



**Research Report
KTC-90-25**

**EVALUATION OF GEOCOMPOSITE
PAVEMENT PANEL DRAINS INSTALLED
IN A SAND BACKFILL UNDER
REVISED INSTALLATION SPECIFICATION**

by

**L. John Fleckenstein
Engineering Geologist**

and

**David L. Allen
Chief Research Engineer**

**Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, 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, the Kentucky Transportation Cabinet, nor the Federal Highway Administration. This report does not constitute a standard, specification, or regulation. The inclusion of manufacturer names and trade names are for identification purposes and are not to be considered as endorsements.

**December 1990
(Revised August 1991)**

1. Report No. KTC-90-25		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Evaluation of Geocomposite Pavement Panel Drains Installed in a Sand Backfill Under Revised Installation Specification				5. Report Date December 1990 (Revised August 1991)	
				6. Performing Organization Code	
7. Author(s) L. J. Fleckenstein, and David L. Allen				8. Performing Organization Report No.6 KTC-90-25	
9. Performing Organization Name and Address Kentucky Transportation Center College of Engineering University of Kentucky Lexington, KY 40506-0043				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. Federal Aid Research Task 46	
12. Sponsoring Agency Name and Address Kentucky Transportation Cabinet State Office Building Frankfort, KY 40622				13. Type of Report and Period Covered Interim	
				14. Sponsoring Agency Code	
15. Supplementary Notes Publication of this report was sponsored by the Kentucky Transportation Cabinet with the U.S. Department of Transportation, Federal Highway Administration					
16. Abstract Prior to 1989, highway edge drains were backfilled with the existing trench material and dynamically compacted with a tamping shoe. The net result was damage to the inner core of the edge drain. In response to these problems the installation specification was revised in 1989 to insure the integrity of the drainage system. The revised method of installation consisted of moving the panel to the shoulder side of the trench and then flushing a sand slurry into the trench for backfill. Flushing the sand eliminates the need for mechanical compaction. Since 1989, two projects have been completed using the revised special note for installation and another is currently under construction. This report discusses the performance of these installations.					
17. Key Words Panel Drain Advanedge Contech Monsanto			18. Distribution Statement Unlimited		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages	
				22. Price	

EXECUTIVE SUMMARY

Prior to 1989, highway edge drains were backfilled with the existing trench material and dynamically compacted with a tamping shoe. The net result was damage to the inner core of the edge drain.

In response to these problems, the installation specification was revised in 1989 to insure the integrity of the drainage system. The revised method of installation consisted of moving the panel to the shoulder side of the trench and then flushing a sand slurry into the trench for backfill. Flushing the sand eliminates the need for mechanical compaction.

Since 1989, two projects have been completed using the revised installation specification and another is currently under construction.

From observations made at each site, it is apparent that the sand/slurry backfill helps to insure the integrity of the drainage system during installation.

The sand acts as an extra filter medium; and if the capacity of the drainage system is exceeded, the sand will act as a temporary reservoir.

**PROTECTED UNDER INTERNATIONAL COPYRIGHT
ALL RIGHTS RESERVED
NATIONAL TECHNICAL INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE**

Reproduced from
best available copy.



INTRODUCTION

From 1987 to 1989, several problems were observed during and after the installation of pavement edge drains (panel drains) throughout Kentucky. In response to these problems, the special note for installation was revised (9-6-89) to insure the integrity of the drainage system. The revised method of installation consisted of moving the panel to the shoulder side of the trench and then flushing a sand slurry into the trench for backfill (Figure 1). Flushing the sand eliminates the need for mechanical compaction which had been proven to damage the core of the drainage systems on numerous occasions. The sand acts as an extra filter medium; and if the capacity of the drainage system is exceeded, the sand will act as a temporary reservoir. Since 1989, three construction projects have been let under the revised special note. These projects include Mountain Parkway, I-75 (Project IR 75-4 (41)100), and I-64 (Project IR 64-4 (64)57).

