Available online www.ejaet.com

European Journal of Advances in Engineering and Technology, 2016, 3(10):1-7

Research Article ISSN: 2394 - 658X

Comparative Study on the Effect of Sewing Thread Count for Different Types of Seam Strength

Md. Zulfikar Hasan

Department of Textile Engineering, South East University, Dhaka, Bangladesh
hasanzulfikar0@gmail.com

ABSTRACT

In this study the author analyzed the effects of sewing thread count on seam strength. In this study different types of seam classes (Superimposed Seam, Lapped Seam & Bound Seam) were produced by using different sewing thread counts (Tex-27, Tex-60, Tex-80 & Tex-120) and Stitch Class-300 (Lock Stitch) was used to produce the seams keeping the Stitch Per Inch at 4.5. Here seam strengths of different seams were determined by using Titan Universal Strength Tester and ASTM D1683-04 method was used to determine seam strengths. After completing the research work, it was found that seam strength increased with the increment of sewing thread count for same seam class. But the suitability of the sewing thread count changed with the variation in thread size when different seam classes came into account.

Key words: Sewing Thread Count, Seam Strength, Seam Classes, Stitch, Stitch Classes, Cover Factor, SPI (Stitch per Inch)

INTRODUCTION

A seam is a joint between two pieces of fabric. This was the essence of the British Standard definition of seams as contained in the 1965 version of BS 3870: Schedule of Stitches, Seams and Stitching. The current BS 3870: Part 2:1991: Classification and Terminology of Seam Types, and The earlier 1983 edition, define a seam as 'the application of a series of stitches or stitch types to one or several thicknesses of material'. According to BS 3870:1991 there are eight classes of seam which are: a). Class-1: Superimposed Seam (SS), b) Class-2: Lapped Seam (LS), c) Class-3: Bound Seam (BS), d) Class-4: Flat Seam (FS), e) Class-5: Decorative Stitching (DS), f) Class-6: Edge Neatening (EN), g) Class-7: Applied Seam (AS), h) Class-8: Single Ply Construction (SPC) [1]. Seam strength refers to the load required to break a seam. This measures the strength and tenacity of a seam. Seam strength results from the breakage of either fabric or thread or, in more case, both simultaneously. Research has revealed that the load required to rupture the seam is usually less than that required to break the unsewn fabric [2-3]. A number of studies have determined the seam strength according to ASTM 1683-04 standards, which express the value of seam strength in terms of maximum force (in Newton (N)) to cause a specimen to rupture [4-8]. In discussing seam types, it has been necessary to make some mention of stitch types and it should already be evident that a wide variety is required for even the limited number of seam types. British Standard 3870: Part 1:1991: Classification and Terminology of Stitch Types, is the standard reference to the wide range of stitch types now available for use in garment construction. It defines a stitch as: 'one unit of conformation resulting from one or more strands or loops thread intralooping, interloping or passing into or through material'. According to British Standard 3870: Part 1:1991, there are six classes of stitch which are: a) Class-100 (Chain Stitch), Class-200 (Hand Stitch), Class-300 (Lock Stitch), Class-400 (Multithread Chain Stitch), Class-500 (Overedge Chain Stitch), Class-600 (Covering Chain Stitch).

Numerous references have been made to fine and heavy threads without, as yet, indication of these as relative sizes or any indication of the methods or units of measurement. All types of textile yarns can be produced in different thicknesses and the relationship between the length and weight of a specific yarn is known as its yarn count or grist or size. There are many traditional count systems which are either fixed weight, or fixed length systems that show the weight of a given length. The latter system is simpler in that it gives a higher figure to a thicker yarn or thread, which is more logical than the other way round that shows the weight of a given length [1]. Stitch density was deemed to be an important attribute because it binds the textiles together. Although several sewing books note the differential use of stitch density, very limited work has been done on determining the impact of stitch density on seam strength, seam efficiency and elongation [9].

