11 YEAR EVALUATION OF FABRIC FORM WITH CEMENT FLY ASH MIXTURE FOR EROSION AND SEDIMENT CONTROL

Construction Final Report Addendum
June 1998

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Addendum to 1987 Final Report. Short brief of the construction and reference to previous recommendations, major objectives, and notation of conclusions. Findings, observations, and pictures showing long term effects to fabric form. Conclusions and recommendations for long term effects. This addendum constitutes a follow-up to Item 2114; 81-08-1, “FabricForms”.

Major Conclusions: Fabric Form can be utilized with little preparatory work. Nylon resists ultraviolet radiation and bonds with the mortar mix better than the polypropylene. The pillowed effect of the fabric collects sediment, thereby encouraging vegetative growth. Weep hole should be used. Lesser slopes result in greater abrasion to the material.
# SI (Metric) Conversion Factors

## Approximate Conversions to SI Units

<table>
<thead>
<tr>
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<th>When you know</th>
<th>Multiply by</th>
<th>To Find</th>
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<td>mi</td>
<td>miles</td>
<td>1.609</td>
<td>kilometers</td>
<td>km</td>
</tr>
</tbody>
</table>

**AREA**<br>
in² | square inches | 645.2 | square millimeters | mm² |
| ft² | square feet | 0.0929 | square meters | m² |
| yd² | square yards | 0.8361 | square meters | m² |
| ac | acres | 0.4047 | hectares | ha |
| mi² | square miles | 2.590 | square kilometers | km² |

**VOLUME**<br>
fl oz | fluid ounces | 29.57 | milliliters | mL |
| gal | gallons | 3.785 | liters | L |
| ft³ | cubic feet | 0.0283 | cubic meters | m³ |
| yd³ | cubic yards | 0.7645 | cubic meters | m³ |

**MASS**<br>
oz | ounces | 28.35 | grams | g |
| lb | pounds | 0.4536 | kilograms | kg |
| T | short tons (2000 lb) | 0.907 | megagrams | Mg |

**TEMPERATURE (exact)**<br>
°F | degrees Fahrenheit | (°F−32)/1.8 | degrees | °C |
| | | | | |
| °C | degrees Celsius | 9/5+32 | degrees | °F |

## Approximate Conversions from SI Units

<table>
<thead>
<tr>
<th>Symbol</th>
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<th>Multiply by</th>
<th>To Find</th>
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<td>millimeters</td>
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<td>m</td>
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<td>m</td>
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<td>km</td>
<td>kilometers</td>
<td>0.6214</td>
<td>miles</td>
<td>mi</td>
</tr>
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</table>

**AREA**<br>
mm² | square millimeters | 0.00155 | square inches | in² |
| m² | square meters | 10.764 | square feet | ft² |
| m² | square meters | 1.196 | square yards | yd² |
| ha | hectares | 2.471 | acres | ac |
| km² | square kilometers | 0.3861 | square miles | mi² |

**VOLUME**<br>
mL | milliliters | 0.0338 | fluid ounces | fl oz |
| L | liters | 0.2642 | gallons | gal |
| m³ | cubic meters | 35.315 | cubic feet | ft³ |
| m³ | cubic meters | 1.308 | cubic yards | yd³ |

**MASS**<br>
g | grams | 0.0353 | ounces | oz |
| kg | kilograms | 2.205 | pounds | lb |
| Mg | megagrams | 1.1023 | short tons | T |

**TEMPERATURE (exact)**<br>
°C | degrees Celsius | 9/5+32 | degrees | °F |
| | | | | |
| °F | degrees Fahrenheit | | | |

## FORCE and PRESSURE or STRESS

<table>
<thead>
<tr>
<th>Symbol</th>
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<th>Multiply by</th>
<th>To Find</th>
<th>Symbol</th>
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<td>lb</td>
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<td>4.448</td>
<td>Newtons</td>
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<td>lb</td>
<td>poundforce</td>
<td>6.895</td>
<td>kilopascals</td>
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<td>lbf</td>
<td>poundforce</td>
<td>0.2248</td>
<td>Newtons</td>
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Introduction

In 1983 the Oklahoma Department of Transportation's Research and Development Division in cooperation with the Federal Highway Administration undertook an investigation in the use of Fabric Form for erosion and sediment control, utilizing varying portland cement/fly ash grout mixtures. The site is located approximately 2 miles south of Antlers, Oklahoma on the east side of US-271.

