Pipe Lining Policy

Crystal Weaver, PE

Tony Cox, PE
Pipe Lining Agenda:

- New Technical Advisory.
- Types of Approved Pipe Liners.
- Pipe Lining considerations.
- Pipe Lining design criteria.
Pipe Lining:

- Technique for rehabilitating culverts.
- Used when replacement is difficult.
Pipe Lining Policy:

- Established in Design Memorandum No. 12-02, dated February 16, 2012.
- Adds to Indiana Design Manual Section 31-4.05(06).
- Effective immediately.
Pipe Lining: Types

- For Round Pipes:
  - Solid wall HDPE
  - Profile wall HDPE
  - Profile wall PVC
  - Cured In Place (CIPP)
Example: Round HDPE
Example: Round CIPP
Pipe Lining: Types

- For Deformed Pipes:
  - Solid wall HDPE, ovalled
  - Cured In Place (CIPP)
Example: Ovalled HDPE
Pipe Lining: Types

- Undergoing testing:
  - Spiral Wound Liners
  - Centrifugally Cast Concrete Pipe Liners (CPPP)
- Currently being installed.
- For both round and deformed pipes.
- Not approved by INDOT.
Example: Experimental
Pipe Lining:

- See INDOT *Standard Specifications* Section 725 for more information.
Pipe Lining Considerations
Considerations

- Barrel should be relatively straight and basically intact.
Considerations

- Barrel should have no significant damage.
Considerations

- Barrel should be free of obstructions.
Considerations
Considerations

- Backfill around structure should be free from large voids.
Considerations

- Need sufficient room to work from at least one end of the existing structure.
Considerations

- Other lining considerations
Considerations

- Consider Existing Scour Problems
Considerations

- Structure is in a location where road closure is impractical.
Pipe Lining Design Criteria
Design Criteria

- HY8 hydraulic analysis required.
- Minimum Manning’s n value is 0.012 for smooth interiors.
Design Criteria

- The backwater depth should not increase over existing conditions.
Design Criteria

- Riprap scour protection required at outlet per IDM.

<table>
<thead>
<tr>
<th>Erosion Protection Method</th>
<th>Velocity (ft/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revetment Riprap</td>
<td>Velocity ≤ 6.5</td>
</tr>
<tr>
<td>Class 1 Riprap</td>
<td>6.5 &lt; Velocity ≤ 10</td>
</tr>
<tr>
<td>Class 2 Riprap</td>
<td>10 ≤ Velocity ≤ 13</td>
</tr>
<tr>
<td>Energy Dissipator</td>
<td>Velocity &gt; 13</td>
</tr>
</tbody>
</table>

If clear zone or other issues prohibit the use of the required Erosion Protection method, the designer must contact the Office of Hydraulics for additional instructions.
Design Criteria

- Largest possible liner should be used
Design Criteria

- CIPP liners should be used when the use of an HDPE liner is not possible and replacement is impractical.

- CIPP liners are only available up to 96 inch equivalent diameter.
Design Criteria

- CIPP liner thickness varies with diameter.
  
  - A CIPP liner will reduce the existing structure size as follows.
  - a. For an equivalent diameter of 24 in., the diameter is reduced by 1 in.
  - b. For an equivalent diameter of 27 in. through 48 in., the diameter is reduced by 2 in.
  - c. For an equivalent diameter of 54 in. through 72 in., the diameter is reduced by 3 in.
  - d. For an equivalent diameter of 78 in. through 96 in., the diameter is reduced by 4 in.
Design Criteria

- Deviation from the design criteria requires a Design Exception.
  - Subject to Office of Hydraulics Approval
Pipe Lining: Conclusion
Conclusion

- Design Memorandum 12-02
- Several currently approved materials.
- Not a universal solution for pipe rehabilitation.
Conclusion

- Pipe requires certain characteristics to be lined.
- Hydraulic Analysis is required.
Conclusion

- Contact Office of Hydraulics if problems arise.
- Crystal Weaver:
  cmweaver@indot.in.gov
  (317) 233-2096
Questions?