Evaluation of Edge Drains on I-81, in Roanoke, Virginia

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EVALUATION OF EDGE DRAINS
ON I-81, IN ROANOKE VIRGINIA

by

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June 1996
EXECUTIVE SUMMARY

This report documents findings of the investigation of five different brands of panel edge drains installed in a test section along Interstate 81 in Roanoke, Virginia, from Milepost 154.148 to Milepost 156.11. Findings from this study indicated that closed core edge drains (Multi-Flow, Advanedge) are less likely to become damaged or distressed than the more open core drains (Contech, Akwadrain, Hydraway). Typical distress found in the more open cores was rolling over of the top row of support columns, fabric intrusion between support columns, and rolling up of the bottom row of support columns.
INTRODUCTION

In 1995, panel drains were installed on I-81, in the vicinity of Roanoke, Virginia. The panels were backfilled with a crushed granite, No. 8 aggregate. Predominately Hydroway edge drains were installed throughout the project. A two-mile test section was installed from milepost 156.110 to 154.180. Four additional edge drain products were installed in the test section. This included: Contech, Akwadrain, Advanedge, and Multi-Flow. In May 1996, personnel of the Kentucky Transportation Center (KTC) inspected the panel edge drains. This report documents the findings from this inspection.

SITE INSPECTION

On April 30, 1996, personnel from KTC and the Virginia Research Council met on I-81 to inspect the test section and to layout locations for the borescope inspection. It was observed that headwalls had not been attached to a large portion of the outlets. Eighteen of the 35 outlets inspected did not have headwalls. Headwalls had not been installed in the Contech, Multi-Flow, or Hydroway test sections (Appendix A).

BORESCOPE INSPECTION

On May 1, 1996, the panel drains were inspected with a rigid and a flexible borescope. The inspection information is contained in Table 1. Video prints showing the distress that was observed in some of the panels is contained in Appendix B. The inspection indicated that tilting or rolling of the top and bottom rows of support columns was occurring in the more open, cuspated and post-type cores (Contech, Akwadrain, Hydroway). Slight to moderate fabric intrusion was also noticed in each of the three panels. It appears that approximately five to 10 percent of the core area has been reduced in the post and cuspated drains due to rolling and fabric intrusion. The remaining 90 to 95 percent of the core appeared to be in good condition. It appears there was no core area loss in solid core drains. No distress was observed in the Advanedge panel. No distress was observed in the horizontal flow tubes of the Multi-Flow panel. It did appear that some of the vertical tubes of the Multi-Flow panel had been compressed.

Due to the time restraints on the inspection, the performance of the filter fabric on each panel was not fully evaluated. The inverts of the drains appeared to be relatively clean and did not contain any significant amount of siltation.
DISCUSSION

Rolling or folding of the top and bottom rows of support columns is typical behavior of the post and cusped types of drainage panels. This behavior has been duplicated using the vertical compression chamber developed at the Kentucky Transportation Center. Compression of the vertical flow tubes documented in the field inspection of the Multi-Flow panel has also been observed during vertical compression tests.

Current vertical compression flow tests being conducted at the KTC indicate that rolling of the top and bottom rows, in addition to slight fabric intrusion between support columns, can reduce the total flow capacity by approximately 2 to 4 gallons per minute (using a clean, well grade, concrete sand).

TABLE 1. DISTRESS OBSERVED IN EDGE DRAIN PANELS

<table>
<thead>
<tr>
<th>PANEL TYPE</th>
<th>LOCATION</th>
<th>OBSERVED DISTRESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTECH</td>
<td>Milepost 155.730</td>
<td>Slight fabric intrusion between support columns. Bottom row rolled up almost in contact with upper row. Lateral offset at mid panel.</td>
</tr>
<tr>
<td>CONTECH</td>
<td>Milepost 155.540</td>
<td>Rows 4 and 5 were slightly pushed closer together. Significant fabric intrusion occurring between rows 7 and 8.</td>
</tr>
<tr>
<td>CONTECH</td>
<td>Milepost 155.505</td>
<td>Fabric intrusion between rows 4 and 5. Lateral offset at mid panel.</td>
</tr>
<tr>
<td>ADVANEDGE</td>
<td>Milepost 155.384</td>
<td>No signs of deformation. Drain appears to be in excellent shape.</td>
</tr>
<tr>
<td>ADVANEDGE</td>
<td>Milepost 155.225</td>
<td>No signs of deformation. Drain appears to be in excellent shape.</td>
</tr>
<tr>
<td>AKWADR AIN</td>
<td>Milepost 154.914</td>
<td>5th row down support columns pushed 1/3 of the way together. Slight offset at base of panel. Slight fabric intrusion between some of the support columns.</td>
</tr>
<tr>
<td>AKWADR AIN</td>
<td>Milepost 154.737</td>
<td>Fabric intrusion occurring second row from bottom. Bottom row of support columns rolled up.</td>
</tr>
<tr>
<td>MULTI-FLOW</td>
<td>Milepost 154.415</td>
<td>Inspected top tube of drain. Appeared to be in good shape. Couldn't inspect tubes below without damaging the drain.</td>
</tr>
<tr>
<td>MULTI-FLOW</td>
<td>Milepost 154.405</td>
<td>Inspected horizontal tubes 1-3, and 7-8. Tubes appeared to be in good shape. Some compression appears to be occurring in some of the vertical flow tubes.</td>
</tr>
<tr>
<td>HYDRAWAY</td>
<td>Milepost 154.05</td>
<td>Top row of support columns had rolled 1/4 way over. Moderate fabric intrusion. The bottom row had rolled up with moderate to severe fabric intrusion occurring.</td>
</tr>
<tr>
<td>HYDRAWAY</td>
<td>Milepost 154.03</td>
<td>Bottom row of support columns had rolled up. Fabric was also folded in between the support columns.</td>
</tr>
</tbody>
</table>
CONCLUSIONS AND RECOMMENDATIONS

It appears the headwalls not being attached has not severely damaged the panels or the filter fabric. It is recommended that the headwalls be attached when the drain is placed. Water being held in these drainage systems can do more damage than good if they are not properly installed and maintained.

Some of the fabric intrusion observed mid-panel appears to be due to lateral offsets in the panel possibly caused by irregularities in the trench wall. In comparison to past borescoped inspections of post and cuspated core-type panel drains installed with excavated trench material, the drains appear to be in relatively good condition. Rolling of the top and bottom rows of support columns and some fabric intrusion will typically occur, and should not be attributed to the backfill material used on this project or the method of installation.

It is evident that the solid-core products appear to be more stable.

It is the opinion of the authors that expected core area changes and the associated reduction of flow should be addressed during design of these systems.
SYMBOL KEY

Outlet With Drain

Outlet With No Headwall

Inspected Panel Drain With Borescope
APPENDIX B
DISTRESS OBSERVED IN EDGE DRAIN PANELS
CONTECH
Offset Core, Mid Panel

Rolling of Bottom Posts

Fabric Intrusion, Mid Panel

Tilting of Post, Bottom of Panel
ADVANEDGE
Vertical View of ADS Panel

Water Coming Through Bottom Perforations

Diagonal View of ADS Panel
AKWADRAIN
Rolling of Columns, and Fabric Intrusion, Bottom

Compression Between Post

Rolling of Posts, and Fabric Intrusion, Bottom of Panel

Compression Between Post
MULTI-FLOW
Tilting of Columns, Bottom Panel

Fabric Intrusion

Fabric Intrusion

Fabric Intrusion, Bottom of Panel