The four-year study concluded that the use of fly ash/portland cement grout in Fabric Form is beneficial in reducing sedimentation, eliminating erosion and brush growth, and is cost effective. The fabric mat was installed under flowing water using minimal equipment and with no apparent pollution to the water.
Materials and Methods

The grout mixtures were designed in three different fly ash/cement ratios, one of 50/50, one of 80/20, and one of 0/100. Usages of two different woven fabrics were incorporated to determine differences in resistance to ultraviolet deterioration, abrasion resistance, and bleeding control of excess water in the grout mixture.

The fabric mat sections were placed, alternating the Nylon and the Polypropylene material types (Figure 1). These sections (Figure 2) were then filled by pumping the grout mixtures through 'fill holes' in the mats. The tops of the mats were anchored into trenches to resist undercutting (Figure 3). Sections No. 7 through No. 11 and No. 13 utilized the addition of 'weep holes' to alleviate underlying moisture from the effects of a high water table (Figure 4).
Figure 1 Test Section Layout

US-271

Meters

Horizontal Scale

Feet

<table>
<thead>
<tr>
<th>A-1</th>
<th>A-2</th>
<th>C-3</th>
<th>B-4</th>
<th>A-5</th>
<th>B-6</th>
<th>C-7</th>
<th>A-8</th>
<th>B-9</th>
<th>C-10</th>
<th>A-11</th>
<th>B-12</th>
<th>A-13</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 0  | 4.9 | 9.8 | 14.6| 19.5| 24.4|

| Feet | 0  | 16  | 32  | 48  | 64  | 80  |

- Nylon 0/100
- Polypropylene 0/100
- Nylon 80/20
- Polypropylene 80/20
- Nylon 50/50
- Polypropylene 50/50

Fence
Figure 2 Typical Section

Figure 3 Trench Anchor Section Detail

Figure 4 Weep Hole Section Detail
Previous Recommendations

1. The fabric form site should be monitored annually and core samples taken periodically for 10 years. This will allow adequate time for a long term strength and performance evaluation of the test sections.

2. Concern about ultraviolet degradation of either fabric seems unwarranted, since both fabrics showed no visible sign of degradation in the four years since installation. It is recommended that either fabric be considered for use.

Major Objectives From Previous Report

1. Ascertain the durability and economic feasibility of using a double layer of nylon and polypropylene woven fabrics as an envelope for fabric form grout.

2. Observe and document the effect of ultraviolet radiation on the two different in-situ fabrics.

3. Determine the erosion control capabilities and durability of the different mixes, including resistance to abrasion.

4. Determine the feasibility of using fabric form as a procedure for construction and for maintenance operations.
Previous Notes from 1987 Conclusions

1. Several years of observations are needed to put to rest the doubt and concern about FA-PC grout durability, long term affects of freeze-thaw, abrasion resistance, flexural strength and its general usage for controlling erosion.

2. Periodic sampling and testing is necessary to establish an accurate and comparative relationship between the laboratory unconfined compression tests and the in place compressive strengths of the installed fabric form grout.
Testing

In February of 1986, compression testing was done. The strength of each of the different grout mixtures met or exceeded minimum requirements for ditch liner. The following table shows the four year test results.

