Thread Selection for Geotextiles

By Vincent Diaz

Planning for geotextile installations is becoming a more exact and technical procedure for both contractors and designers. Today, more concern is now being given to materials and methods that will insure the finished results needed for success.

Because geotextiles are only available in sections of finite lengths and widths, one of the most demanding concerns facing the project designer is how to join the sections together. Since many situations require the joining of seams to be made by sewing, the following comments are offered in an effort to suggest different products that will help in choosing the "right thread for the right job."

Figure 1. On site seaming of a geotextile using Kevlar® aramid, TEX 420.

Different Joining Methods

Some may wonder if sewing seam joints is the best method to use. In some instances it won't be! If the installation requires a non-porous impermeable barrier (such as liners for toxic waste disposal sites), even a small needle hole would make the impermeability of the installation suspect. However, many projects require the passage of water through the fabric. Projects, such as airport runways, confined dredge material sites, and soil stabilization sites must allow the passage of water through the fabric to insure years of serviceability without suffering extensive water damage.

Seaming of geotextiles has evolved from overlapping of fabric, seam joining with pins or staples, heat sealing or securing seams with adhesives, to the sewn seam. Often, the best choice for project designers and installers is to specify the sewing of seam joints. By eliminating the wasteful overlapping of fabric, sewn seams can offer a reduction in labor costs, quicker completion of the installation phase, and superior results.

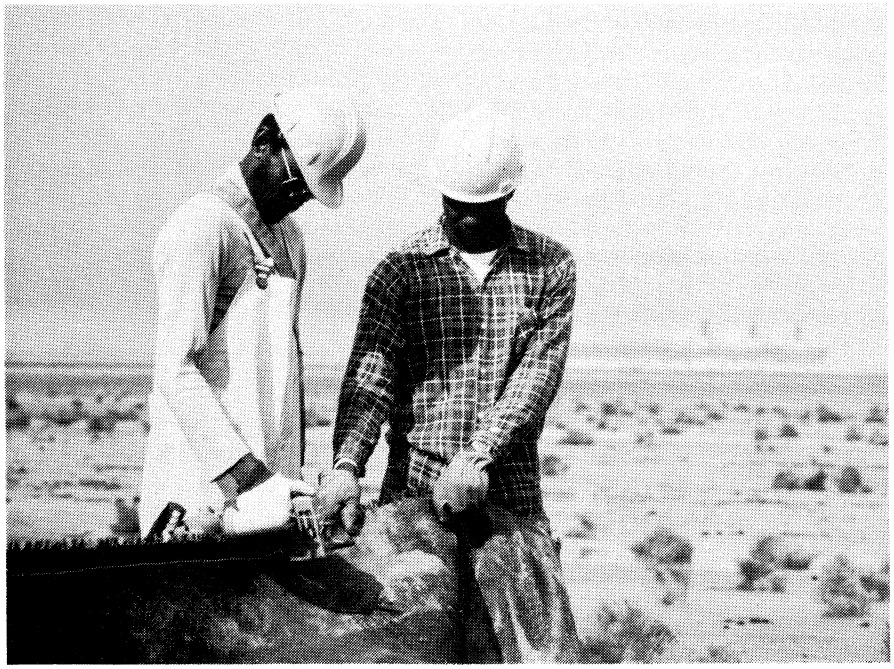

Figure 2. Superior strength of seam allows seams to be stressed during installation.

Figure 8. TEX-Thread Numbering System

TYPE OF FABRIC	TEX SIZE	APPROXIMATE BREAK STRENGTH Polyester	Polypropylene	Para-aramid	APPROXIMATE YARDAGE PER LB.
Light	50	9 lbs.	8 lbs.	20 lbs.	8200 yds.
	70	13 lbs.	11 lbs.	28 lbs.	6700 yds.
	100	16 lbs.	14 lbs.	38 lbs.	4200 yds.
Medium	140	26 lbs.	22 lbs.	60 lbs.	3000 yds.
	210	34 lbs.	29 lbs.	80 lbs.	2100 yds.
	330	48 lbs.	41 lbs.	115 lbs.	1480 yds.
Heavy	420	62 lbs.	53 lbs.	150 lbs.	1050 yds.
	560	88 lbs.	75 lbs.	175 lbs.	900 yds.

Thread Type

Having selected the seam and stitch type, the choice of **sewing thread** must now be made. One of the most important considerations when selecting a thread is "How long should it last?" If the application requires long term seam strength, along with good seam integrity, the choice should be limited to a thread made with synthetic fibers. Unlike natural fibers, such as cotton, linen and jute, the man-made fibers have been developed to offer special properties making them less susceptible to damage from moisture and the elements. The most popular of these generic fibers include: polyester, polypropylene and para-aramid. Although suppliers will have trademarks to distinquish their product line from that of a competitor, identification of the fiber should be required.

Any discussion about sewing thread will eventually lead to an explanation about thread sizes. But for the purpose of this article, we'll limit our comments about thread sizes to one size designation—TEX sizes.

TEX size, as can be seen in Figure 8, is a numbering system used for thread size selection. TEX size 50 is a light size of thread, while TEX size 100 is *twice* as heavy, and approximately twice as strong. The other important measurement is yards of thread per pound. While TEX size 50 has approximately 8000 yards of thread per pound, TEX size 100 has approximately 4000 yards. A rule of thumb we use in order to reduce the chance of a possible error is the following: The thread selected for a light-to-medium weight fabric should be under TEX size 200; higher strength installations should be above this size. This rule is based upon two general classifications of sewing thread for seam joining. These can be distinguished by the weight and strength of the fabric: light-to-medium fabrics exhibit a break strength of less than 300 lbs/in.; high strength fabrics, greater than this.

The first classification, light-to-medium, allows the use of threads made from polyester and polypropylene, popular because of their resistance to damage from moisture. Thread made from both of these fibers will provide good stitch formation. This stitch formation, along with the proper seam selection (Figs. 3, 4, 5) will help in achieving good seam strength efficiency. The interdependency between fabric, thread, machine stitching, and seam selection will make a good seam joint.

Polyester and polypropylene threads ranging from TEX size 50 to TEX size 210 will usually satisfy most requirements for light-to-medium weight fabrics. Both threads yield good seam integrity for extended periods of time. Although different finishes on sewing thread can provide good sewability, either a "bonded" or "heat set" finish will offer better results, especially when a Type 101 chainstitch is used. The reason for suggesting either a "bonded" of "heat set" thread is to reduce the chance of seam elongation. Without a process such as these, the thread can have as much as 30% stretch. This low modulus (high elongation) can be a detriment to the integrity and long life stability of the installation.

The newest area of concern for geotextile designers and installers is the joining of "high strength" fabrics. The problem of joining these sections is compounded by the limitations of the seam type selected (Figs. 3, 4, 5). In some cases, the only seam type that can be effectively used is *Ssa* (superimposed seam). This seam type requires that the thread bear the majority of force when the seam is stressed. The popular thread for these high strength applications is para-aramid. When processed using certain procedures, KEVLAR®-aramid, a superstrong fiber developed by E.I. Dupont, offers a sewing thread that meets the most demanding seam strength requirements. The high modulus (low elongation) improves the long term seam stability, critical to "high strength" installations, by reducing the chance of elongation at the seam.

Despite the focus of this article being the selection of sewing threads for geotextile applications, it must be noted that no *single* component is the cause for success or failure of any project. A good seam joint is the interaction of fabric, sewing machine stitiching, and thread. When a decision is made to join geotextile sections together by means of sewing, a careful analysis must be made of these three variables. This review, during the planning phase, will result in a productive and ultimately successful installation.

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