MATERIALS

In this research work 100% Cotton Z-Twill Fabric (EPI: 58, PPI: 43, Warp Count: 15, Weft Count: 12, Width: 63") was used with different sewing thread (100% Polyester) count like as Tex-27, Tex-60, Tex-80 & Tex-120. Counting Glass, Pin, Marker Pen, Scissors and Scale were also used here. Titan Universal Strength Tester Machine was used for the determination of the seam strengths which is shown in Fig 1 and the specification of the machine is given in Table 1. High Speed Lock Stitch Machine that was used for making the seams is shown in Fig 2 and the specification of the machine is given in Table 2.

Fig. 1 Titan Universal Strength Tester

Fig. 2 High Speed Lock Stitch Machine

Table- 1 Specifications of Titan Universal Strength Tester

Features	Measuring Principle	Accuracy of Load Cells Class	Speed Accuracy	Maximum Stroke	Total Vertical Stroke	Positional Accuracy	Working Pressure	Minimum Flow	Warranty
Specification	Constant Rate of Extension (CRE)	0.5 (±0.5%) from 2 - 100% of load cell capacity	±0.005%	660mm	885mm	± 0.00125mm	7-10 bar, 700-1000 kPa, 100-145 psi	17 litres per minute	18 months

Table- 2 Specifications of High Speed Lock Stitch Machine

Features	Machine Name	Country of origin	Company Name	Machine Speed	Stitch Class	Number of thread
Specification	High Speed Lock Stitch Sewing Machine	China	YAMATA	2500-3000 r.p.m.	300	2 (1 needle thread, 1 bobbin thread)

METHODOLOGY

The research work was done in two steps which are: Step-1 (Comparison of Seam Strength for Different Seam Classes Produced by Using Same Sewing Thread Count) is shown in Fig 3; Step-2 (Comparison of Seam Strength for Same Seam Class Produced by Using Different Sewing Thread Counts) is shown in Fig 7. In the first step, we produced Superimposed Seam (Fig 4), Lapped Seam (Fig 5) and Bound Seam (Fig 6) by using Tex-27 sewing thread. We followed ASTM D1683-04 method's sample size to produce the seams. In the same way we produced Superimposed Seam, Lapped Seam & Bound Seam for Tex-60, Tex-80 & Tex-120 respectively. Then we compared the seam strength of Superimposed Seam, Lapped Seam & Bound Seam produced by using Tex-27 sewing thread. The process was repeated for Tex-60, Tex-80 & Tex-120 sewing thread. Stitch Density was 4.5 for all the seams