Table 1 1986 Compression Test Results

<table>
<thead>
<tr>
<th>Section</th>
<th>Mat Type</th>
<th>Mixture %</th>
<th>Break Load</th>
<th>Break Load</th>
<th>Unit Stress</th>
<th>Unit Stress</th>
</tr>
</thead>
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<tr>
<td>A-1</td>
<td>Nylon</td>
<td>0 100</td>
<td>210835</td>
<td>47400</td>
<td>24339</td>
<td>3530</td>
</tr>
<tr>
<td>A-2</td>
<td>PP</td>
<td>0 100</td>
<td>217062</td>
<td>48800</td>
<td>25787</td>
<td>3740</td>
</tr>
<tr>
<td>C-3</td>
<td>Nylon</td>
<td>80 20</td>
<td>233520</td>
<td>52500</td>
<td>26063</td>
<td>3780</td>
</tr>
<tr>
<td>B-4</td>
<td>PP</td>
<td>50 50</td>
<td>225958</td>
<td>50800</td>
<td>31028</td>
<td>4500</td>
</tr>
<tr>
<td>A-5</td>
<td>Nylon</td>
<td>0 100</td>
<td>209056</td>
<td>47000</td>
<td>25305</td>
<td>3670</td>
</tr>
<tr>
<td>B-6</td>
<td>PP</td>
<td>50 50</td>
<td>126323</td>
<td>28400</td>
<td>15514</td>
<td>2250</td>
</tr>
<tr>
<td>C-7</td>
<td>Nylon</td>
<td>80 20</td>
<td>236634</td>
<td>53200</td>
<td>29028</td>
<td>4210</td>
</tr>
<tr>
<td>A-8</td>
<td>PP</td>
<td>0 100</td>
<td>240192</td>
<td>54000</td>
<td>29786</td>
<td>4320</td>
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<td>209946</td>
<td>47200</td>
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<td>3750</td>
</tr>
<tr>
<td>C-10</td>
<td>PP</td>
<td>80 20</td>
<td>311360</td>
<td>70000</td>
<td>38198</td>
<td>5540</td>
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<tr>
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<td>Nylon</td>
<td>0 100</td>
<td>265990</td>
<td>59800</td>
<td>32338</td>
<td>4690</td>
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<tr>
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<td>PP</td>
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<td>317587</td>
<td>71400</td>
<td>37026</td>
<td>5370</td>
</tr>
<tr>
<td>A-13</td>
<td>Nylon</td>
<td>0 100</td>
<td>243750</td>
<td>54800</td>
<td>29649</td>
<td>4300</td>
</tr>
</tbody>
</table>

In October of 1994 cores were obtained from the test site. The psi results of the different grout mixtures compared favorably to the fourth year testing. Note that the 50%-50% mixture in section B-6 increased significantly in strength, as well as section A-13 with a 0%-100% mixture. Table 2 on the next page shows the test results.
Table 2 1994 Compression Test Results

<table>
<thead>
<tr>
<th>Section</th>
<th>Mat Type</th>
<th>Mixture %</th>
<th>Break Load*</th>
<th>Break Load*</th>
<th>Unit Stress</th>
<th>Unit Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>F.A. - P.C.</td>
<td>N Lbs.</td>
<td>kPa</td>
<td>psi</td>
<td></td>
</tr>
<tr>
<td>A-1</td>
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<td>0 100</td>
<td>---------</td>
<td>21202</td>
<td>3075</td>
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</tr>
<tr>
<td>A-2</td>
<td>PP</td>
<td>0 100</td>
<td>---------</td>
<td>22236</td>
<td>3225</td>
<td></td>
</tr>
<tr>
<td>C-3</td>
<td>Nylon</td>
<td>80 20</td>
<td>---------</td>
<td>29717</td>
<td>4310</td>
<td></td>
</tr>
<tr>
<td>B-4</td>
<td>PP</td>
<td>50 50</td>
<td>---------</td>
<td>31096</td>
<td>4510</td>
<td></td>
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<tr>
<td>A-5</td>
<td>Nylon</td>
<td>0 100</td>
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<td>26098</td>
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<tr>
<td>B-6</td>
<td>PP</td>
<td>50 50</td>
<td>---------</td>
<td>32062</td>
<td>4650</td>
<td></td>
</tr>
<tr>
<td>C-7</td>
<td>Nylon</td>
<td>80 20</td>
<td>---------</td>
<td>23374</td>
<td>3390</td>
<td></td>
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<tr>
<td>A-8</td>
<td>PP</td>
<td>0 100</td>
<td>---------</td>
<td>25891</td>
<td>3755</td>
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<td>B-9</td>
<td>Nylon</td>
<td>50 50</td>
<td>---------</td>
<td>25167</td>
<td>3650</td>
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<tr>
<td>C-10</td>
<td>PP</td>
<td>80 20</td>
<td>---------</td>
<td>39026</td>
<td>5660</td>
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<tr>
<td>A-11</td>
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<td>40749</td>
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<tr>
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<td>PP</td>
<td>50 50</td>
<td>---------</td>
<td></td>
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</tr>
<tr>
<td>A-13</td>
<td>Nylon</td>
<td>0 100</td>
<td>---------</td>
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</table>

