall be equipped with an electric or gasoline engine powered facing unit to square and trim the pipe ends smooth and provide full surface contact with the heating plate.
 - ix. The heating plate on the fusion machine shall be electrically heated and thermostatically controlled with a temperature gauge and be capable of maintaining 500°F with a tolerance of 10°F. Fusion temperature shall be as recommended by the pipe manufacturer.
7. Joint strength shall be equal to or greater than the tensile strength of the pipe and shall indicate a ductile rather than brittle fracture when tested.

B. Data Logger.

1. The current version of the pipe supplier’s recommended and compatible software shall be used.
2. Protective case shall be utilized for the hand-held wireless portion of the unit.
3. Datalogger operations and maintenance manual shall always be with the unit.

4. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

C. Other Equipment.

1. Other equipment specifically required for the fusion process shall include the following:
 - a. Pipe rollers shall be used for support of pipe to either side of the machine.
 - b. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement and /or windy weather.
 - c. Fusion machine operations and maintenance manual shall always be kept with the fusion machine.
 - d. Facing blades specifically designed for cutting pipe.
 - e. The heater plate shall be equipped with suitable means to measure the temperature of plate surfaces and to assure uniform heating such as thermometers or pyrometers.
 - f. External and Internal Bead removers shall be McElroy Manufacturing, Inc. or equal.

D. Joint Recording.

1. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.
2. The fusion data logging and joint report shall be generated by software developed specifically for the fusion of pipe.
3. The software shall include pipe based dimensional data and pipe based interfacial pressure relationships.
4. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

E. House Assemblies Long & Short: Long and short house assemblies shall be installed in accordance with this specification, Item 15 and Standard Detail Drawing No. 6 requirements.

F. Service Riser Stacks. Refer to Item 15. Riser stacks shall be installed in accordance with the manufacturer's installation procedures and detail drawing 7B, or other SCSE engineering approved equal requirements.

G. Tracer Wire System. All labor, equipment and materials necessary for installation of the Tracer wire system for all non-ferrous water and sewer pressure pipe (force mains, HDD, jack & bore and pipe burst) applications shall be in accordance with all:

1. SCSE Detail Drawings.
2. SCSE Specification Item 60.

5.0 ELECTRICAL. This section is not applicable.

6.0 QUALITY ASSURANCE. The items covered under this section of the Specification are intended to be the materials as described above. All material used on this project shall be new and unused unless otherwise specified and all workmanship shall be of the best quality.

A. Testing. The work covered under this section of the Specification is intended to be the work, materials, labor and equipment required to install the sewer system as described above.

1. All material used on this project shall be new and unused unless otherwise specified and all workmanship shall be of the best quality. Only qualified and skilled workmen/women shall be employed for all phases of this project.
2. Hydrostatic testing: Refer to Item 14 Appendix "A": Hydrostatic testing of projects will be conducted as the project is being installed. This includes but is not limited to, all mainline between manholes, future mainline stubs, laterals and laterals out of manholes.
3. The contractor shall be responsible for furnishing all equipment and labor for the hydrostatic test at no additional cost to the County.
4. Deflection testing: Deflection testing shall be required after a minimum of 30 days post construction as specified in Item 14 Appendix 'B'.
5. Post CCTV. The Contractor shall be responsible to provide post CCTV of the entire sewer system after completion of all installation and testing.
6. All post video work shall comply with and be paid for under SCSE Item 40.
7. Continuity Testing required for the Tracer Wire System shall be done in accordance with SCSE Item 60 specification.

B. Observation.

1. All pipe will be subject to inspection and approval by the County after delivery of material to the job site. Any pipe or fittings found to be unsatisfactory or otherwise damaged shall not be approved for use, returned and replaced at the Contractors' expense.
2. The Contractor shall furnish the Engineer two (2) copies of lists of all pieces of pipe and fittings in each shipment received and shall include mark numbers, class, size and description of each item.

C. Warranty.

1. Materials. The Contractor shall provide all material manufacture warranties utilize on this project.
2. In addition to all material warranties, the two (2) year maintenance bond and warranties described under the General Conditions, Items 15, 17, 18, and 49 respectively, the contractor shall provide the following additional installation warranty.
3. All warranties for the tracer wire system shall be in accordance with SCSE Specification Item 60.