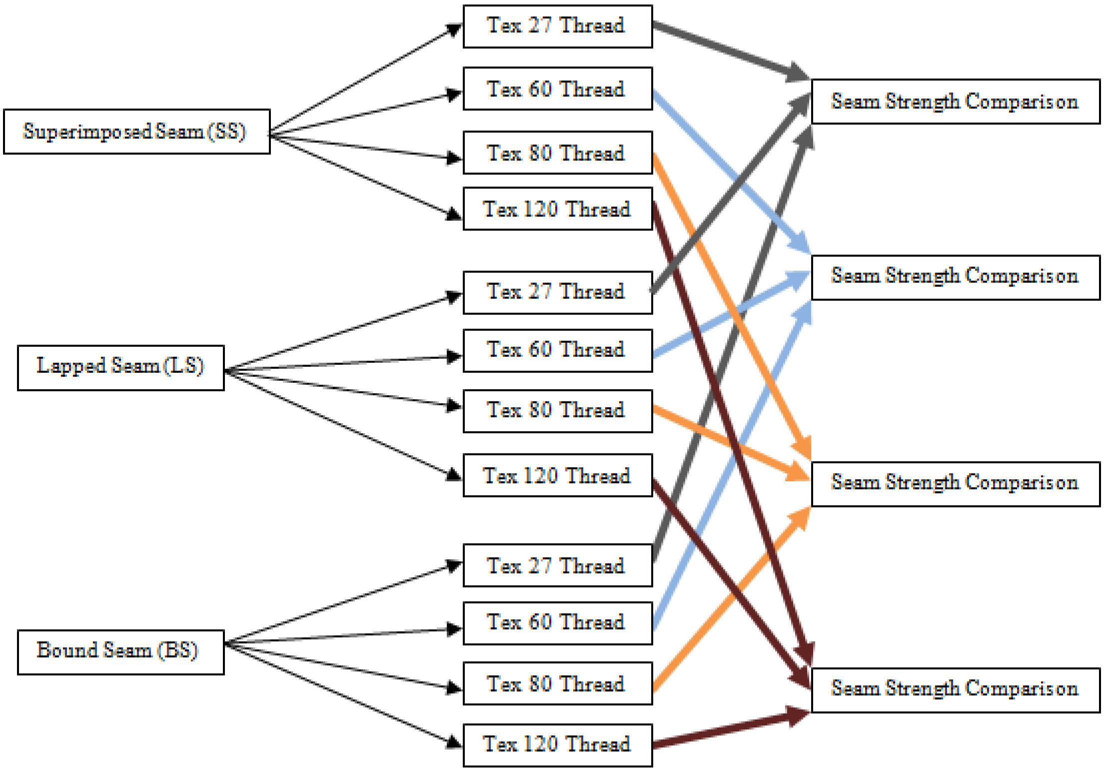

Fig. 3 Step-1 (Comparison of Seam Strength for Different Seam Classes Produced by Using Same Sewing Thread Count)

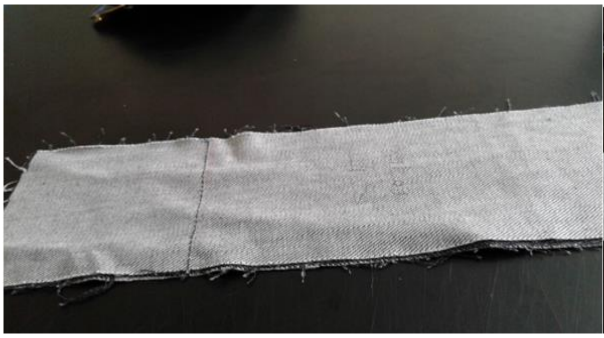

Fig. 4 Superimposed Seam

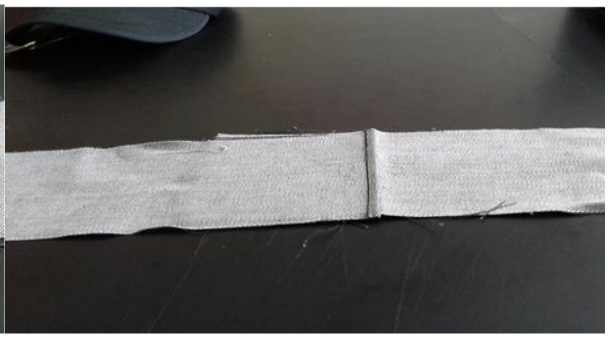

Fig. 5 Lapped Seam

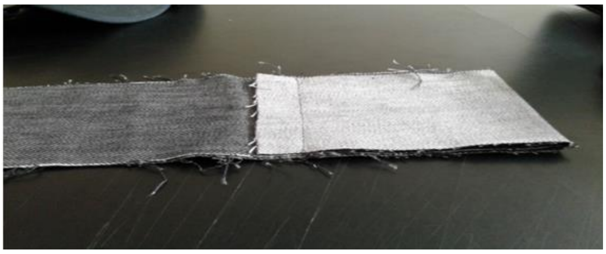

Fig. 6 Bound Seam

In the second step at first we produced Superimposed Seam by using Tex-27, Tex-60, Tex-80 and Tex-120. We followed ASTM D1683-04 method's sample size to produce the seams. Then we compared the seam strengths of Superimposed Seams produced by using Tex-27, Tex-60, Tex-80 and Tex-120. We repeated the process for Lapped Seam and Bound Seam respectively. Stitch density in this step was as same as step-1 which was 4.5.