* This test not performed on 1994 specimens.
Performance Evaluation & Observations

In October of 1994 a visual inspection (Appendix A) of the fabric form research project was conducted. A follow-up was conducted in November of 1997 (Appendices B and C), support the 1994 findings. The following observations were noted from the 1984 survey:

1. At the top edge where the mats were anchored into the soil, neither of the two types of mats, nylon or polypropylene, showed signs of stress or wear.

2. The nylon mats adhered to the mortar better than the polypropylene type mats.

3. The polypropylene type mats tend to separate at the sewed joints.

4. The nylon type mats bonded better at the sewed joints.

5. Surfaces of the polypropylene type mats exhibited separation and shredding of the exposed fibers.

6. Surfaces of the nylon mats displayed abrasion and wear.

7. Surface wearing seems more predominant in the lesser slopes (i.e., 4:1 as compared to 2:1 or 1:1 slopes).

8. Lateral and longitudinal cracking of varying degrees was observed in all the sections.

9. Longitudinal cracking is primarily at stress points created from the underlying soil, where increased expansion and contraction rates occur.

10. Part of the lateral cracking in the back slopes displayed staining from moisture seepage.
11. The weep holes provided a protective growing area for vegetation. There is greater vegetative growth in the areas where the nylon bags were placed, regardless of the different mortar mixes.

12. Vegetative growth was found in some longitudinal cracks in the lower 1/3 of the slopes.

13. Most of the vegetation is growing in soil accumulations gathered at the stitch-lines of the matting and in the ditch bottom.

14. Voids were found under the upper 1/4 to 1/3 of the inslope, ranging from 6.4 mm (1/4 in) upwards to 101.6 mm (4 in).
Conclusions & Recommendations

The areas that show greater abrasion of the matting material are considered due to the weaker, (low-strength) mortar mixes and are more prevalent in the lesser sloping areas.

Long term exposure to ultraviolet radiation has a high impact on polypropylene fiber decomposition. The reduced bonding of the polypropylene mat with the mortar mixes is felt to have amplified the deterioration.

The nylon mat sections maintained overall integrity by holding each side together.

The longitudinal cracking is the most probable cause for the vegetative growth along the side-slopes of the ditch. This type of problem could be corrected by an annual or semiannual maintenance program where cracks are routed, cleaned and sealed; or use of an appropriate herbicide.

The vegetative growth in the ditch bottom is due to the collection of sediment and debris in the quilting of the mat construction.

The justification in using nylon or polypropylene type mats should be based upon:
  1) The type of mortar mix to be used,
  2) Cost of the materials,
  3) Necessity for ease of placement,
  4) Whether placement will be in direct full-sunlight.

Future projects utilizing weep holes should use a fabric cover on both the embedded and exposed ends to reduce soil collection and thus retard vegetative growth.

