

**COMMONWEALTH OF VIRGINIA  
DEPARTMENT OF TRANSPORTATION  
CONSTRUCTION DIRECTIVE  
MEMORANDUM**

<b>GENERAL SUBJECT:</b>	<u>Pipe Replacement or Rehabilitation Contracts</u>	<b>NUMBER:</b>	<u>CD-2008-11</u>
		<b>DATE:</b>	<u>April 1, 2008</u>
<b>SPECIFIC SUBJECT:</b>	<u>Guidelines for Pipe Culvert Replacement or Rehabilitation - Selection Criteria, Specifications, and Inspection</u>	<b>SUPERSEDES:</b>	<u>N/A</u>
<b>DATE EFFECTIVE</b>	<u>Upon Receipt</u>	<b>SUNSET/ EXPIRES:</b>	<u>April 1, 2013</u>

Original with signature on file in the office of the  
Scheduling & Contract Division

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**W. BYRON COBURN, JR., P.E.  
STATE CONSTRUCTION ENGINEER**

**DIRECTED TO - DISTRICT ADMINISTRATORS**

The Department has determined that all pipe culvert replacement or rehabilitation contracts will be advertised by the Scheduling & Contract Division as either RAAP or SAAP contracts. Once awarded these contracts will be administered by a Responsible Charge Engineer.

Contract Development and Advertisement – The Responsible Charge design engineer will utilize the pipe replacement or rehabilitation selection matrix found in Location & Design Division IIM-LD-244 when determining which rehabilitation methods or replacement methods are applicable for use for each location in the contract. The Contractor will have the option of choosing any of the available options specified in the Contract at the specified site or location. The attached Special Provision For Pipe Culvert Replacement or Rehabilitation must be included in the contract to specify available methods for Replacement or Rehabilitation and the associated requirements. In addition, the latest edition of the Location & Design Division IIM-LD-244 is available at the following internet address. <http://www.virginiadot.org/business/locdes/rd-ii-memoranda-index.asp> . All pipe culvert replacement or rehabilitation contracts will be properly engineered to determine the appropriate method or methods for replacement or rehabilitation so that these can be specified in the contract and appropriately administered in the field.

Contract Administration – Once each contract has been executed it will be assigned to and administered by a Responsible Charge construction Engineer. The Responsible Charge construction Engineer will ensure the contracts are inspected as detailed in the Inspection Manual.

DAS|Attachment

C:     Commissioner  
       Deputy Commissioner  
       Commissioner's Staff  
       Division Administrators  
       District Construction Engineers  
       District Maintenance Engineers

District Materials Engineers  
District Preliminary Engineering Managers  
District Location and Design Engineers  
District Civil Rights Managers  
District Contract Administrators  
Regional Operations Directors  
Residency Administrators  
Area Construction Engineers  
Construction Managers  
Project Inspectors  
Federal Highway Administration  
Office of the Attorney General  
Virginia Department of Minority Business Enterprise  
Virginia Transportation Construction Alliance  
Old Dominion Highway Contractors Association  
Virginia Asphalt Association  
American Concrete Pavement Association  
Virginia Ready-Mixed Concrete Association  
Precast Concrete Association of Virginia  
Division Library

**ATTACHMENT**

VIRGINIA DEPARTMENT OF TRANSPORTATION  
SPECIAL PROVISION FOR  
**PIPE CULVERT REPLACEMENT OR REHABILITATION**

March 26, 2008

**I. DESCRIPTION**

This work shall consist of the replacement or rehabilitation of existing storm water and surface water pipe culverts and/or sanitary sewer lines at the designated locations described in the Contract using various standard and non-standard methodologies and technologies in accordance with the requirements of this provision and as directed by the Engineer.

**II. MATERIALS**

Pipe used in replacement operations shall conform to Section 232 of the Specifications.

Smooth-wall steel pipe liner shall conform to Section 232.02 (c) 5. of the Specifications.

Corrugated Steel Pipe Liner shall conform to Section 232.02 of the Specifications and shall be 10 gage with 3 inch by 1 inch angular corrugations.

