

VIRGINIA DEPARTMENT OF TRANSPORTATION

# LOCATION AND DESIGN DIVISION

## INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: PIPE REHABILITATION	NUMBER: IIM-LD-244.2
SPECIFIC SUBJECT: METHODS AND SELECTION PROCESS	DATE: AUGUST 26, 2013
	SUPERSEDES: IIM-LD-244.1
APPROVAL:	B. A. Thrasher, P.E. State Location and Design Engineer Approved August 26, 2013

Changes are shaded.

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### CURRENT REVISION

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- This memorandum has been revised to update the Flexible Liner Selection Guidelines.
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### EFFECTIVE DATE

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- This memorandum is effective upon receipt.
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### POLICY

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- When existing pipes become damaged or deteriorated to the point that they are no longer functional, or their functionality has been considerably impacted, decisions need to be made as to what type of retrofit methods need to be employed. The Special Provision for Pipe Replacement lists two possible methods for accomplishing this work.
    - Method A – Jacked pipe installation
    - Method B – Open trench pipe installation
  - The Special Provision for Pipe Rehabilitation lists three possible methods for accomplishing this work:

- Method C – Corrugated steel pipe liner
- Method D – Flexible pipe liner
- Method E – Smooth wall steel pipe liner

Methods A and B involve replacement of the existing pipe while Methods C, D and E involve leaving the existing pipe in place and lining it with one of the various approved materials.

- Some issues to be considered in the initial decision making process of whether to install a new pipe or line the existing pipe are as follows:
  - What is the condition of the existing pipe and what are the deficiencies that need to be addressed?
  - Is the existing pipe located in a “hostile environment”? For example, is the pH of the water and soil and the resistivity beyond the acceptable limits shown in Table C (page 107.22) of Road and Bridge Standard PC-1 for the applicable pipe material?
  - What is the height of cover over the existing pipe? If the height of cover is  $\leq 5$  feet, an economic evaluation should be done to determine the feasibility of excavating and replacing, rather than lining, the existing pipe. Where consideration is being given to the utilization of a Flexible Liner (Method D), an economic evaluation should be performed to determine the feasibility of excavating and replacing rather than lining the existing pipe, regardless of the height of cover.
  - If considering a liner, what impact will the liner have on the hydraulic capacity of the existing pipe? This condition must be evaluated by a Hydraulic Engineer to determine if the liner reduces hydraulic capacity of the existing pipe to a point that upstream water surface elevations for the design storm event and the 100 year event would be increased beyond that which is acceptable. If so, one option to consider would be to line the existing pipe and jack another line of pipe beside it to make up for the loss in hydraulic capacity.
  - If using a liner, has the outlet velocity of the pipe increased as a result of changed hydraulic properties, i.e. decrease in Mannings n value, decrease in flow area, etc.? This condition must be evaluated by a Hydraulic Engineer to determine if additional outlet protection (riprap) is required to dissipate outlet velocities.
  - Has the deterioration of the pipe resulted in a situation where structural strength needs to be restored as part of the replacement method/material selected? This condition must be evaluated by a Structural and/or Materials Engineer to insure the resulting repair provides sufficient strength to result in a safe and long lasting repair.
- While these are some main points to consider in the initial decision making process for pipe rehabilitation, they are certainly not all inclusive. Other issues relative to site specific characteristics or limitations must also be taken into account in arriving at a final decision on the method of rehabilitation to use.

- When considering a Flexible Liner (Method D) a decision matrix, as shown in Table A, can be useful in selecting the best type of flexible liner to utilize based on the existing pipe material and the noted deficiencies of the existing pipe or site limitations.
- When using a Cured-in-Place Pipe (CIPP) Liner as the method of rehabilitating an existing pipe, Scheduling and Contract Division's Form C-9 (CIPP Inspection Checklist) shall be used by the VDOT Inspector to document the contractor's pre-installation, installation and post-installation activities.

<b>TABLE A FLEXIBLE LINER (METHOD D) TYPE SELECTION GUIDELINES</b>			
<b>Pipe Deficiency or Site Limitation</b>	<b>Pipe Type</b>		
	<b>Concrete</b>	<b>Corrugated Metal</b>	<b>Plastic</b>
<b>Minor Cracks</b>	A, B, C, D	NA	A, B, C, D
<b>Major Cracks and/or Spalls</b>	A, B, C	NA	A, B, C
<b>Joints Separated &gt;1 inch</b>	A, B, C	A, B, C	A, B, C
<b>Coating Removed, No Corrosion</b>	NA	A, B, C, D	NA
<b>Coating Removed, Minor Corrosion</b>	NA	A, B, C, D	NA
<b>Coating Removed, Major Corrosion</b>	NA	A, B, C, D	NA
<b>Minor Deformation, &lt;5% of inside diameter</b>	NA	A, B, C, D	A, B, C
<b>Intermediate Deformation, 5% to 7% of inside diameter</b>	NA	A, B, C, D	A, B, C
<b>Major Deformation, &gt;7% of inside diameter</b>	NA	A, B, C, D	A, B, C
<b>Height of cover</b>	*	*	*
<b>Access (Limited space to end of pipe, accessible by manhole or drop inlet)</b>	A, B	A, B	A, B
<b>Bends in pipe</b>	A, B	A, B	A, B

\* Note: An economic evaluation should be performed to determine the feasibility of excavating and replacing rather than lining the existing pipe.

**LEGEND:**

- Category A – Cured In Place Pipe (CIPP)
- Category B – Fold and Form Flexible Liner
- Category C – HDPE, PVC, or Polypropylene (PP) slip liners
- Category D – Spray-On Liner
- NA – Not applicable

Note:

The VDOT Materials Division Approved Products List **No. 38 Pipe Rehabilitation Systems** should be consulted for the current products approved for use. This list is available at:  
<http://www.virginiadot.org/business/resources/bu-mat-MD298-07.pdf>

The document “Approved List 38 **New** Product Application Criteria, Individual Project Design Requirements, and Associated Construction Requirements to Ensure Valid Designs” should be consulted for design and construction requirements. This list is available at:  
<http://www.virginiadot.org/business/resources/LocDes/AL38Criteria-1-25-13.pdf>