Evaluation of Ads Polyethylene Pipe

L. John Fleckenstein*  David L. Allen†

*University of Kentucky
†University of Kentucky, dallen@engr.uky.edu
This paper is posted at UKnowledge.
https://uknowledge.uky.edu/ktc_researchreports/519
EVALUATION OF ADS POLYETHYLENE PIPE -- N-12

by

L. J. Fleckenstein
Engineering Geologist

and

David L. Allen
Chief Research Engineer

Kentucky Transportation Research Program
College of Engineering
University of Kentucky

in cooperation with
Transportation Cabinet
Commonwealth of Kentucky

and

Federal Highway Administration
U. S. Department of Transportation

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the University of Kentucky or the Kentucky Transportation Cabinet. This report does not constitute a standard, specification, or regulation. The inclusion of manufacturer names and tradenames are for identification purposes and are not to be considered as endorsements.

February 1988
Technical Report Documentation Page

   UKTRP-88-3

2. Government Accession No. 

3. Recipient's Catalog No. 

4. Title and Subtitle  
   Evaluation of ADS Polyethylene Pipe -- N-12

5. Report Date  
   February 1988

6. Performing Organization Code 

7. Author(s)  
   L. John Fleckenstein and David L. Allen

   UKTRP-87-17

9. Performing Organization Name and Address  
   Transportation Research Program  
   College of Engineering  
   University of Kentucky  
   Lexington, Kentucky 40506-0043

10. Work Unit No. (TRAIS) 

11. Contract or Grant No.  
   M 8540 (3) ESP 34-5723

12. Sponsoring Agency Name and Address  
   Kentucky Transportation Cabinet  
   State Office Building  
   Frankfort, Kentucky 40622

13. Type of Report and Period Covered  
   Interim


15. Supplementary Notes  
   Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration

16. Abstract  
   Construction and performance evaluations of ADS Polyethylene Pipe N-12 are presented. Construction procedures and visual inspection data are included. The pipe appears to be performing well.

17. Key Words  
   polyethylene  backfill  corrugated  inlet  culvert  outlet

18. Distribution Statement

19. Security Classif. (of this report)  
   Unclassified

20. Security Classif. (of this page)  
   Unclassified

21. No. of Pages  
   14

22. Price
INTRODUCTION

This report documents the installation and performance of N-12 pipe installed during construction of South Forbes Road in Lexington, Kentucky. The pipe is manufactured by Advanced Drainage Systems, Inc., and is designated as ADS N-12. ADS N-12 is a corrugated high-density polyethylene (HDPE) pipe. The pipe has a corrugated exterior for increased strength and smooth interior to provide maximum flow capacity and rigidity.

The purpose of the study was to evaluate the performance of the pipe during construction and after placement.

CONSTRUCTION

ADS N-12 was installed in two locations along South Forbes Road. Location of the study area is shown in Figure 1. Figure 2 is a photograph of the area. The first location was 28 feet right of Station 6+54. The 15-inch N-12 is used as an entrance pipe. The entrance pipe was backfilled with approximately 1 foot of material. The second location starts at a storm sewer inlet and runs 240 feet north to a manhole; this N-12 is used as a 15-inch culvert pipe. The culvert was installed to a depth of approximately 6 feet. The pipe was backfilled with No. 9 stone to approximately 1 foot above the top of the pipe. The remainder of the trench was backfilled to grade elevation with excavated material (Figures 3 and 4). The No. 9 stone was used because, it was readily available, gives stronger lateral and vertical support, and is easier to install than a soil backfill.

Elevations were taken on November 19, 1987, on the final backfill heights. The 15-inch culvert had approximately 3.4 feet of fill at the
south end near the inlet to the storm sewer. The north end near the manhole box had approximately 6 feet of fill. Elevations on the culvert indicated a final grade of 2.6 percent. At that time, there were no indications of further consolidation of the backfill material.

VISUAL INSPECTION

During a visual inspection of the N-12 on November 19, 1987, random measurements were taken of the internal diameter of both pipes. The measurements indicated that there had been little to no distortion of the pipe diameter since construction (Figures 5 through 8).

The pipes also were inspected for chemical or physical deterioration or defects. The inlet, outlet, and manholes were examined and photographed; there were no signs of deterioration or weakening of the N-12 pipe (Figure 9 and 10).

Both drainage systems were inspected for potential clogging. The culvert showed no signs of clogging. The entrance pipe had approximately 2 inches of organic material in the first 6 inches of the inlet and the outlet. The accumulation of material in the outlet end seemed to be due to inaccurate excavation of the trench at the outlet end.

CONCLUSION

Visual inspections indicated there were no major problems encountered during installation. Both pipes appear to be performing well. This is probably not an ideal test section for the N-12 pipe. The service road over the entrance pipe appears to be used infrequently,
is seldom under heavy loads, and the backfill over the culvert pipe is not sufficiently substantial to fully test the compressive strength of the N-12.
Figure 2. Location of the Study Area on South Forbes Road.
Figure 3. No. 9 Stone.