Mountain Parkway

The edge drains were installed in 1989, between Milepost 16 and Milepost 22 (Staton Exit). One mile of Contech Stripdrain 100 was installed in the outside shoulder from Milepost 16 to Milepost 17. Advanedge edge drains were installed on the remainder of the project.

The edge drains were borescoped on July 17, 1989 shortly after installation was completed. Both drainage systems appeared to be in good condition.

On September 28, 1989, the Kentucky Transportation Cabinet requested the Kentucky Transportation Center to investigate an apparent drainage problem in this area. It was concluded that stained areas which were appearing on the surface were related to problems

noted at the outlets and not in the mainline of the drainage system. (These problems are discussed in Research Report KTC-89-50).

The edge drains were inspected again in 1990, approximately a year after installation. There were no signs of compression in the core of either edge drain. A build up of calcium carbonate was occurring in the invert of both drainage systems (approximately 0.25 inch thick). The filter material around each panel appeared to be open. The sand backfill was inspected for blinding adjacent to the broken slab. The sand backfill appeared to be relatively clean. A sample of the sand backfill was obtained from three locations 1) the stockpile prior to installation, 2) directly above the panel, and 3) adjacent to the concrete slab. Grain size analyses were performed on the three samples. The gradation comparison for each sample is shown in Figure 2. It appears that there has been no significant change in the gradation of the sand backfill.

Interstate 75

In 1989, ten miles of edge drains were installed on I-75. Nine miles of Advanedge was installed in the southbound outside shoulder from Milepost 101.32 to Milepost 110.25. Approximately one mile of Contech Stripdrain 100 was installed in the southbound outside shoulder from Milepost 100.32 to Milepost 101.32. Borescope observation ports were installed at every milepost. Both edge drain systems were borescoped after construction was completed in 1989. There were no signs of compression or siltation in either drainage system.

On June 12, 1991, KTC personnel inspected the edge drains on the southbound side of Interstate 75. The Contech panel was excavated in two locations at milepost 101.35 and milepost 101.28. At both locations, the top two rows of support columns had rolled over. The

fabric was pushed in between the support columns between rows five and six. At milepost 100.51, the sixth row of support columns had punctured the fabric allowing material to enter the core of the panel. Some of support columns in row six had also failed. The Contech panel was bowed out from the wall of the trench at both locations. The panel was bowed out from the shoulder side of the trench approximately 1.5 inches. This indicates the panel may not have been correctly placed during installation. Less damage might have occurred if the panel was flush with the wall of the trench. Approximately 85 percent of the core is still open. There were no signs of horizontal or vertical compression in the Advanedge panel which was inspected at milepost 101.67 (southbound).

The asphalt patch had settled approximately one-half inch. It appears this settlement might have caused the top two rows of the Stripdrain 100 to be pushed down. Further densification of the sand backfill may have also caused the filter fabric to be pushed in between rows five and six to the point the filter fabric and the support columns started to fail. Further inspection and laboratory testing will be needed to confirm this.

During the excavation of the trench, the sand backfill was inspected for signs of blinding or clogging. A distinct layer approximately 1/4-inch thick of dark silted sand was observed adjacent to the concrete interface. The remainder of the sand between the panel appeared to be clean. The filter fabric surrounding the core of the drain was also clean. Gradation tests were performed on the two samples. Sample A was taken against the face of the concrete and sample B was taken from the center of the trench. A noticeable difference is apparent on the number 10 and 20 sieves. There appears to be a slight increase in minus two hundred material against the face. The gradation curves are shown in Figure 3.

Interstate 64

Edge drains (new Monsanto Hydraway) are currently being installed on I-64 from Milepost 57.90 to Milepost 73.29 in the eastbound direction, and from Milepost 57.90 to Milepost 74.31 in the westbound direction. The edge drain was borescoped in two locations around Milepost 59.75 (eastbound). The top row of support columns in the edge drain was partially rolled over. The portion of the panel below the first row of columns appeared to be in good condition.

