Timber Tech Tips

United States Department of Agriculture
Forest Service
Technology & Development Program

December 1992

2400 9224 1310—SDTDC

Gratings with Geotextile as Wetland Crossing

Lola E. Mason, Civil Engineer

Introduction

Over the past 2 years, some of the wetland crossing products discussed in the December 1990 San Dimas Technology and Development Center (SDTDC) publication 9024 1203 *Portable Wetland and Stream Crossing* (Mason) have been field tested. These products are meant to be a portable, temporary, reusable means of allowing vehicles to cross, with minimum disturbance, soil having poor load-bearing capacity and high moisture content or standing water. For a product being chosen for field testing it should be new to this type of use, inexpensive, readily available, or any combination of these three. Testing, thus far, has encompassed the crossing of three classes of conveyances—log trucks (or similar heavy vehicles), light vehicles, and skidders.

Testing began by locating possible sites, then determining which products would be the most suitable. The National Forests in Florida, Osceola Ranger District (RD), were considered the most desirable to begin with, due to its large variety of wetland areas. Bill Foster, RD timber sale administrator, was chosen as the contact for the Osceola field testing. The products considered to have the most potential were the gratings with an underlying geotextile.

Grating and Geotextile

Grating was chosen due to it being unique to this use and readily available. Two types were chosen—figure 1: 4-pound expanded metal grating; figure 2: deck span safety grating (also called "heavy-duty steel grip strut® safety grating"). Nothing was known by the manufacturer concerning the performance of grating as a road surfacing material.

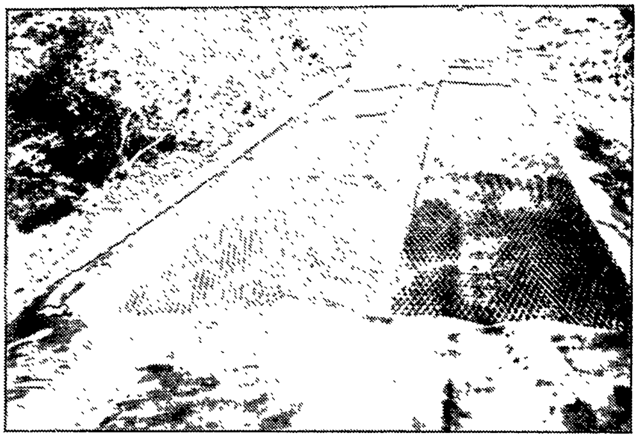

Figure 1. Expanded metal grating.

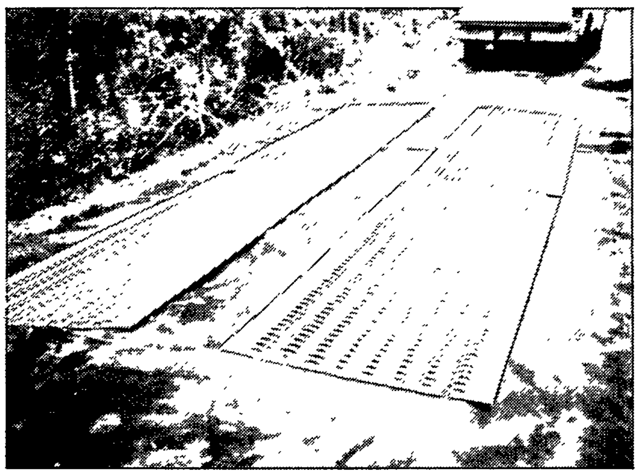

Figure 2. Deck span safety grating.

The ***expanded metal grating*** is made of nongalvanized (regular carbon) steel that is 4 by 10 feet by 0.618 inch, with a diamond-shaped opening that is 1.33 by 5.33 inches. This grating is relatively light and inexpensive. The surface is rough enough to give some traction. This grating has less steel than the second type; thus, is considered to have lower strength and rigidity.