Seam Preparation: In the research work, the seams which were used to get the data were produced by following ASTM D1683-04. Each specimen of the fabric was cut in the warp direction into 350 mm (14 inches) perpendicular to the proposed seam, with 250 mm (10 inches) on one side of the seam and 100 mm (4 inches) on the opposite side of the seam, and a width of 100 mm (4 inches) parallel to the stitch line(s) of the seam. The Cut Specimen Dimension from fabric and Seamed Specimen Placement in Clamp are shown in Fig 8 and Fig 9 respectively.

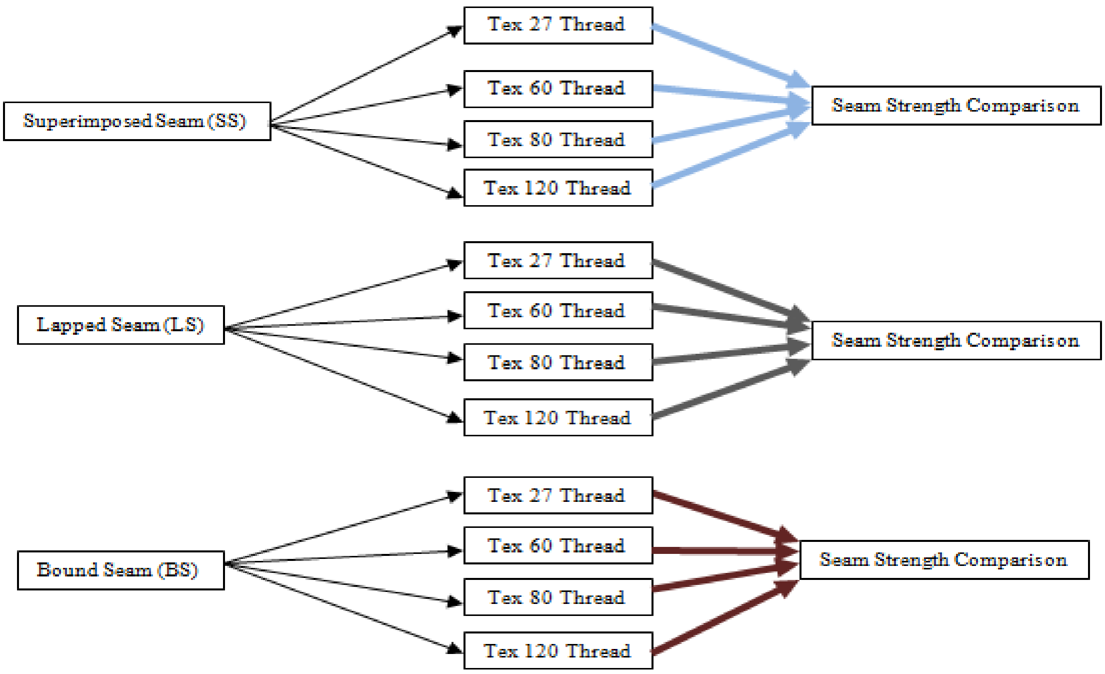

Fig. 7 Step-2 (Comparison of Seam Strength for Same Seam Class Produced by Using Different Sewing Thread Counts)