Figure 4. Backfill over Culvert Pipe.
Figure 5. Culvert Pipe Viewed from the Inlet.

Figure 6. Culvert Pipe Viewed from the Outlet.
Figure 7. Inlet of Entrance Pipe.

Figure 8. Entrance Pipe Viewed from the Outlet.
Figure 9. Culvert Inlet.

Figure 10. Culvert Outlet.
APPENDIX A

SHORT FORM SPECIFICATIONS FOR A.D.S. N-12 PIPE
This specification applies to A.D.S. N-12 high density polyethylene corrugated pipe with an integrally formed smooth interior.

(a) GENERAL- This specification currently is applicable to nominal sizes 12" through 24"; however, it may later be applicable to larger sizes. Pipe and pipe shapes (fittings) shall meet the requirements of ASTM F-667 and AASHTO M-294-851. The pipe and fittings shall be free of foreign inclusions and visible defects. The ends of the pipe shall be cut square and cleanly so not to adversely affect joining.

(b) MATERIALS- Pipe and fittings shall be made of high density polyethylene compounds which conform with the requirements of Type III, Category 4, or 5, Grade P 33, or P 34, Class C per ASTM-1248, with applicable requirements per ASTM D-1248.

(c) DESCRIPTION- Terms used for the definition of Corrugated Polyethylene Pipe shall be governed by ASTM D-883 and ASTM D-412.

(d) DIMENSIONS- The nominal size of the pipe and fittings shall be based on the nominal inside diameter of the pipe. Inside diameter tolerances shall be plus 3% minus 1.5%. Dimensions shall be determined as governed by AASHTO M-294-851. ASTM D-2122.

(e) FITTINGS- Corrugated fittings may be either molded or fabricated by the manufacturer. The use of fittings supplied by manufacturers other than the supplier of the pipe shall not be permitted without the approval of the owner.

(f) COUPLINGS- Couplings shall be corrugated to match the pipe corrugations and the width shall not be less than half the nominal diameter of the pipe. Split couplings shall be manufactured to engage an equal number of corrugations on each side of the pipe joint.
(g) TESTING- Testing for Corrugated Polyethylene Pipe shall be those found in AASHTO M-294-851 and ASTM as follows:

- ASTM D-618 conditioning for plastics for testing
- ASTM D-2412 test method for environmental stress cracking
- ASTM D-2444 impact resistance
- ASTM D-543 test method for chemical resistance
- ASTM D-2412 pipe stiffness minimum stiffness as follows:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Pipe Stiffness</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot;</td>
<td>45psi</td>
</tr>
<tr>
<td>15&quot;</td>
<td>42psi</td>
</tr>
<tr>
<td>18&quot;</td>
<td>40psi</td>
</tr>
<tr>
<td>24&quot;</td>
<td>34psi</td>
</tr>
</tbody>
</table>

(h) MARKINGS- Markings requirements are those found in AASHTO M-294-851.

(i) CERTIFICATION- Manufacturers certification that the product is manufactured, tested and supplied in accordance with this specification shall be furnished upon request by the owner or project engineer.

(j) INSTALLATION- Installation shall be in accordance with ASTM D-2321 recommended practice unless otherwise approved by the project engineer.

Bedding and backfill DO NOT require the use of imported gravel; however they do require select native soil meeting Class I, II, or III. Class IV soil may be borderline depending on the moisture content. Good engineering practice may warrant importing soil if native soils are Class IV or V. Backfill should be placed in approximately 8" lifts with compaction to minimum 90% AASHTO density.
APPENDIX B

N-12 "FACT SHEET"
<table>
<thead>
<tr>
<th>Attribute</th>
<th>12&quot;</th>
<th>15&quot;</th>
<th>18&quot;</th>
<th>24&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>3.7</td>
<td>4.6</td>
<td>7.5</td>
<td>11.5</td>
</tr>
<tr>
<td>Pounds/20' Length</td>
<td>74.0</td>
<td>92.0</td>
<td>150.0</td>
<td>230.0</td>
</tr>
<tr>
<td>Inside Diameter (Nominal)</td>
<td>12.25&quot;</td>
<td>15.30&quot;</td>
<td>18.16&quot;</td>
<td>24.53&quot;</td>
</tr>
<tr>
<td>Outside Diameter (Nominal)</td>
<td>14.10&quot;</td>
<td>17.80&quot;</td>
<td>21.25&quot;</td>
<td>28.35&quot;</td>
</tr>
<tr>
<td>Wall Thickness (Nominal)</td>
<td>.070&quot;</td>
<td>.075&quot;</td>
<td>.090&quot;</td>
<td>.115&quot;</td>
</tr>
<tr>
<td>Pipe Stiffness</td>
<td>Min. 45 PSI</td>
<td>Min. 42 PSI</td>
<td>Min. 40 PSI</td>
<td>Min. 34 PSI</td>
</tr>
<tr>
<td>5% Deflection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>