Considerations should be made for a joint sealant, such as silicone or an asphaltic tape in addition to sewing for increased durability.
References

1) Jimmy L. Etti-Williams, Fabric Form With Cement Fly Ash Mixture for Erosion and Sediment Control, Final Report, December 1987, Oklahoma Department of Transportation, Research and Development Division in Cooperation with the Federal Highway Administration, FHWA/OK 87(8).
APPENDIX A

PHOTOGRAPHS OF OBSERVATIONS
Illustration 1 Overall view looking south

Illustration 2 Culvert at south end of ditch
Illustration 3 Weep hole

Illustration 4 Vegetative growth in longitudinal cracks
Illustration 5 Placement around pipe (Shows discoloration)

Illustration 6 Section 10 - Showing seam separation
Illustration 7 Section 9 - Showing cracking at seam line

Illustration 8 Showing wear (Polypropylene type)
Illustration 9 Showing separation (Polypropylene type)

Illustration 10 Showing Bond (Nylon type)
APPENDIX B

NOVEMBER 1997
SUMMARY OF INSPECTION RESULTS
<table>
<thead>
<tr>
<th>Number</th>
<th>Fabric</th>
<th>Mix</th>
<th>Condition</th>
<th>Voids</th>
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<td>A-1</td>
<td>Nylon</td>
<td>1/100</td>
<td>Worn</td>
<td>Good</td>
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<td></td>
<td></td>
<td></td>
<td>75% Deterioration</td>
<td>V.G.</td>
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<td></td>
<td></td>
<td></td>
<td>Signs of Stress</td>
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</tr>
<tr>
<td>A-2</td>
<td>Nylon</td>
<td>1/100</td>
<td>Worn</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Signs of Stress</td>
<td>N/A</td>
</tr>
<tr>
<td>C-3</td>
<td>Nylon</td>
<td>80/20</td>
<td>Wear in middle</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Signs of Stress &amp; Wear</td>
<td>N/A</td>
</tr>
<tr>
<td>B-4</td>
<td>Nylon</td>
<td>80/20</td>
<td>75% Deterioration</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Signs of Some Stress</td>
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<tr>
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<td>1/100</td>
<td>Wear in Upper North End</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Signs of Stress &amp; Wear</td>
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<tr>
<td>B-6</td>
<td>Nylon</td>
<td>50/50</td>
<td>80% Shredded</td>
<td>Good</td>
</tr>
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<td>P.P.</td>
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<td>Good</td>
<td>N/A</td>
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<td>60% Worn</td>
<td>Good</td>
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<td>nylon</td>
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<td>Signs of Stress &amp; Wear</td>
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</tr>
<tr>
<td>A-8</td>
<td>P.P.</td>
<td>1/100</td>
<td>Shredding</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good</td>
<td>N/A</td>
</tr>
<tr>
<td>B-9</td>
<td>Nylon</td>
<td>50/50</td>
<td>Minor Wear</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Signs of Some Wear &amp; Stress</td>
<td>Horizontal</td>
</tr>
<tr>
<td>C-10</td>
<td>Nylon</td>
<td>80/20</td>
<td>Shredding</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>P.P.</td>
<td></td>
<td>Signs of Stress &amp; Wear</td>
<td>N/A</td>
</tr>
<tr>
<td>A-11</td>
<td>Nylon</td>
<td>1/100</td>
<td>Worse Wear in North End</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good</td>
<td>Horizontal</td>
</tr>
<tr>
<td>B-12</td>
<td>Nylon</td>
<td>50/50</td>
<td>30% Worn</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good</td>
<td>N/A</td>
</tr>
<tr>
<td>A-13</td>
<td>Nylon</td>
<td>1/100</td>
<td>V.G. w/10% Wear</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Good</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 3: Summary of Inspection Results
In November, 1997 a visual inspection was conducted. The following observations were noted:

1. At the top edge where the mats are anchored into the soil, neither of the two types of mats, nylon nor polypropylene, showed signs of stress or wear.

2. The nylon mats adhered to the grout better than the polypropylene mats.

3. The seams of the polypropylene sections showed signs of stress and wear.

4. The seams of the nylon sections were still in good shape.

5. The surfaces of the polypropylene sections showed separation and shredding of the exposed fibers.

6. The surfaces of the nylon sections showed some abrasion and wear.

7. The stress on the fabric seemed to be more in the lesser (flatter) slopes of each section.

8. No lateral cracking was observed in any of the sections. However, horizontal cracking was observed in sections B-9 and A-11 (see page 3 for locations).

