

SECTION 15066

CARTRIDGE-LOADED, RESTRAINED JOINT POLYVINYL CHLORIDE PIPE

PART 1 –GENERAL

1.01 DESCRIPTION

A SCOPE

1. This section specifies cartridge-loaded, restrained joint polyvinyl chloride pipe, including standards for dimensions, testing, quality, assembly, safe handling and storage.

B PIPE DESCRIPTION

1. Pipe supplier shall furnish cartridge-loaded, restrained joint polyvinyl chloride pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.
2. Pipe shall conform to the following dimensions and general characteristics table:

<u>Pipe Description</u>	<u>Nominal Diameter (in.)</u>	<u>DR</u>	<u>Pressure Class (psi)</u>

1.02 QUALITY ASSURANCE

A REFERENCES:

1. This section includes references to the following documents. These documents are a part of this section to the extent and for the purposes specifically used in this section. Where a referenced document contains references to other standards, those other standards are included as references under this section as if referenced directly to the same extent and for the same purpose. In the event of a conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.
2. Unless otherwise specified, references to documents shall mean the documents in effect at the time of design, bid, or construction, whichever is earliest. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued.

Reference	Title
ANSI/AWWA C110/A21.10	American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids
ANSI/AWWA C111/A21.11	American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
ANSI/AWWA C153/A21.53	AWWA Standard for Ductile-Iron Compact Fittings for Water Service
AWWA C605	Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
AWWA C651	Standard for Disinfecting Water Mains
AWWA C900	Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100mm Through 300mm), for Water Distribution
AWWA M23	AWWA Manual of Supply Practices PVC Pipe—Design and Installation, Second Edition
ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
UNI-PUB-08	Tapping Guide for PVC Pressure Pipe
NSF-61 G	Drinking Water System Components--Health Effects

B SPECIFIED PIPE SUPPLIERS

1. Cartridge-loaded, restrained joint polyvinyl chloride pipe shall be used as manufactured under the trade names TerraBrute[®] and TerraBrute[®] CR, for Underground Solutions, Inc., Poway, CA, (858) 679-9551. Owner and engineer are aware of no other cartridge-loaded, restrained joint polyvinyl chloride pipe that is an equal to this specified pipe supplier and product.

C PRE-CONSTRUCTION SUBMITTALS

1. The following PRODUCT DATA is required from the pipe supplier and/or manufacturer:
 - 1) Pipe size
 - 2) Dimensions
 - 3) Pressure class
 - 4) Color
 - 5) Recommended minimum bending radius

- 6) Recommended maximum safe pull force
- 7) Installation instructions

PART 2 – PRODUCTS

2.01 CARTRIDGE-LOADED, RESTRAINED JOINT POLYVINYL CHLORIDE PIPE

- A Cartridge-loaded, restrained joint polyvinyl chloride pipe starting stock shall be made to the AWWA C900 standard. The finished product shall be tested in accordance with AWWA C900.
- B Cartridge-loaded, restrained joint polyvinyl chloride pipe shall have an integral bell. Bell shall have the same wall thickness as the pipe barrel. It shall not contain any metallic components.
- C Cartridge-loaded, restrained joint polyvinyl chloride pipe shall be manufactured in a standard, 20 foot long nominal lay length.
- D Cartridge-loaded, restrained joint polyvinyl chloride pipe shall be blue in color for potable water applications.
- E Cartridge-loaded, restrained joint polyvinyl chloride pipe for potable water use shall be certified per NSF-61 G.
- F Cartridge-loaded, restrained joint polyvinyl chloride pipe shall be marked as follows:
 - 1. Nominal pipe size
 - 2. PVC
 - 3. Dimension Ratio (DR)
 - 4. AWWA pressure class
 - 5. AWWA standard designation number
 - 6. NSF-61 G mark verifying suitability for potable water service
 - 7. Extrusion production-record code
 - 8. Trademark or trade name
 - 9. Cell Classification 12454 and/or PVC material code 1120 may also be included
- G Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible faults.

2.02 INTEGRAL RESTRAINED JOINTS

- A Unless otherwise specified, cartridge-loaded, restrained joint polyvinyl chloride pipe lengths shall be assembled in the field using an integral, gasketed, restrained joint. The Contractor shall follow the pipe supplier's written guidelines for joining the product.

- B At a minimum, the cartridge-loaded, restrained joint shall be rated to provide the following pull force capabilities with a minimum safety factor of two being applied to the ultimate tensile capacity of the joint.

Nominal Size (in)	Safe Pulling Force (lbs)
4	11,200
6	24,700
8	25,800
10	42,100
12	61,800

- C The cartridge-loaded, restrained joint shall use a high deflection, profile gasket per ASTM F477. Standard gasket material shall be styrene-butadiene rubber (SBR). Optional, special order nitrile rubber gaskets shall be used where indicated in the construction documents. O-rings or similar gaskets shall not be allowed.
- D The assembled restrained joint shall meet the requirements of ASTM D3139.
- E The assembled restrained joint shall allow for expansion and contraction within the joint.