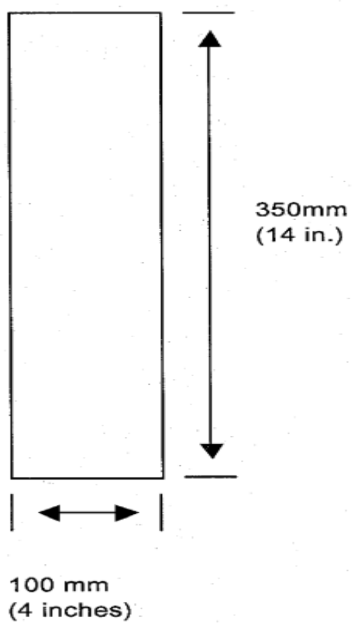

Fig. 8 Cut Specimen Dimension from fabric

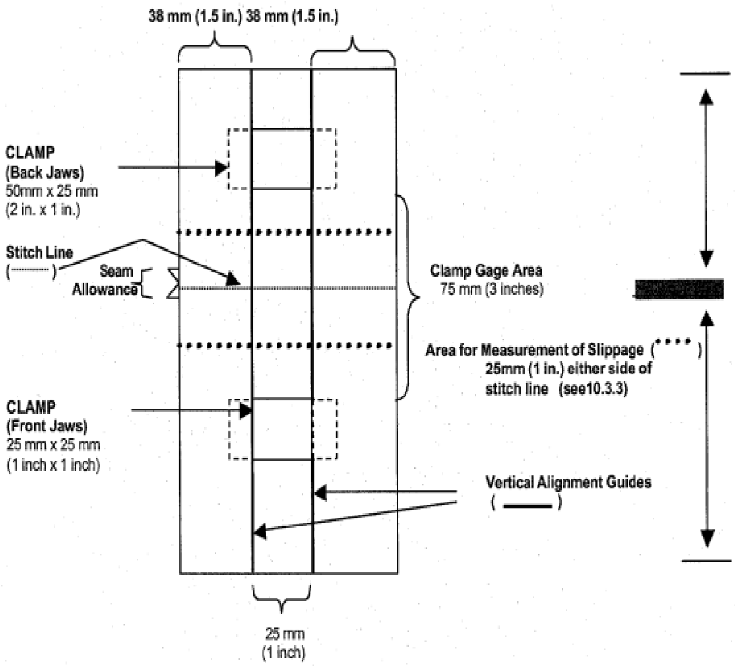

Fig. 9 Seamed Specimen Placement in Clamp

RESULTS AND DISCUSSIONS

Table- 3 Comparison of Seam Strength for Different Seam Classes Produced by Using Different Sewing Thread Counts

Types of Seam	Average Seam Strength (N)			
	Tex 27	Tex 60	Tex 80	Tex120
Superimposed Seam	162.208	195.15	234.387	271.654
Lapped Seam	80.417	163.137	262.043	308.528
Bound Seam	102.77	207.516	242.625	265.966

Comparisons of seam strength for different seam classes produced by using same sewing thread count are summarized in Table 3 and the comparison of seam strength is shown in the above graphs (Fig. 10-13).

Step-1 (Comparison of Seam Strength for Different Seam Classes Produced by Using Same Sewing Thread Count)

