

SPECIFICATION FOR EXPANDED-IN-PLACE PVC PIPELINE RECONSTRUCTION
(AS PROVIDED BY MILLER PIPELINE CORP, FOR THE EX METHOD)

GENERAL

This work shall include the furnishing of all labor, equipment and materials necessary to complete the reconstruction of pipelines as stipulated herein and as shown on the Contract Drawings. As becomes applicable to this specific Contract, the work shall include the preparation of the construction site, including cleaning and flushing of existing piping; flow control bypass pumping; protection of existing conditions during installation work; unloading, hauling; distributing and installation; testing of all pipe, fittings, scaffolding, piping, valves, boilers, etc. and other accessories as required for the proper installation; protection of the site during the life of the Contract, including providing of necessary watchmen, warning lights, barricades, traffic control, dust control and maintenance of detours, as needed; and finally the cleanup of the work site, including maintenance of surfaces such as paving, and seeding, sodding and graveling, as needed, if damaged.

It is the intent of this Specification to provide for the reconstruction of existing pipelines by the installation of a high strength P.V.C. expanded in place new pipe. Expansion shall be accomplished by circulating steam, or other approved method and providing pressure to properly expand the P.V.C. pipe tight against the host pipe. After expansion, the P.V.C. pipe shall extend over the length of the host pipe from manhole to manhole in a continuous, jointless, tight fitting, watertight pipe

II. REFERENCE SPECIFICATIONS

This specification references American Society for Testing and Materials (ASTM) standard specifications, which are made a part hereof by such reference and shall be the latest edition and revision thereof.

1. D-638 Test Method for Tensile Properties of Plastics
2. D-790 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
3. D-1784 Specifications for Rigid Poly (Vinyl Chloride) (P.V.C.) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
4. D-696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics
5. F-1 504 Specification for Folded Poly (Vinyl Chloride) (P.V.C.) Pipe for Existing Sewer and Conduit Rehabilitation

The P.V.C. pipe shall be fabricated to a size that, when installed, will neatly and tightly fit the internal circumference of the conduit. Allowance for longitudinal stretching during insertion shall be made,

The minimum length shall span the distance from inlet to the outlet of the respective pipe to be reconstructed. The Contractor shall verify the lengths in the field before starting work.

The minimum thickness for PVC pipe shall be as verified by design calculations prepared by a professional engineer for each specific pipe location.

III. Unless otherwise specified, the Contractor shall furnish a Poly Vinyl Chloride pipe that meets ASTM Test Procedures D-638 and D-790 and the finished expanded physical strengths specified herein and ASTM F1 504 Standard Specifications for Folded Poly (Vinyl Chloride) (PVC) Pipe for existing Sewer and Conduit Rehabilitation.

The expanded pipe shall conform to the minimum structural standards as listed below:

PHYSICAL CHARACTERISTICS	TEST PROCEDURE	MINIMUM VALUE
Tensile Strength	ASTM D-638	5,000 psi
Flexural Strength	ASTM D-790	8,000 psi
Flexural Modulus	ASTM D-790	320,000 psi
Coefficient of Thermal Expansion	ASTM D-696	.00003 in/in °F *
Source: Handbook of P.V.C. Pipe Design and Construction Uni-bell P.V.0 Pipe Association		

The PVC used for the expanded in place pipe shall conform to ASTM D-1784 cell classification I 23346, 1 2334B, 1 334B or 1 3223B and as further defined in ASTM F-1 504. Compounds that have superior properties to those specified are also acceptable.

The PVC compound shall be chemically resistant to withstand exposure to domestic sewage. For effluents other than domestic sewage, an analysis shall be performed of the waste stream to determine applicability.

The Contractor shall furnish, prior to use of the materials, satisfactory written certification of his compliance with the manufacturer's standards and specifications for all materials.

IV. SUBMITTALS

After the award of the contract and before any pipe system materials are delivered to the job site, the Contractor shall submit to the Engineer a complete list of all materials proposed to be furnished and installed.

Show manufacturers name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer's recommendations as to the method of installation.

Upon approval of the Engineer, the manufacturer's recommendations shall become the basis for acceptance or rejection of actual methods of installation used in the work.

The Contractor shall not permit any pipe reconstruction component to be brought onto the job site until it has been approved by the Engineer.