The ***deck span safety grating*** is made of 10-gauge, pregalvanized sheet metal that is 3 by 10 feet by 1-5/16 inches. The edges are left flat; the standard is bent into a channel. An eight-diamond design, with an opening that is 3-7/8 by 1-1/4 inches, is punched

For additional information contact: *Timber Program Leader, San Dimas Technology & Development Center, 444 East Bonita Avenue, San Dimas, CA 91773. Phone: 909/599-1267; FTS 700/793-8000; FAX 909/592-2309. DG, SDTDC: W07A*

into the steel. The punched areas have serrated edges, which make an excellent surface for traction. This grating is very heavy and considered much stiffer and stronger than the first type.

Geotextile was considered necessary in order to retrieve the grating after use on a wet site. The geotextile needed to be either strong enough to be retrieved after use, or biodegradable—and, thus, could be left in place after use. The geotextile also needed to be strong enough to withstand puncturing from grating edges or the serrated surface of the deck span safety grating. A manufacturer suggested using the Mirafi 600X, a woven geotextile that is 12-1/2 by 360 feet. Although there are biodegradable types, they are not strong enough to withstand puncturing.

Field Tests

Prior to placement of the grating, some of the deck span safety grating was connected together to reduce the amount of "cold press." Cold press is the slow deformation (bowing) of the sheet metal so that the ends curve up instead of laying flat. Cold pressing does not harm the grating, but it would necessitate flipping over the grating occasionally. It is unlikely that log truck drivers would stop to flip the grating over, making it necessary to decrease the amount of the bowing. Connecting the grating was also considered a means of reducing the installation time. Wing hinges were used to connect two sets of the heavy duty safety grating (fig. 3). One set was connected along the width edge, the other was connected along the length edge.

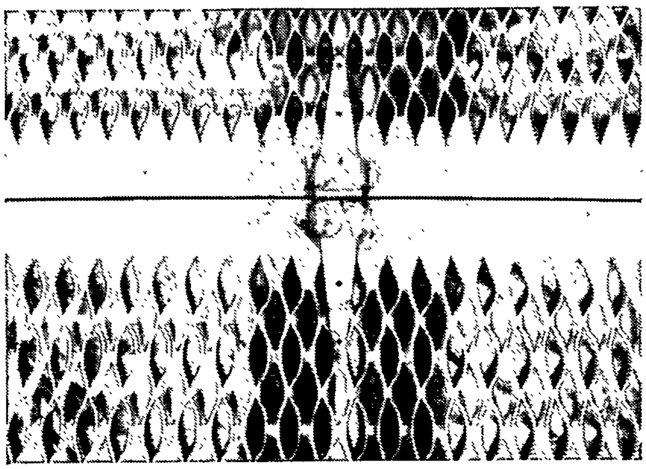

Figure 3. Wing hinge connection.

For the field tests, the grating was placed in the wheel paths with the length edge parallel to the direction of travel. Only the set of safety grating connected along the length edge was placed with the length edge perpendicular to the direction of travel. The main problem with the connected grating during installation was its weight. It took six to eight persons to lift, carry, and place the grating (fig. 4). The connected width edge did not bow, but the unconnected edge did. The connected length edge set did not bow, because bowing would not normally occur with the length edge perpendicular to traffic flow. The grating installation time was decreased very little, if any, by connecting the grating.

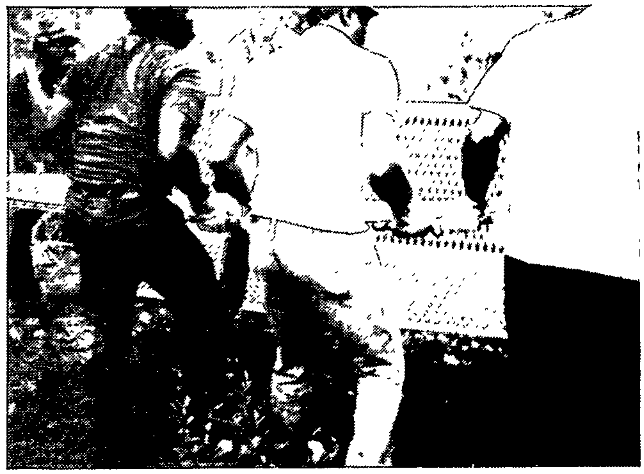

Figure 4. Excessively heavy connected grating being loaded into pickup truck.