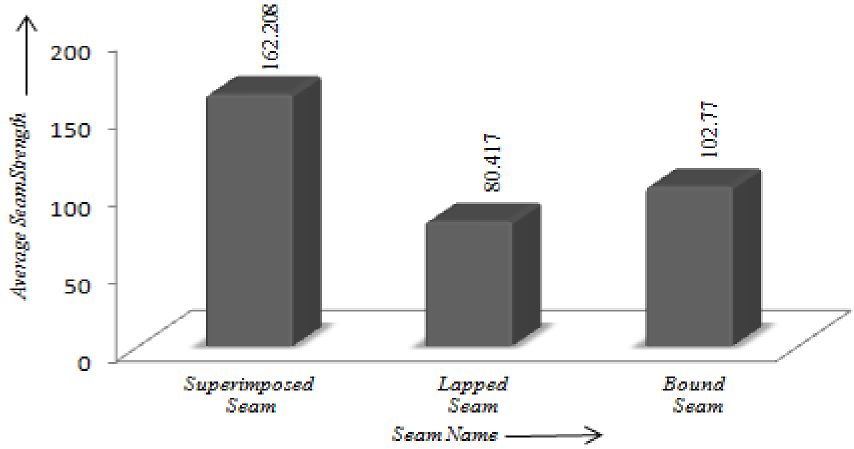

Fig. 10 Seam Strength Comparison for Tex-27 Sewing Thread

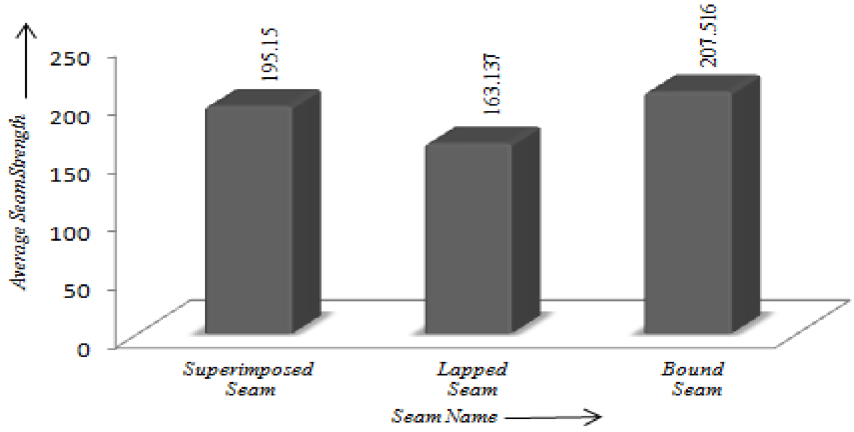

Fig. 11 Seam Strength Comparison for Tex-60 Sewing Thread

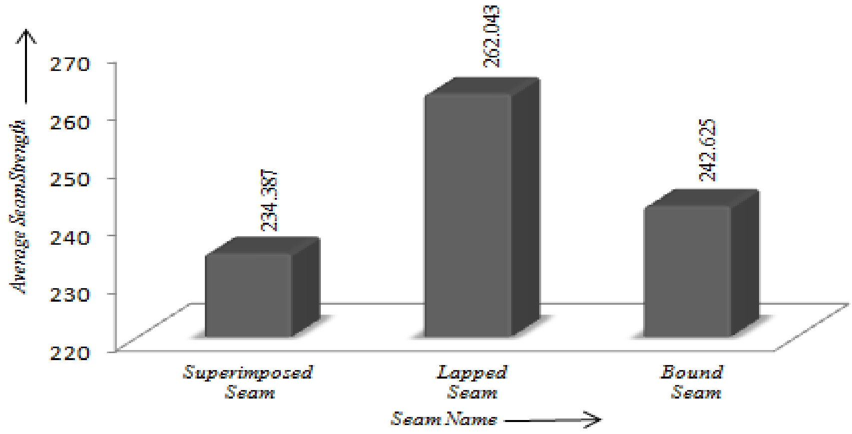

Fig. 12 Seam Strength Comparison for Tex-80 Sewing Thread

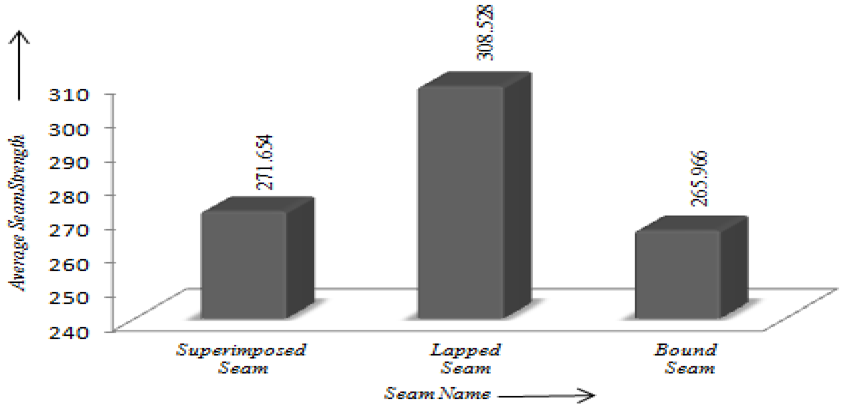

Fig. 13 Seam Strength Comparison for Tex-120 Sewing Thread

From Fig. 10, we can see that the average seam strength of Superimposed Seam is highest, average seam strength of Lapped Seam is lowest and average seam strength of Bound Seam is in between for Tex-27 sewing thread. So, it is clear from Fig. 10 that Superimposed Seam is the most suitable seam when using Tex-27 sewing thread for producing the seams whereas Lapped Seam is the worst choice while using Tex-27 sewing thread. For Tex-60 sewing thread Bound Seam exhibits highest seam strength and lapped seam shows lowest seam strength. For Tex-80 sewing thread Lapped Seam exhibits highest seam strength and Superimposed Seam shows lowest seam strength. For Tex-120 sewing thread Lapped Seam exhibits highest seam strength and Bound Seam shows lowest seam strength. So to ease the view we can show the comparison of average seam strengths for different sewing thread counts as follows:

i) The sequence of average seam strength when using Tex-27 sewing thread for producing seams:
Superimposed Seam > Bound Seam > Lapped Seam

ii) The sequence of average seam strength when using Tex-60 sewing thread for producing seams:
Bound Seam > Superimposed Seam > Lapped Seam

iii) The sequence of average seam strength when using Tex-80 sewing thread for producing seams:
Lapped Seam > Bound Seam > Superimposed Seam

iv) The sequence of average seam strength when using Tex-80 sewing thread for producing seams:
Lapped Seam > Superimposed Seam > Bound Seam

The above graphs and sequences of average seam strength it is clear that with the variation of sewing thread count the name of the most suitable seam changes for the respective sewing thread size. According to many researchers, various factors affect seam strength and these comprise of sewing thread, sewing condition and others [10-11]. Improper use of sewing thread size directly affects seam quality and seam strength is one of the parameters of seam quality [12]. From the above graphs and sequences of average seam strength it is clear that suitability of seam may vary with the variation of thread size.

Step-2 (Comparison of Seam Strength for Same Seam Class Produced by Using Different Sewing Thread Counts)

Comparisons of seam strength for same seams produced by using different sewing thread counts are summarized in Table 3 and the comparison of seam strength is shown in the above graphs (Fig. 14). Sequence of average seam strength for Superimposed Seam, Lapped Seam & Bound Seam for Tex-27, Tex-60, and Tex-80 and Tex-120 are as follows:

i) Average seam strength sequence for Superimposed Seam produced by using different sewing thread counts is:

Seam Produced by Using Tex-27 Sewing Thread > Seam Produced by Using Tex-60 Sewing Thread > Seam Produced by Using Tex-80 Sewing Thread > Seam Produced by Using Tex-120 Sewing Thread

ii) Average seam strength sequence for Lapped Seam produced by using different sewing thread counts is:

Seam Produced by Using Tex-27 Sewing Thread > Seam Produced by Using Tex-60 Sewing Thread > Seam Produced by Using Tex-80 Sewing Thread > Seam Produced by Using Tex-120 Sewing Thread

iii) Average seam strength sequence for Superimposed Seam produced by using different sewing thread counts is:

Seam Produced by Using Tex-27 Sewing Thread > Seam Produced by Using Tex-60 Sewing Thread > Seam Produced by Using Tex-80 Sewing Thread > Seam Produced by Using Tex-120 Sewing Thread

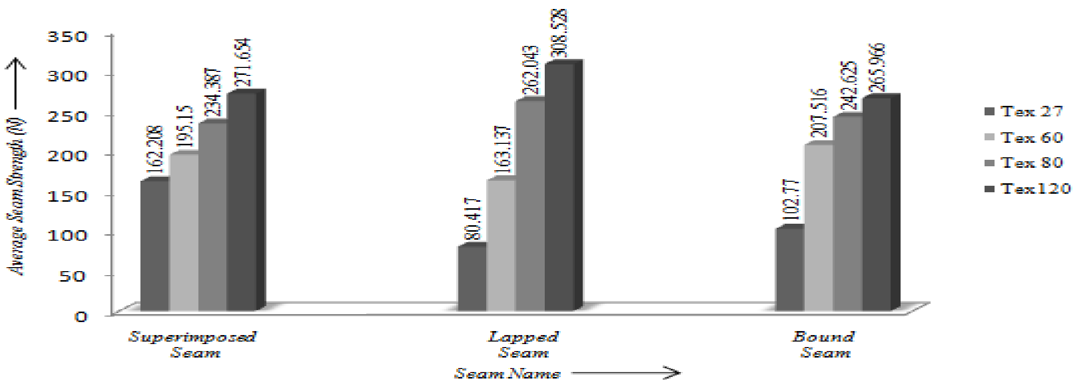

Fig. 14 Comparison of Seam Strength for Same Seam Produced by Using Different Sewing Thread Counts