9. The weep holes had vegetation growing from them, in some places willow trees.

10. Most of the vegetation is growing in the creases and seams at the bottom of the ditch where two sections are sewn together.

11. There were no visual voids found.
NOVEMBER 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Visual Inspection by: Glenda Goodner

Photographs by: Chuck Donovan

Mat No. A-1

Fabric Type: Nylon

Grout Mix: 1/100

Upper Side Condition: Very good

Fabric Condition: The fabric is worn away where the grade of the slope is less steep. The water which runs off the roadway washes small rocks, debris, etc. down over the fabric. This material acts like an abrasive causing excessive wear.

Grout Condition: The grout shows wear where the fabric is worn off and it is exposed to the elements. But, it is solid and without cracks here.

Seam Condition: They show signs of stress.

Vegetation Growth: Vegetation is growing at the bottom of the fabric where it crosses the ditch. Sediments filter into a crease and with moisture from the ditch it makes an ideal place for weeds and willow trees to grow. This crease runs along the whole project.

Voids: This mat has no visual voids at this time.

Core Hole(s): One
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: A-2

Fabric Type: Polypropylene

Grout Mix: 1/100

Upper Side Condition: Very good

Fabric Condition: The fabric has deteriorated into shreds over 75 per cent of the area. The grout is exposed in this area to the elements. This mat has no cracking.

Grout Condition: The grout seems to be in very good condition even with the exposure where the fabric is shredded.

Seam Condition: The seams on this mat are showing some signs of stress especially where it is worn the most.

Vegetation Growth: Weeds and willow trees are growing in the crease at the bottom of the mat.

Voids: This mat has no visual voids at this time.

Core Hole(s): Two
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

**Mat No:** C-3

**Fabric Type:** Nylon

**Grout Mix:** 80/20

**Upper Side Condition:** Very good

**Fabric Condition:** This shows signs of wear in the middle where the slope is less steep. The wear is the same pattern as the other nylon mats.

**Grout Condition:** The grout is in good condition.

**Seam Condition:** The seams are showing signs of wear and stress.

**Vegetation Growth:** Vegetation is growing in the crease at the bottom of the mat.

**Voids:** No visible voids at this time.

**Core Hole(s):** Two
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: B-4

Fabric Type: Polypropylene

Grout Mix: 50/50

Upper Side Condition: Very good

Fabric Condition: The fabric has deteriorated into shreds over 75 per cent of the area, exposing the grout mix to the elements. This shredding is mainly in the areas that have a slight slope.

Grout Condition: The grout in this section seem to be in good condition in spite of the exposure. This section has no visual cracks.

Seam Condition: The seams in this section are showing some stress.

Vegetation Growth: This section has weeds growing in creases at the bottom of the mat.

Voids: This mat has no visual voids at this time.

Core Holes: One
TO: Curt Hayes, Sr. Branch Manager
FROM: Glenda Goodner, Trans. Spec. II
SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: A-5

Fabric Type: Nylon

Grout Mix: 1/100

Upper Side Condition: Very good

Fabric Condition: This mat has more wear in the less sloping areas on the north end, worse in the upper portion.

Grout Condition: Good

Seam Condition: Shows signs of stress and wear.

Vegetation Growth: Vegetation is growing in creases at the bottom of the mat and any place sediments can build up.

Voids: This mat has no visual voids at this time.

Core Holes: one
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

**Mat No:** B-6

**Fabric Type:** Polypropylene

**Grout Mix:** 50/50

**Upper Side Condition:** Very good

**Fabric Condition:** The fabric is shredded over 80 per cent of the area.

**Grout Condition:** Good in spite of being exposed to the elements.

**Seam Condition:** Good

**Vegetation Growth:** This mat has vegetation growing in the seams and creases where sediment can collect.

**Voids:** This mat has no visual voids at this time.

**Core holes:** One
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: C-7

Fabric Type: Nylon

Grout Mix: 80/20

Upper Side Condition: Very good

Fabric Condition: This mat has some bulges where the grout wasn’t evenly distributed. The fabric has worn away over these bulges and in the less sloping areas. Approximately 60 per cent of the fabric is worn away.