Recent field inspections conducted July 16, 1991 on the current I-64 edge drain installation revealed that the asphalt plug has settled one to two inches. In one area, the plug has settled three to four inches toward the pavement side of the trench and approximately one inch on the shoulder side. During excavation of the panel, it was observed that the asphalt plug was resting on top of the Hydraway panel. The Hydraway panel is starting to show signs of deflection. The panel is supporting a large portion of the load being exerted on the asphalt plug. At the time of the inspection, the final asphalt plug had not been placed. It is apparent the sand has densified since installation.

Discussion

Prior to revision of the installation specification, numerous lane miles of the old Hydraway drain that had been installed under the original installation specification were observed to be damaged. These damaged panels are likely to become clogged during breaking and seating of existing rigid slabs. The Western Kentucky Parkway is currently showing signs of clogging. It is recommended that the existing Hydraway installations be replaced prior to

breaking and seating.

Conclusions

From observations at each construction project, the sand/slurry backfill helps to insure the integrity of the drainage system during initial backfilling. It appears more attention should be placed on insuring the proper density of the sand backfill by inspection personnel. It also appears that the initial asphalt plug is not being properly compacted.

It is also apparent that panels should be tested in the vertical plane as well as the horizontal plane. Although the Advanedge is weak in comparison to the other panels in the horizontal plane, it is substantially more rigid in the vertical plane. However, past field performance indicates that the Advanedge panel performs well when backfilled with a sand slurry. Other panels are starting to show signs of compression under the same installation methods.

The long-term possibility of the fines (generated during breaking and seating) clogging the edge drains cannot be documented at present. This phenomenon must be monitored over a considerably longer period. Mountain Parkway edge drains should be included in long-term monitoring.