2.03 CONNECTIONS AND FITTINGS

- A Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems.

B DUCTILE IRON MECHANICAL AND FLANGED FITTINGS

Acceptable fittings for use with cartridge-loaded, restrained joint polyvinyl chloride pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.

1. Connections to cartridge-loaded, restrained joint polyvinyl chloride pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.
2. Bends, tees and other ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.
3. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

C PVC GASKETED, PUSH-ON FITTINGS

Acceptable fittings for use with cartridge-loaded, restrained joint polyvinyl chloride pipe shall include standard PVC pressure fittings conforming to AWWA C900.

1. Acceptable fittings for use in joining cartridge-loaded, restrained joint polyvinyl chloride pipe, other sections of cartridge-loaded, restrained joint polyvinyl chloride pipe or other sections of PVC pipe shall include gasketed PVC, push-on type couplings and fittings, including bends, tees, and couplings.
2. Bends, tees and other PVC fittings shall be restrained with the use of thrust blocking or other restraint products as required.
3. PVC gasketed, push-on fittings and mechanical restraints, if used, must be installed per the manufacturer's guidelines.

D SLEEVE-TYPE COUPLINGS

1. Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe, and may be restrained or unrestrained as required.
2. Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

E EXPANSION AND FLEXIBLE COUPLINGS

1. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.
2. Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

F CONNECTION HARDWARE

Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

PART 3 – EXECUTION

3.01 DELIVERY AND OFF-LOADING

- A All pipe shall be bundled or packaged in such a manner as to provide adequate protection during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.
- B Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
- C Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed.
- D Off-loading devices such as chains, wire rope chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

- E If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces.
- F Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

3.02 HANDLING AND STORAGE

- A Any length of pipe showing a crack or other visible damage that may have caused a crack, shall be marked as damaged and removed at once from the work.
- B Any scratch or gouge greater than 10% of the wall thickness will be considered significant and the affected pipe will not be used unless determined acceptable by the owner or engineer in consultation with the pipe supplier.
- C Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer or pipe supplier. Caution should be exercised to avoid compression, damage, or deformation to the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.
- D Pipe shall be handled and supported with the use of woven fiber (nylon) pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
- E If pipe is to be stored for periods of 1 year or longer, the pipe should be shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.
- F Pipe shall be stored and stacked per the pipe supplier's guidelines.

3.03 CARTRIDGE-LOADED, RESTRAINED JOINT PROCESS

- A Cartridge-loaded, restrained joint polyvinyl chloride pipe shall be handled in a safe and non-destructive manner before, during, and after the joining process.
- B The pipe shall be joined using the integral, gasketed restrained joint in accordance with the pipe supplier's guidelines.

3.04 GENERAL INSTALLATION

- A Installation guidelines from the pipe supplier shall be followed for all installations.
- B The cartridge-loaded polyvinyl chloride pipe shall be installed in a manner so as not to exceed the recommended minimum bending radius.
- C Where cartridge-loaded polyvinyl chloride pipe is installed by pulling in tension, the recommended safe pulling force established by the pipe supplier shall not be exceeded.
- D Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

3.05 PIPE SYSTEM CONNECTIONS

- A Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

3.06 TAPPING APPLICATIONS

- A Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. **NO DIRECT TAPPING WILL BE PERMITTED.** Tapping shall be performed in accordance with the applicable sections for Saddle Tapping per UNI-PUB-8.
- B Equipment used for tapping shall be made specifically for tapping PVC pipe:
 1. Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. 'Hole saws' made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
 2. Manually operated or power operated drilling machines may be used.
- C Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap,) or when the pipeline is not filled with water and not under pressure ('dry' tap).

3.07 TESTING

- A Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.
- B **HYDROSTATIC TESTING AND LEAKAGE TESTING FOR PRESSURE PIPING**
 1. Hydrostatic and leakage testing for piping systems shall comply with AWWA C605.
 2. Unless agreed to or otherwise designated by the owner or engineer, for a simultaneous hydrostatic and leakage test following installation, a pressure equal to 150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation shall be applied. The duration of the pressure test shall be for two hours.
 3. If hydrostatic testing and leakage testing are performed at separate times, follow the procedures as outlined in AWWA C605.
 4. In preparation for pressure testing the following parameters must be followed:
 - 1) All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which allows all non-entrained air to escape the pipeline at all high points. Venting may also be supplemented by 'flushing' the pipeline

in accordance with the parameters and procedures as described in AWWA C605.

- 2) The pipeline must be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the restraint manufacturer's guidelines, whether permanent or temporary to the final installation. This also includes the installation and curing of any and all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to beginning the test.
- 3) Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to minimize the amount of potentially entrapped air in the pipeline.

C DISINFECTION OF THE PIPELINE FOR POTABLE WATER PIPING

1. After installation, the pipeline, having passed all required testing, shall be disinfected prior to being put into service. Unless otherwise directed by the owner or engineer, the pipeline will be disinfected per AWWA C651.

D PARTIAL TESTING

1. Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the owner and engineer.

****END OF SECTION****