No pipe shall be reconstructed without prior notification of the Engineer. Each pipe shall be subject to inspection by the Engineer immediately before it is installed and defective pipe may be rejected. Contractor shall submit to the Engineer as part of the shop drawings the manufacturers design calculations for the minimum thickness of the pipe materials being supplied. The design calculations shall be developed based on the following parameters:

- a. Existing Pipe Characteristics

1. Assume pipe fully deteriorated
 2. Ovality equal to 2 percent
- b. Soil and Ground Water Characteristics:
1. Type of soil - clay or actual
 2. Soil density - 120 pcf or actual
 3. Soil modulus - 1000 psi or actual
 4. Ground water 2 feet below existing grade or actual
- c. Live Load Calculation
1. AASHTO HS- 20 load at depths shown on plans.
- d. Design calculations shall show that when utilizing the above noted parameters that:
1. Buckling - Utilizing a safety factor of 2.0, the liner will not buckle
 2. Deflection - There will not be more than a 5 percent change in the vertical cross-section of the pipe under the worst backload condition utilizing a deflection lag factor of 1.5 and a bedding factor of 0.11
 3. Ring-Bending - The maximum ring-bending stress will not exceed 50 percent of the ring-bending strength of the liner

The Contractor shall submit to the Engineer as part of the shop drawings a detailed resume of the field superintendent who will direct the work. The field superintendent shall have at least two-(2) year's field supervisory experience in trenchless pipeline reconstruction. The field superintendent shall be on the job full time during any and all steps of the pipe installation.

V INSTALLATION

Prior to all work, the Contractor shall carefully inspect the area for "present" existing conditions.

The Contractor shall verify all existing pipe diameters prior to ordering pipe materials.

In the event of a discrepancy, the Contractor shall immediately notify the Engineer. No work shall be performed in an area of discrepancy until it has been fully resolved by the Engineer.

The Contractor shall use all means necessary to protect pipe materials before, during and after installation and to protect the installed work and materials of all other trades.

The Contractor shall make all required connections to existing pipes and manholes and carry out such work in accordance with local standards and requirements and as directed by the Engineer. Extreme care shall be used to prevent debris from entering existing pipe prior to reconstruction.

In the event of damage caused to materials, the Contractor shall make all repairs and replacement necessary to the approval of the Engineer at no additional cost to the Owner.

The Contractor shall maintain in operating condition all active pipes encountered during the pipeline reconstruction,

The following installation procedures shall be adhered to unless otherwise approved by the 3

Engineer:

The Contractor shall carry out his operations in strict accordance with all OSHA and manufacturers safety requirements, Particular attention is drawn to those safety requirements involving working with hazardous/combustible material, (if needed), scaffolding (if required) and entering confined spaces.

It shall be the responsibility of the Contractor to remove all internal debris from the pipeline prior to installing the new *PVC* pipe.

Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by closed circuit television, The interior of the pipeline shall be carefully inspected to determine the location of any condition which may prevent proper installation of the new pipe. Defects shall be noted so that these conditions can be corrected. A video tape and suitable log shall be submitted to the owner prior to and after installation of the pipe.

THE CONTRACTOR, WHEN REQUIRED, SHALL PROVIDE FOR THE FLOW AROUND THE SECTION OF PIPE DESIGNATED FOR RECONSTRUCTION. THE BYPASS SHALL BE MADE BY PLUGGING THE LINE AT AN EXISTING UPSTREAM MANHOLE AND PUMPING THE FLOW INTO A DOWNSTREAM MANHOLE OR ADJACENT SYSTEM. THE PUMP AND BYPASS LINES SHALL BE OF ADEQUATE CAPACITY AND SIZE TO HANDLE THE FLOW. ONCE THE P.V.C. PIPE HAS BEEN PULLED INTO THE HOST PIPE NO FLOW SHALL BE ALLOWED TO PASS THROUGH THAT SECTION OF PIPE UNTIL THE P.V.C. PIPE IS FULLY EXPANDED.

It shall be the responsibility of the Contractor to clear the line of obstructions or collapsed pipe that will prevent reconstruction. If inspection reveals an obstruction that cannot be removed by conventional pipe cleaning equipment, then the Contractor shall hydraulically reround the pipe or make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's representative prior to the commencement of the work and shall be considered as a separate pay item.