7.0 MEASUREMENT. Method of measurement for all work completed under this specification shall be as follows.

- A.** The sizes of PVC Gravity pipe and fittings as shown on the drawings or as specified refer to inside diameters. No PVC pipe (gravity) shall be rated at a greater standard dimension ratio than 35 as defined under ASTM D3034.
- B.** All House Service Assembly: short and long paid for under this item shall be the actual number of installed short or long assemblies necessary to complete the work under this Contract.
 - 1. House Service Assembly (SHORT). The Contractor shall provide all materials necessary to provide the “short” house service assembly as indicated on the detail drawings and below:
 - a. Short House Service Assemblies shall be determined to be any length less than or equal to $\frac{1}{2}$ the width of the right-of-way or easement to the point along the right-of-way where the homeowner’s lateral terminates and the main line sewer invert at the service connection fitting, as indicated on all detail drawings, as indicated on all detail drawings; measurement shall be made along the horizontal alignment of the service pipe.
 - b. Y-branch or T-branch as indicated on the detail drawing or in the proposal for standard service sewer.
 - c. All Y-branches, T-branches, lateral pipe, fittings, service stacks and house service sewers shall be (6) six inches in diameter unless specifically shown or called for as of a different size.
 - d. Reconnecting existing service sewer:
 - i. Item 14E – 4” PVC Cleanout.
 - ii. Item 14F – 6” PVC Cleanout.
 - iii. All Y-branches, T-branches.
 - iv. All stoppers shall be sealed in the pipe in such a manner that they will be watertight and will not move during testing for leakage.
 - 2. House Service Assembly (LONG). The Contractor shall provide all materials necessary to provide the “long” house service assembly as indicated on the detail drawings and below:
 - a. Long House Service Assemblies shall be determined by any length greater than $\frac{1}{2}$ the width of the right-of-way or easement from the point along the right-of-way where the homeowner’s lateral terminates and the main line sewer invert at the service connection fitting, as indicated on all detail drawings; measurement shall be made along the horizontal alignment of the service pipe.
 - b. Y-branch or T-branch as indicated on the detail drawing or in the proposal for standard service sewer.
 - c. All Y-branches, T-branches shall be SDR35 PVC pipe unless otherwise noted on detail drawings.

- d. All lateral pipe, fittings, service stacks shall be (6) six-inch diameter PVC pipe unless specifically shown or called for as a different size or material.
 - e. House service sewer (lateral) shall include any necessary transition fitting(s) and pipe as shown on detail drawing.
 - f. Reconnecting existing service sewer.
 - i. Item 14E – 4" PVC Cleanout.
 - ii. Item 14F – 6" PVC Cleanout.
 - iii. All Y-branches, T-branches,
 - iv. All stoppers shall be sealed in the pipe in such a manner that they will be watertight and will not move during testing for leakage.
3. House Service Assembly (OUTSIDE OF CASING). For house service assemblies that require casing to be installed, the Contractor shall provide all materials necessary to provide the service assembly as indicated on the detailed drawings and below:
- a. House Service Assemblies (Outside of Casing) shall be determined to be any length not installed within a casing pipe to the point along the right-of-way where the homeowners lateral terminates and the main line sewer invert at the service connection fitting, as indicated on all detail drawings, as indicated on all detail drawings; measurement shall be made along the horizontal alignment of the service pipe.
 - b. Y-branch or T-branch as indicated on the detail drawing or in the proposal for standard service sewer.
 - c. All Y-branches, T-branches shall be SDR35 PVC pipe unless otherwise noted on detail drawings.
 - d. All lateral pipe, fittings, service stacks shall be (6) six-inch diameter PVC pipe unless specifically shown or called for as a different size or material.
 - e. House service sewer (lateral) shall include any necessary transition fitting(s) as shown on detail drawings.
 - f. Reconnecting existing service sewer:
 - i. Item 14E – 4" PVC Cleanout.
 - ii. Item 14F – 6" PVC Cleanout.
 - iii. All Y-branches, T-branches,
 - iv. All stoppers shall be sealed in the pipe in such a manner that they will be watertight and will not move during testing for leakage.
4. All stack assemblies paid for under this item shall be the actual number of stack assemblies necessary to complete the work under this Contract.
5. All linear footages for materials required to install the House Service Assemblies; long and short, and all Stack Assemblies shall be included in the unit cost as indicated below. No additional payments shall be made.

C. Main Sewers. The lengths of PVC sewer main pipe to be paid for under this Item, shall be the total number of lineal feet and size of main actually furnished and placed in accordance with the Specifications, measured along the axis of the pipe after the pipe has been connected in place.

- a. **Tracer Wire and Polyethylene Tape Marker.** The entire tracer wire system and polyethylene marker tape installed shall be included as part of the total

number of lineal feet and size of main sewer actually furnished and placed, under this item, as indicated above.

No additional payments for tracer wire or marker tape shall be made.

8.0 PAYMENT. The unit price stipulated in Item 14 shall include the items specified herein. Basis for payment of accepted quantities follows:

<u>Item</u>	<u>Unit</u>	<u>Description</u>
14	LF	8" to 15" PVC Gravity Sewer
14	LF	18" and Larger PVC Gravity Sewer
14	LF	PVC Pressure Pipe
14	LF	Fusible PVC
14A	EA	House Assembly (Long)
14B	EA	House Assembly (Short)
14C	LF	House Assembly (Outside of Casing)
14D	EA	Stack Assembly Complete
14E	EA	4" PVC Cleanout
14F	EA	6" PVC Cleanout

END OF SECTION