

## FINAL EVALUATION REPORT

### FIBER-REINFORCED POLYMER (FRP) PULTRUDED DECKING MATERIAL AND HELICAL ANCHORING SYSTEM FOR USE IN SNOW FENCE APPLICATIONS

Location: Livingston, Montana - Park County

Project No.: IM90-7(63)33, Interstate 90, MP-332

FHWA No.: MT 00-01

Description: Final semi-annual analysis of remaining test section of snow fence using proprietary EZ-Deck Fiber-Reinforced Polymer (FRP) and Helical Anchoring System.

Evaluation Date: October 2005

Date Constructed: November 1999

Report Origin: Craig Abernathy  
Experimental Project Manager

The goal of this study is to evaluate the feasibility of using a fiber-reinforced polymer (FRP) material in the construction of snow fences. FRP is a process where continuous glass-fiber strands are pulled through a thermosetting polyester resin (or /matrix) to form a composite. The main purpose of testing the FRP product is to determine its structural integrity based on MDT's current snow fence design specifications, especially with the harsh climate these structures are subjected to in the

state of Montana. In addition, this experiment was to compare a new design as submitted by the contractor. The modified design deleted the interior rear supports (Test Section 1 [TS1] vs. Test Section 2 [TS2]), as explained in the November 1999 construction report (document address located at the end of this report). As noted in the May 2001 report, TS2 was found collapsed, which was assumed a structural-related failure due to the three rear (sole) supports buckling or snapping in high winds.



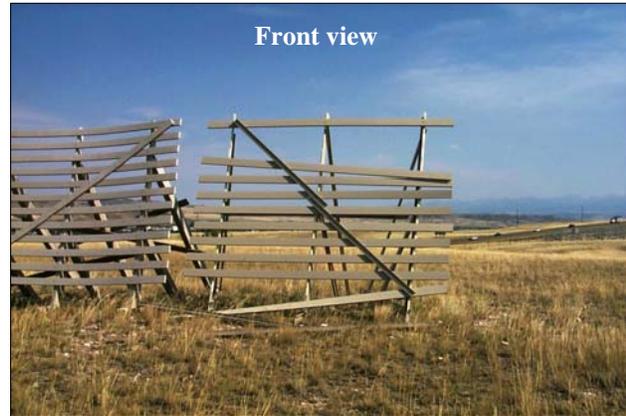
The final purpose was to test the Helical Anchoring System as a reliable ground attachment for snow fences (used only in TS2). As stated earlier, section TS2 was found collapsed, the helical anchors were not affected by this failure. In addition, the anchor supports competently held the FRP braces on the ground preventing FRP sections from becoming missiles that may have caused a safety concern to the nearby interstate. (refer to May, 2001 report).

Site visits were held in late fall and winter to document the environmental effects of seasonal extremes to the FRP material as well as stability of design.

### **Evaluation**

The evaluation consisted of a visual inspection of the FRP material, structural supports and ground attachments. Special attention was given to the hardware of the FRP planks, (setting screws, bolts, FRP clips).

This inspection found TS1 partially collapsed. The remaining rear helical anchor bolt had snapped allowing two of the three rear supports to bow away from the center. Several front planks had broken away from the bolted attachments and fallen to the ground. In a visit several weeks later, TS1 was totally collapsed. The FRP planking material itself remained unaffected from the failure, it seemed to be the attachment hardware and bracketing that succumbed to the harmonics and force of the wind. The helical anchors have remained intact during the entire 60-month experiment. The images on the right show the front and rear of the damaged section.



The main cause of failure seemed to be the way this section was constructed rather than the strength of the main FRP planking. The bolts, which held the bottom support to the helical anchors, had snapped. The bracket attachment that the planking was connected to, over time, visually showed accumulative wear and tear. The small screw which assisted in holding the plank to the bracket proved too weak. This material, when compared to conventional wood or plastic products have one-third the weight, this may have also been a causal factor in this premature failure as well.

There was not adequate cost and labor information provided to determine a cost ratio analysis. RFP material is very expensive compared to the other listed products. One positive element that the panels and supports can be constructed off site and quickly assembled on site with just a few persons.

Due to the possibility of high winds blowing the loose material towards the interstate, the Department has removed TS1.

To view this and all other snow fence reports, visit the Research experimental website at; [http://www.mdt.mt.gov/research/projects/livingston\\_snowfence.shtml](http://www.mdt.mt.gov/research/projects/livingston_snowfence.shtml)