The method of installation shall be compatible with the manufacturer's recommended practices.

The new pipe shall be inserted into the existing pipe through existing manholes, without modification of manholes, other than minor chipping of manhole channels or removing processing equipment. There shall be no excavation of the roadway to install "receiving" or "sending" pits, unless the length of pipe between manholes exceeds the manufacturer's maximum coiling length technology.

The Contractor shall supply a suitable heat source to thoroughly heat the full length of pipe to be inserted. The heat or steam used for preheating shall be monitored and regulated as recommended by the pipe manufacturer. The entire length of pipe shall be heated both internally as well as externally prior to installation.

After the *PVC* pipe is heated both internally and externally, the Contractor shall pull the *P.V.C.* into the existing pipe using a winch. The winch shall have sufficient capacity to pull the *P.V.C.* through the host pipe without exceeding pulling tensions as recommended by the manufacturer.

After insertion is completed, the Contractor shall supply suitable heat source. The equipment shall be capable of delivering steam through the pipe section to uniformly raise the temperature

to effect forming of the P.V.C. pipe.

The steam for processing shall be monitored and regulated as recommended by the pipe manufacturer.

The new pipe shall be expanded until pressed tightly against the existing pipe wall.

After the P.V.C. pipe has been fully expanded and held in that position for the required period, the steam pressure shall be replaced with air pressure cooling the pipe to 100°F or lower.

If the pipe fails to form, the contractor shall remove the failed pipe and replace it with a new pipe. This work shall be performed without additional cost to Owner.

After the pipe has been formed and cooled, the ends of the pipe shall be cut away at both manholes and the ends shall be curled up to lock the pipe in place.

The finished liner pipe shall be continuous over the entire length of run between two manholes and be as free as commercially practical from visual defects such as foreign inclusions and pin holes. It shall also meet the leakage requirements or pressure test specified.

Any defects which will affect in the foreseeable future or warranty period, the integrity or strength of the new P.V.C. pipe shall be repaired at the Contractor's expense. Any ribs resulting in the cross sectional area of the pipe shall be removed or the pipe replaced in its entirety unless approved otherwise by the Engineer.

If, due to broken or offset pipe at the manhole wall, the pipe fails to make a tight seal, the Contractor shall apply a seal at that point. The seal shall be of a resin mixture compatible with the pipe material,

After the pipe has been expanded in place, the Contractor shall reconnect the existing active service connections. The Contractor shall be responsible to confirm the active laterals prior to reconnection, This shall be done without excavation from the interior of the pipeline by means of a television camera and a cutting device that re—establishes the service connections to not less than 90 percent capacity.

The Contractor shall restore or replace all removed or damaged paving, curbing, sidewalks, gutters, shrubbery, fences, sod or other disturbed surfaces or structures in a condition equal to that before the work began, to the satisfaction of the Engineer, and shall furnish all labor and material incidental thereto.

Surplus pipe, tools and temporary structures shall be removed by the Contractor. All dirt, rubbish and pipe material from the operation shall be legally disposed of by the Contractor.

VI. ACCEPTANCE

The Contractor shall provide a pipe "coupon" specimen from each run of pipe for testing, after installation, by an approved laboratory. All expenses for the testing of these specimens will be paid by the Owner. The cost of retests made necessary by the failure of the samples of specimens to meet the specified requirements shall be paid for by the Contractor.

As part of the testing requirement, upon completion of the installation, a visual inspection shall 5

be performed of the pipe expanded in place via a closed circuit television camera. A video tape (VHS) of the inspection shall be provided to the Owner.

The Contractor shall Warrant and save harmless the Owner and his Engineer against claims for patent infringement and any loss thereof.

VII. PAYMENT

The unit price bid for rehabilitating the sewer main in the manner described, shall be full compensation for all materials, labor, equipment, and incidentals required to insert the liner pipe within the sewer main. Payment for the liner will also include the cost of seating the liner in the manholes, reworking the manhole inverts and benches. etc. Payment will be for actual linear footage of liner installed in the field and shall be measured between the center lines of the manholes, The payment shall be based on the depth of the deeper flow line of the rehabilitated segment, cleaning, preconstruction television inspection, post construction television inspection, and all relevant submittals shall be incidental to the lining items.