Grout Condition: This section has a horizontal crack that goes the length of it. The grout shows very little wear despite the crack and being exposed to the elements where the fabric is missing.

Seam Condition: The seams are showing signs of stress and wear.

Vegetation Growth: Vegetation is growing at the bottom of the mat in a crease.

Voids: The horizontal crack may be caused by a void under this section.

Core Holes: One
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: A-8

Fabric Type: Polypropylene

Grout Mix: 1/100

Upper Side Condition: Very good

Fabric Condition: This fabric has shredding like the other polypropylene fabrics.

Grout Condition: The grout is in good condition despite the shredding of the fabric exposing it to the elements.

voids: This section has no visual voids at this time.

Core Holes: Two
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: B-9

Fabric Type: Nylon

Grout Mix: 50/50

Upper Side Condition: Very good

Fabric Condition: The fabric shows only minor wear.

Grout Condition: The grout is in good condition except for two cracks. The first is located approximately 1.83 meters (6 ft) down from the upper side and extends the length of the mat. The second crack is a small one, approximately 0.61 meters (2 ft) long and is located in the middle of the section.

Seam Condition: The seams are showing some signs of wear and stress.

Vegetation Growth: This section has vegetation growing along the bottom in a crease in the fabric.

Voids: There are no visible voids at this time. However, the cracks mentioned earlier may be caused by voids under this section.

Core Holes: Two
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: C-10

Fabric Type: Polypropylene

Grout Mix: 80/20

Upper Side Condition: Very good

Fabric Condition: This fabric is shredding like the other polypropylene fabrics.

Grout Condition: The grout seems to be in good condition.

Seam Condition: These seams are showing signs of stress and wear.

Vegetation Condition: Vegetation is growing along a crease at the bottom of this section.

Voids: This section has no visual voids at this time.

Core Holes: Two
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager

FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: A-11

Fabric Type: Nylon

Grout Mix: 1/100

Upper Side Condition: Very good

Fabric Condition: The north end of this section is worse than any other part. Debris is piled all across this section approximately six feet down from the upper side.

Grout Condition: The grout in this section has a crack approximately 1.83 meters (6 ft) down from the upper side that extends the length of the section. Otherwise the grout seems to be in good condition.

Seam Condition: The seams are in good condition.

Vegetation Growth: Vegetation is growing along a seam at the bottom of this section where it connects with the section laying in the bottom of the creek.

Voids: The crack mentioned earlier may indicate voids under this section.

Core Holes: Two
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager
FROM: Glenda Goodner, Trans. Spec. II

SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: B-12

Fabric Type: Polypropylene

Grout Mix: 50/50

Upper Side Condition: Very good

Fabric Condition: Approximately 30 percent of this section is worn on the south end. This section has debris on it.

Grout Condition: Good

Seam Condition: The seam are in good condition.

Vegetation Growth: Vegetation is growing along the bottom of this section.

Voids: This section has no visual voids at this time.

Core Holes: Two
November 19, 1997

TO: Curt Hayes, Sr. Branch Manager
FROM: Glenda Goodner, Trans. Spec. II
SUBJECT: Letter to File, HPR-10(10) 81-08-1, Item No. 2114, Visual Inspection of Fabric Form Project at Antlers, Ok.

Mat No: A-13

Fabric Type: Nylon

Upper Side Condition: Very good

Fabric Condition: This section is in good condition. It has small worn places at the bottom, approximately 10 percent.

Grout Condition: Good

Seam Condition: Good

Vegetation Growth: This section has vegetation growing along the bottom.

Voids: This section has no visual voids at this time.

Core Holes: Two