Figure 1. Revised Installation Specification

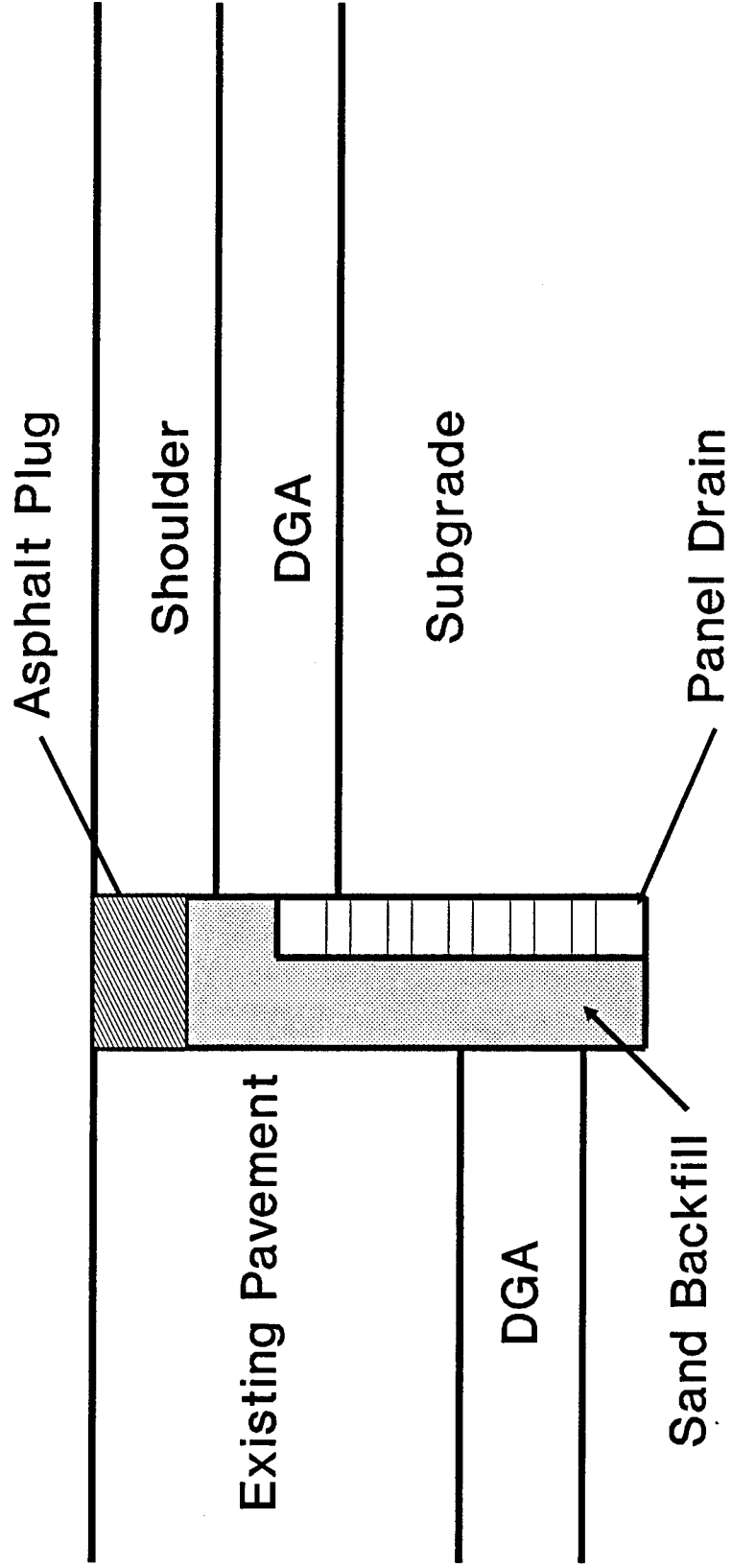
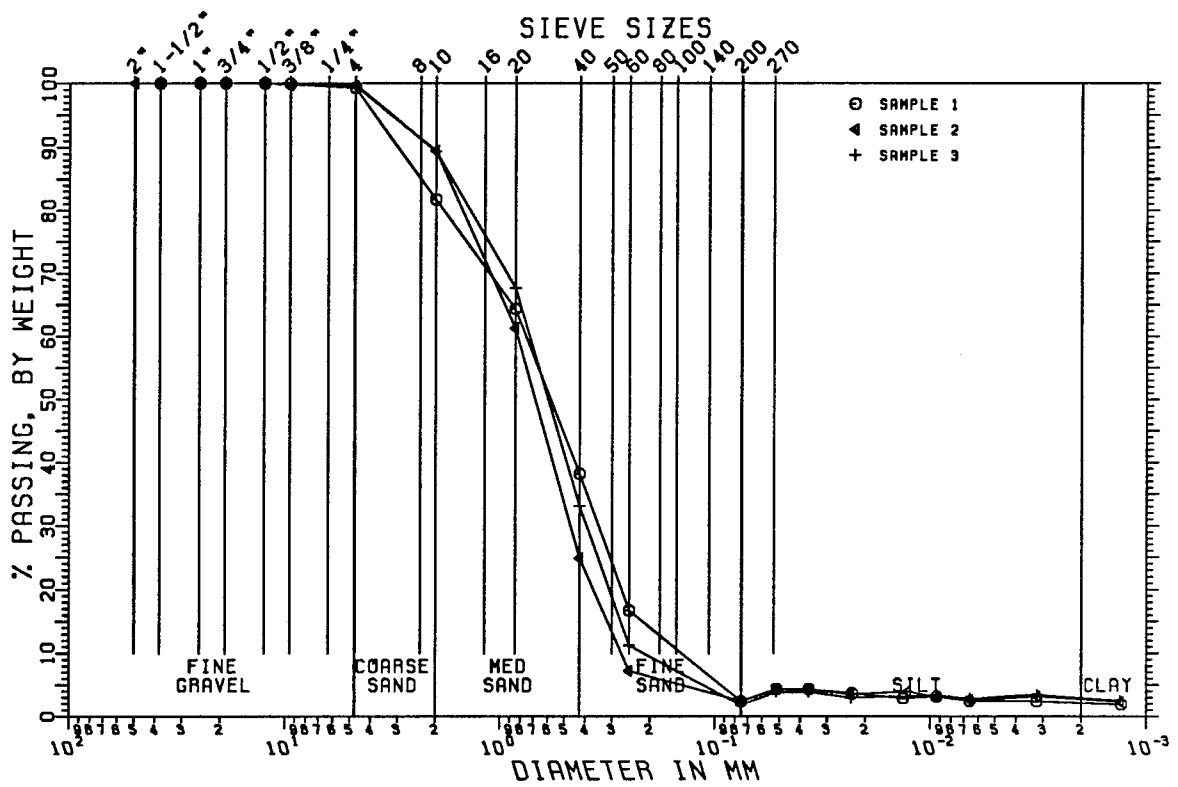
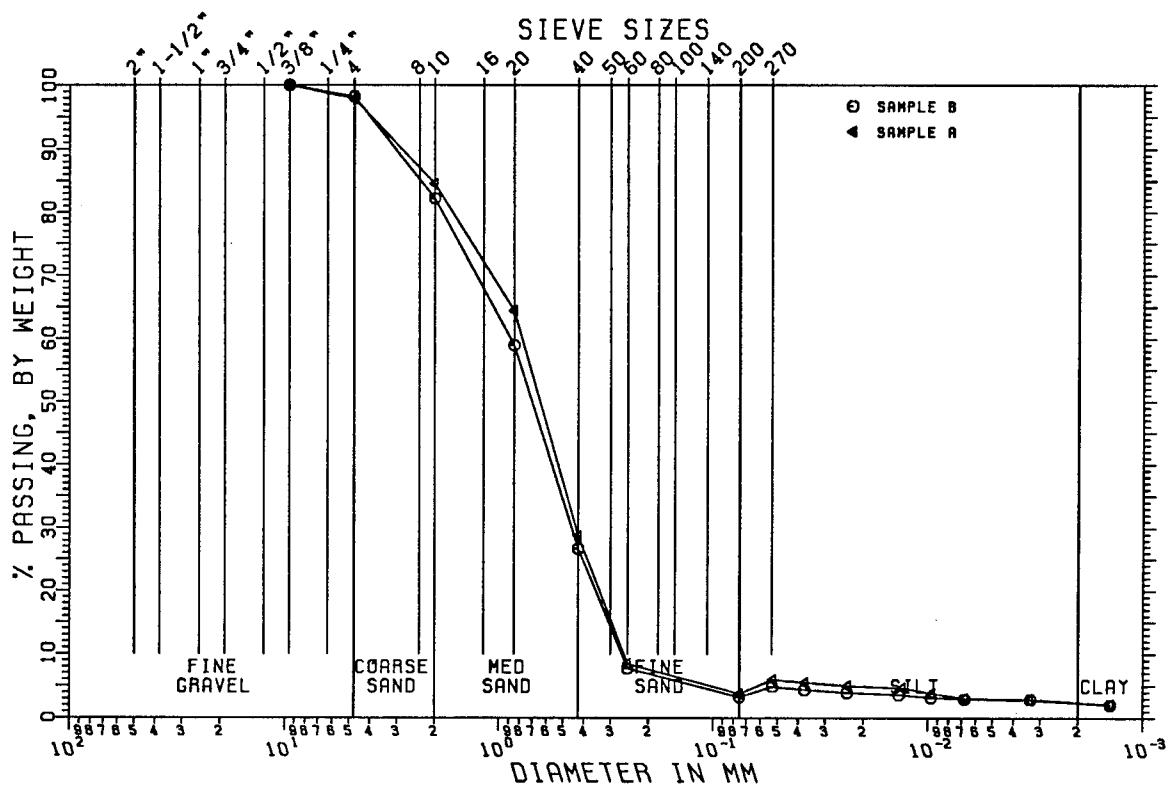


Figure 2. Gradation Comparison (Mountain Parkway)



GRADATION COMPARSION

Figure 3. Gradation Comparison (Interstate 75)



GRADATION COMPARISON