Cured in Place Pipe Liner shall be from the Department's approved products list and shall at a minimum conform to the following requirements:

<b>Property</b>	<b>Test Procedures</b>	<b>Physical Requirements</b>
Tensile strength at yield	ASTM D-638	3,000 PSI
Modulus of elasticity	ASTM D-790	200,000 PSI
Flexural strength	ASTM D-790	4,000 PSI

Cured in place liner systems shall specify method of installation and curing, individual components, tube type (whether reinforced or non-reinforced), manufacturer name and type of resin including catalyst, volume of resin required to achieve proper impregnation. All components of cured in place systems shall include lot numbers and expiration dates.

Styrene Cured in Place Pipe Liner systems shall have an impermeable inner and outer plastic film or plastic pre-liner to promote complete polymerization, prevent resin migration and loss, and prevent styrene contamination of the interior of the finished product.

**Please note:** Cured in place pipe liners may be subject to limitations for use as specified herein or on the Department's Approved Products list.

Cement Grout shall conform to Section 218 of the Specifications except the grout shall be a non-shrink mix design.

### III. GENERAL PROCEDURES

All work shall be contained within the existing right-of-way. Where additional right of way was deemed necessary the Department has obtained the additional right-of-way or easements prior to the release of this contract, however, the Contractor may obtain additional easements for his convenience at no additional cost to the Department.

The Contractor shall maintain all lanes of traffic at all times unless otherwise directed by the Engineer. The cost for maintenance of traffic (including temporary detours, if required by the Contractor's method of operations and where permitted by the locality and the Department) shall be included in the price bid for Pipe Culvert Replacement or Pipe Liner for Rehabilitation. If temporary detours are necessary the Contractor shall design and construct detours in accordance with Sections 104.04 and 512 of the Specifications and GS-10 of the Road and Bridge Standards respectively.

The Contractor shall contact Miss Utility prior to commencing any work that may conflict with existing utilities, and shall coordinate with the utility company(ies) and the Engineer any adjustments deemed necessary to complete the work. The Contractor shall make notification to the VDOT Area Construction Engineer at least 48 hours prior to initiation of replacement or liner rehabilitation operations at the site.

In the event the Contractor's selected method of replacement or liner rehabilitation requires disturbing existing surfaces, these surfaces shall be restored in kind to original pre-construction conditions after rehabilitation operations have been completed.

The Contractor is advised VDOT has performed an inspection of the existing pipe(s) to determine the extent and nature of deterioration or damage requiring replacement or repair. Using the information collected from this inspection VDOT has determined through its engineering analysis the best practical methods for each respective site taking into account site specific conditions such as working space for various types of installation, hydraulic capacity before and after replacement or rehabilitation, height of cover, soil density, and loading conditions among other criteria. The Contractor will select from the method or options of methods for each specified location or site indicated in the contract. Regardless of the final method selected, the Contractor shall provide the Engineer documentation of the procedures, materials, equipment, incidentals and resources he shall employ to ensure success of the replacement or rehabilitation operations and to assist the Engineer in monitoring the Contractor's operations.

Where pipe replacement is specified, replacement procedures shall be performed according to the method specified in accordance with the requirements of Section 302.03 of the Specifications at the location shown or described in the contract. Pipes shall be installed to the line and grade shown or derived from invert elevations specified in the plans. Unless otherwise specified, pipes abandoned in place shall be grouted to fill the entire inside void with flowable backfill conforming to the requirements of the Special Provision for Flowable Backfill.

Where existing pipes are to be rehabilitated using a liner the Contractor shall clear the existing pipe(s) designated for rehabilitation of debris, protrusions greater than ½ inch in height and obstructions prior to rehabilitating. The Contractor shall then thoroughly clean the host pipe prior to liner installation. Cleaning shall conform to the recommendation of the manufacturer/producer or supplier of the methodology to be used or in the absence of such shall be proposed in writing by the Contractor for the Engineer's review and acceptance. A copy of the cleaning methodology and materials shall be provided to the Engineer at least 2 working days prior to beginning of work. **Please note:** All specified time limits in these specifications refer to working days, not calendar days.

The following methods of pipe replacement or rehabilitation are approved by the Department, however, not all methods may be appropriate for each individual location. The Contractor shall consult the contract to determine the method or methods that are designated per location cited. Individual methods shall conform to the criteria specified.