The above graph (Fig. 14) and sequences of average seam strengths for Superimposed Seam, Lapped Seam & Bound Seam each of which were produced by using Tex-27, Tex-60, Tex-80 and Tex-120 sewing thread counts show a definite trend. An ascending trend is seen for each seam produced by using different thread sizes. The above graph (Fig. 14) shows that average seam strength for Superimposed Seam increases with the increment of sewing thread size. The sequence of average seam strength is also same for both Lapped Seam & Bound Seam. It may be due to the fact that higher thread size holds the fabric plies more firmly than the lower size thread and this happens due to the fact that higher thread size gives higher cover factor to the sewing thread. So, from Fig. 14 and above sequences of Step-2 it is clear that seam strength increases with increment of sewing thread size for same seam.

CONCLUSION

The results of this research work indicate that sewing thread size is directly related to seam strength which is a component of seam quality. During the research work two major things were mainly found: a) suitability of the seam changes with sewing thread size or count, b) seam strength of a seam increases with the increment of sewing thread size.

It is quite clear from the research work that improper use of sewing thread directly affects seam strength as well as seam quality. So, the choice of appropriate sewing thread size or count is very much important for seam strength as well as better quality garment product. It is expected that this project work would be beneficial for the sewing thread manufacturing companies as well as garment industries.

Acknowledgements
The author acknowledges sincere thanks to the concerned people of the institutes and industries who were supportive during this work. The Author also would love to thank Ahsanullah University of Science and Technology, Southeast University and other laboratories that were used for this research work and all other peoples who were somehow related in the research work.

Conflicts of Interest
The author declares that there is no conflict of interest regarding the publication of this paper.

REFERENCES

[1] H Carr and B Latham, *The Technology of Clothing Manufacture,* Second Edition, Blackwell Science, Oxford, London, **1994.**
[2] BK Behera and S Sharma, Low Stress Behaviour and Sewability of Suiting and Shirting Fabrics, *Indian Journal of Fiber and Textile Research,* **1998,** 23(4), 233-241.
[3] PK Chowdhury, Improvement in Seam Performance of Jute Bags, *Indian Journal of Fiber and Textile Research,* **2000,** 25 (3), 206-210.
[4] S Bhalerao, AS Budke and SP Borkar, Seam Performance in Suiting, *Indian Textile Journal,* **1997,** 107 (11), 78-81.
[5] Tsung-Huang Lin, Construction of Predictive Model on Fabric and Sewing Thread Optimization, *Journal of Textile Engineering,* **2004,** 50 (1), 6-11.
[6] RA Mohanta, Study on the Influence of Various Factors on Seam Performance, *Asian Textile Journal,* **2006,** 15(10), 57-62.
[7] N Tarafder, R Karmakar and M Mondol, The Effect of Stitch Density on Seam Performance of Garments Stitched from Plain and Twill Fabric, *Man-Made Textiles in India,* **2007,** 50 (8), 298-302.
[8] K Shimazaki, Studies on Seam Strength-Tensile Seam Strength Sewed by Hand, *Japanese Resource Association of textile End-Uses,* **1976,** 20, 317-327.
[9] U Chowdhury and D Poynor, Impact of Stitch Density on Seam Strength, Seam Elongation and Seam Efficiency, *International Journal of Consumer Studies,* **2005,** 30 (6), 561-568.
[10] V Dobilaite and M Juciene, The Influence of Mechanical Properties of Sewing Threads on Seam Pucker, *International Journal of Clothing Science and Technology,* **2006,** 18 (5), 335-345.
[11] DH Brain, The Prediction of Strength of Lockstitch Seams in Woven Fabric, *Journal of Textile Institute,* **1970,** 61 (10), 493-505.
[12] RS Rengasamy, VK Kothari, R Alagirusami and S Modi, Studies on Air-Jet Textured Sewing Threads, *Indian Journal of Fibre and Textile Research,* **2003,** 28 (3), 281-287.