For the field tests, the grating placement plan was as follows:

1. The road surface would be bladed or hand shoveled fairly smooth, removing deep wheel ruts (fig. 5).

2. A pickup truck would drive over the road carrying the roll of geotextile (fig. 5)

3. People behind the truck would hold one end of the geotextile at the beginning of each wet area and cut it off at the end of the wet area (fig. 5).

Figure 5. Steps 1 to 3—placing geotextile.

4. Once all the geotextile was in place, the pickup would then be loaded with the grating (fig. 4).

5. The pickup would drive to each wet spot for the grating to be unloaded (fig. 2).

The initial use of the grating during FY 1991 was for light vehicle access into a large camp site. This site is used once a year; normally when the area is wet, making access difficult. Only the two types of grating were used; the geotextile has not considered necessary. Approximately 200 vehicles traveled over the surfacing during the weekend event. It was very successful, with no problems or user complaints. Because of its success, it was used again this year with plans to continue using it for future events.

To field test the two products with heavy vehicles, purchasers working on the RD would have to agree to try the crossings. Bill Foster discussed the need to test the products with various timber purchasers. Daniel's Lumber, Inc., agreed to try the geotextile and grating in March 1991. Three Forest Service employees and eight of the purchasers employees were on site to either oversee the project, install the surfacing, or gather information.

Road 237J provided access to a site that the contractor was logging prior to a period of rain. The area was still too wet to continue the logging. So, the initial test would only consist of a few passes by an empty log truck. The grating was placed on the geotextile in various patterns—including grating simultaneously in both wheel paths, alternating grating in wheel paths, and only placing grating in the wettest wheel path. One section had only the geotextile. It took eight to ten people 1 to 2 hours to place the geotextile and grating.

After placement, the empty log truck made one round trip. Everything performed successfully, including the geotextile-without-grating section (fig. 6). The contractor remained skeptical. He stated that the road would have held up as well without any surfacing; others disagreed. The materials were left in place, but the road was basically dry by the time logging continued, making the crossings unnecessary.

In March 1992, another opportunity arose. ITT Rayonier, Inc., was logging in an area which was dry enough for logging work, except for one short section of road that stayed continuously saturated (fig. 7). Bill Foster explained the project and the products available to ITT's Forest Supervisor, Mike Conlon, who was very receptive to the idea. Four people

Figure 6. Wetland crossings after one trip by log truck.

installed the geotextile, a heavy duty stabilizer/filter fabric, and the grating; this took approximately 2 hours.

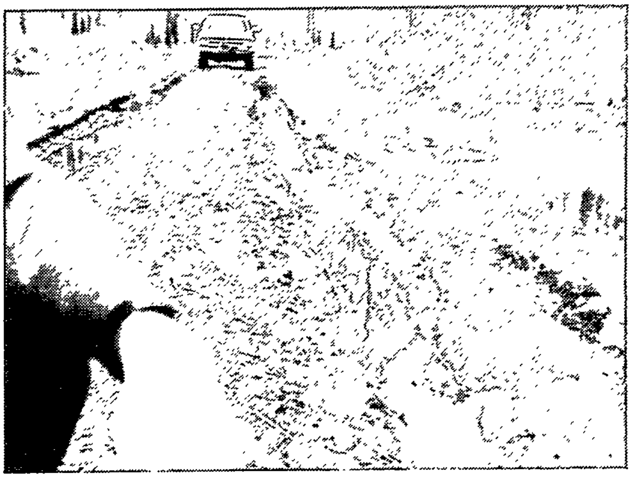

Figure 7. Saturated road section—good candidate for grating with geotextile.