### PIPE REPLACEMENT

**Method A** shall be the Jacked Method in accordance with Section 302.03 (a) 1. of the Specifications.

**Method B** shall be the Open Trench Method in accordance with Section 302.03 (a) 2. of the Specifications.

### PIPE REHABILITATION BY LINER

**Method C** shall be Corrugated Steel Culvert Pipe Liner Method which liner shall be installed through the existing pipe (36" diameter or larger corrugated or concrete pipe). Coupling bands shall be internal expansion type and shall provide a leak-proof joint after grouting.

Expansion devices shall be installed above the mid-point of the pipe. After the Engineer approves installation and alignment of pipe, the Contractor shall pressure grout the annular space between the existing pipe and the liner. Prior to grouting, the annular space shall be adequately sealed at each end. Plug holes required for injection of grout shall be satisfactorily plugged and sealed following the grouting operation.

**Method D** shall be the Cured-in-Place Pipe Liner Method. The Contractor shall install a liner in accordance with the requirements of ASTM F1216, ASTM F2019, ASTM F1743, or ASTM D5813 (as applicable) or as recommended by the manufacturer. The liner system shall be designed, fabricated and installed in such a manner as to result in a maintained full contact tight fit to the internal circumference of the host pipe for its entire length. The installation shall adhere to the cure times and temperatures stipulated in the manufacturer's recommended installation and cure specifications and the finished product shall be free of de-lamination, bubbling, rippling or other signs of installation failure. In the event a post inspection of the installation reveals a tight fit of the liner was not achieved in localized areas (comprising less than 20 percent of the pipe length) the annular space between the liner and the host pipe shall be filled with a resin mixture or a cementitious grout that is compatible with the liner system as specified by the manufacturer. Where a tight fit was not achieved on 25 percent or more of the pipe length the annular space shall be filled as designated herein, however, the Contractor will not be allowed to continue with his methodology of installation or liner system until he can demonstrated to the Engineer that he has remedied his operations so that it results in a snug tight fit between the installed liner and the host pipe. Such remedial efforts shall be at the Contractor's expense.

Pull-in-place liner installation must be accomplished without significant liner twisting or stretching. Pulling force for liner installation shall not exceed that established by the liner manufacturer.

All cured-in-place installations shall be performed in the dry.

Curing may be accomplished by water, steam or ultraviolet light and shall be in accordance with the liner manufacturer's recommendations.

In the event the Contractor employs a styrene-resin based cured-in-place pipe liner system the following requirements will also apply:

The Contractor shall submit preconstruction installation and cure specifications (to include site specific cure time and temperature calculations) and design calculations (stamped by a licensed professional engineer) to the VDOT Engineer a minimum of 72 hours prior to initiation of installation.

The Contractor shall place an impermeable sheet immediately upstream and downstream of the host pipe prior to liner insertion to capture any raw resin spillage during installation and shall remove and properly dispose of any waste materials. Where the pulled-in-place method of installation is used the Contractor shall install a semi-rigid plastic slip sheet over any interior portions of the host pipe that could tear the outer film or over any significant voids in the host

pipe. The Contractor shall ensure no loss of impermeability of the inner and outer plastic films or pre-liner during installation. The Contractor shall promptly repair any pinholes or tears in the plastic films or pre-liner. Where such damaged areas cannot be repaired, the Contractor shall promptly replace the impermeable plastic films or pre-liner before proceeding with the installation.

The Contractor shall not perform work without oversight of the VDOT Inspector for the duration of the installation.

The Contractor shall monitor temperature via a minimum of three thermocouples on the outer surface of the liner (one each at the upstream and downstream ends and one approximately mid-length of the host pipe) and automatically log cure time-temperature data with a print-out from the data logger and provide such information to the VDOT Engineer.

The Contractor shall obtain and comply with all discharge-related permits, including air, water, and wastewater treatment (i.e. Publicly Owned Treatment Works or "POTW"). For any discharge to a Publicly Owned Treatment Works (POTW), the Contractor shall obtain advanced written approval from the receiving facility for acceptance of effluent waste before repair work can start and shall provide documentation of the POTW discharge approval to the Project Engineer. The Contractor shall also obtain all required OSHA confined space entry permits where these are required by the Contractor's operations and the scope of work of the Contract.

The Contractor shall capture and properly dispose of all cure water and/or steam condensate and be responsible for the proper transportation and off-site disposal of process residuals. The Contractor shall provide disposal documentation from the receiving facility to the VDOT Engineer. For any discharge to a Publicly Owned Treatment Works (POTW), the Contractor shall comply with all the requirements of the POTW receiving the discharge.

The Contractor shall thoroughly rinse the cured pipe with clean water and capture and properly dispose of rinse water prior to re-introducing flow.

The Contractor shall employ the services of a qualified independent environmental services laboratory or environmental consultant to collect the following samples:

pre-rehabilitation soil and water samples within 3 feet of the pipe ends (or otherwise as close as possible) upstream and downstream of the pipe location; .and

soil and water samples within 3 feet of the pipe ends (or otherwise as close as possible) upstream and downstream of the pipe location within one week after the pipe liner has cured.

The following information shall be supplied in the water or soil sampling reports:

**Location of pipe:**

County, VDOT Residency  
Route number and distance to nearest intersection  
Name of stream if applicable or known

**Description of pipe:**

Length, diameter, type i.e. concrete, corrugated steel  
Conveyance conditions i.e. wet weather only, perennial, current conditions  
General flow description i.e. high, medium, low  
Site description i.e. stream bed, earthen ditch, concrete ditch subsurface stormwater drainage

Samples shall be collected in accordance with applicable ASTM standard procedures and analyzed for styrene using USEPA Method 8021. The Contractor shall report the results of all sampling to the Engineer within 4 weeks after completion of the rehabilitation.

It shall be the Contractor's responsibility to report and take appropriate corrective actions to contain and remediate any accidental release of styrene-resin based cured-in-place process materials, effluent or condensate into the environment in accordance with applicable local, state or federal regulations. The cost for such remediation shall be at the Contractor's expense.

**Method E** shall be smooth-wall steel pipe liner method and shall be installed through the existing pipe. Pipe shall be joined by butt welds in accordance with AWWA C-206.

Expansion devices shall be installed above the mid-point of the pipe. After installation, the Engineer shall review the alignment of the smooth-wall pipe. Once approved, the Contractor shall pressure inject a non-shrink grout into the annular space between the existing pipe and the liner. Prior to grouting, the annular space shall be sealed at each end. Holes required to facilitate injecting grout shall be plugged and sealed following grouting operations.

**Post Installation Inspection** – The Contractor shall perform a post-installation video inspection on all flexible liners installations. The post-installation inspection shall be performed upon completion of the installation and a copy of the video shall be furnished to the Engineer. The video shall be of such quality as to clearly show the full dimensions of the installation and shall clearly indicate each specific location.

#### IV. MEASUREMENT AND PAYMENT

Pipe Culvert Replacement (Method A) will be measured and paid for in units of linear feet of "Jacked Pipe" in accordance with Section 302.04.

Pipe Culvert Replacement (Method B) will be measured and paid for in units of linear feet of "Pipe" in accordance with Section 302.04.

Pipe Rehabilitation by Liner will be measured in units of linear feet for the size and method specified, and will be paid for at the contract unit price per liner foot. This price shall include furnishing and installing pipe or liner, cement grout, capturing any discharges or releases during installation or curing operations, obtaining any local, POWT, state or federal permits required to perform the work, furnishing any documentation or fees required for effluent or condensate disposal, traffic control including temporary detours, all testing and sampling including furnishing reports and post installation video inspections for flexible liners, waste disposal costs, host pipe inspections and cleaning.

Prices for replacement or rehabilitation shall also include excavating when not designated as a separate pay item attributable to this specific work, sheeting, shoring, dewatering, disposing of surplus and unsuitable material, backfill material, compaction, restoring existing surfaces, clearing obstructions, traffic control including temporary detours and flowable backfill when not designated as a separate pay item attributable to this specific work.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
(Size) Pipe Rehabilitation by Liner (Method)	Linear Foot