The road was continuously used from March through May. Approximately 465 MBF were cut from one full unit and a portion of another. This equaled approximately 130 round trips of the log trucks. When the grating was removed, the section of road showed little difference compared to its condition prior to placement. The grating was quickly and easily removed by the loader as it was driven over the section. The geotextile was saturated and, thus, very heavy. It was pulled out of the wet area and left to dry.

Field Test Observations

The main observation pertains to performance. According to Bill Foster, the trucks would have only made two or three crossings before rock would have been necessary. Then, due to the continuously wet condition, more rock would have had to be intermittently placed. Instead, they only placed one material one time which could then be picked up and used elsewhere. The deck span safety grating, which was expected to perform the best, performed the poorest.

With use, the grating began to bow. As was expected, the grating was not flipped over. Once the ends bowed high enough, they would catch on the truck underside, typically the fuel tank. The rear tires would then complete the permanent folded over position. The expanded metal grating showed some deformation into the previously existing wheel ruts, but there was no cold pressing of the metal. This is partly due to it not being a sheet of steel that has been punched. It is also wider than the other grating; this helped decrease the amount of deformation into the wheel rut.

The key to the systems success seems to be the geotextile. As the tires travel over the geotextile, it goes into tension, which not only helps distribute the load over the road surface between the tires but also helps confine the underlying material. The underlying material is sand with little, if any, binder. Once saturated, it quickly moves out from under a load, which quickly ends vehicle access. The geotextile allows the water to move to the surface while confining the sand beneath.

The grating gives traction, keeps the geotextile from moving, and distributes the direct wheel load over a wider area of the geotextile. The geotextile was torn slightly in a couple of places from the grating. The main amount of tearing occurred when it was removed from the continuously wet section to dry. The geotextile was saturated and, thus, heavy in weight. Basically, it could be salvaged and reused. The main difficulty with geotextile reuse is determining a means of easy, quick removal and transport.

Vendor Information

Appendixes to the original December 1990 SDTDC publication on crossings present both costs (p. 57) and design data (p. 60-61; 69-71) for gratings and geotextile on the pages indicated. Further information can be obtained by contacting:

Gratings

SKM Associates, Inc.
12915-A Telegraph Rd.
Santa Fe Springs, CA 90670
Phone: 213/941-1999.

Geotextile

Mirafi Inc.
P.O. Box 240967
Charlotte, NC 28224
Phone: 800/438-1855.

Future Planned Tests

Several field tests are planned for FY 1993 (subject to available funding). The products which will be tested include grating, Terra Mat (interconnected rubber tire sidewalls), chain link fence, and wood pallets, each with an underlying layer of geotextile. These wetland crossings will not only be tested in excessively wet areas, but also excessively dry, sandy areas. Initially, log trucks will be the main users, but testing with skidders is also hoped for. Crossings that work well for log trucks may not work for the skidders, due to the timber which is dragged behind. The timber can catch on the product and displace or destroy it. With modifications, the same products used for log trucks may be applicable for skidders. Field testing will determine the modifications necessary and the product's success.

Some of the field tests are planned to be performed on the Osceola RD; however, the majority will occur with the cooperation of private companies. This will be very beneficial to the Forest Service. The cooperator will provide test sites, equipment for installation and removal, logging vehicles as users, and personnel. All this in return for trying experimental, and possibly unreliable, products. There will be a guaranteed number of field tests that would otherwise be cost prohibitive. Georgia Pacific has shown some interest and we have toured some of their sites. Also, ITT Rayonier, Inc., still shows a great deal of interest. We have also toured their sites and discussed the various options. They would like to begin using some of the products already available. They have also suggested products listed in the December 1990 SDTDC publication 9024 1203 which they consider potentially beneficial. Because the timber industry is the suggested products listed in the December 1990 SDTDC publication 9024 1203 which they consider potentially beneficial. Because the timber industry is the targeted user of these products, their interest and cooperation will be extremely beneficial to the success of this project and widespread use of the products.