BOMBARDIER
Toronto (de Havilland)
PROPRIETARY INFORMATION

PPS 3.06

PRODUCTION PROCESS STANDARD

Serving Elastic Cord Assemblies

Issue 7
- This standard supersedes PPS 3.06, Issue 6.
- Vertical lines in the left hand margin indicate changes over the previous issue.
- Direct PPS related questions to PPS.Group@aero.bombardier.com or (416) 375-4365.
- This PPS is effective as of the distribution date.

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	Quality	

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for serving all types of elastic cord assemblies.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction and the procedure specified must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives. This PPS shall take precedence over engineering orders and drawings regarding the length of serving or tolerance of the overall length of assembly.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS. Similarly, the procedure and requirements specified in this PPS are not applicable when use of a BAPS, MPS, LES or P. Spec. is specified.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 PPS 13.26 - General Subcontractor Provisions.

3.2 PPS 15.01 - Part Marking of Aircraft Parrs and Assemblies.

3.3 PPS 25.53 - EC2262 Adhesive.

4 Materials and Equipment

4.1 Materials

4.1.1 Elastic cord, as specified on the Engineering drawing.

4.1.2 Bushings, shackles, hooks, etc. as specified on the Engineering drawing.

4.1.3 Thimbles, corrosion resistant steel, AN100C, sizes as specified on the Engineering drawing.

4.1.4 Serving cord, Barbours No. 9 Unwaxed (Material Code Y801010).

4.1.5 Adhesive tape, Fibreglass, DSC91-2-1A and DSC91-2-3A (1/2" and 1" wide).

4.2 Equipment

4.2.1 Stretch winch and vise with bench hook.

4.2.2 Nylon stretch loop.

4.2.3 Ruler and rubber mallets.

4.2.4 Hand spool and spool winder.

5 Procedure

5.1 General

5.1.1 The operator shall determine the length of elastic cord required to make up the assembly, as specified by the engineering drawing.

5.1.2 Wrap the cord with two turns of 1" wide masking tape at the point of cutting to prevent fraying and expansion.

5.1.3 Use only corrosion resistant steel thimbles as specified by the engineering drawing for assemblies served according to this PPS.

5.1.4 Install all attachment parts such as shackles or hooks, in the thimble or loop before welding or serving, as applicable.

5.1.5 Bend out the pointed ends of the thimbles at an angle of approximately 45° as shown in Figure 1 before commencing serving.

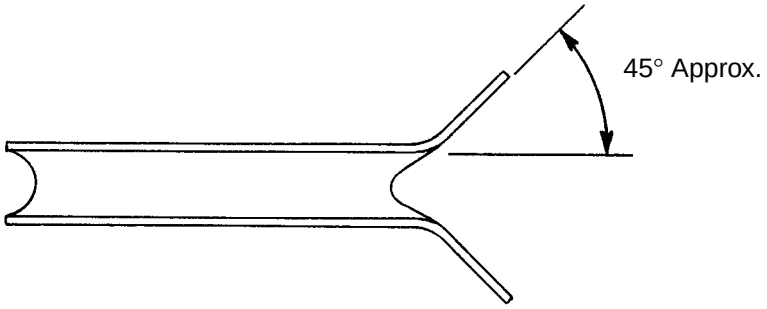

Figure 1 - Side View of Thimble

5.1.6 For thimbles used for multiple strand assemblies according to section 5.3 and thimbles having large gaps at the throat, tack weld at the throat while holding in a vise to close the gap.

5.1.7 Fill the hand spool with serving cord using the spool winder.

5.1.8 Prepare a service loop as shown in Figure 2, using serving cord.

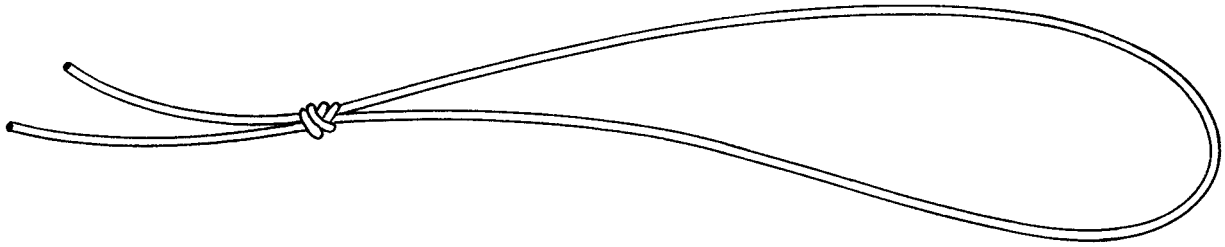

Figure 2 - Service Loop

5.2 Serving Single Strand and V-Shaped Assemblies

5.2.1 Serve single strand and V-shaped assemblies as follows:

Step 1. Wrap the elastic cord snugly around the thimble or bushing as shown in Figure 3 and tie the two strands with a stretch loop.

On loops not fitted with a thimble or bushing, form a loop as specified on the engineering drawing and tie the two strands with the stretch loop. Mark the point at which the serving is to start on the elastic cord (see Figure 4).

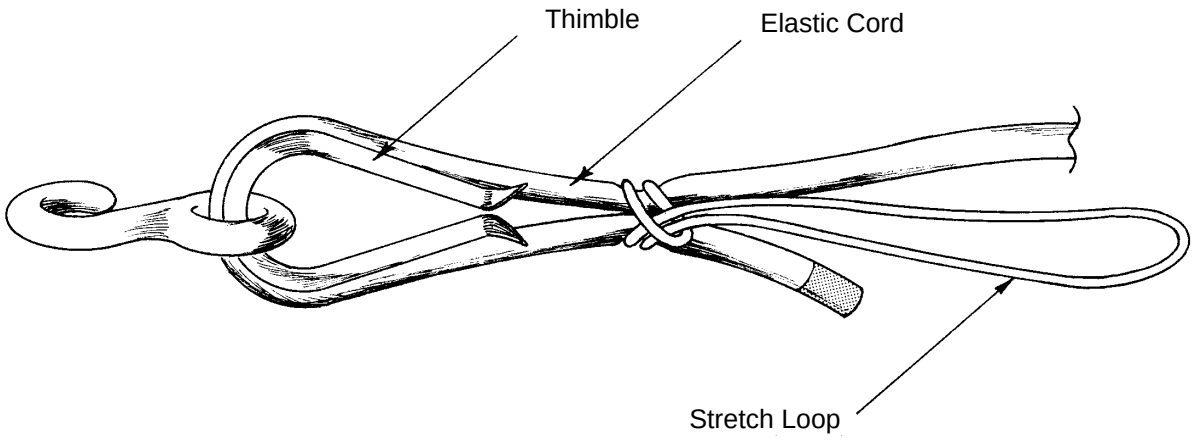

Figure 3 - Loop Fitted with Thimble

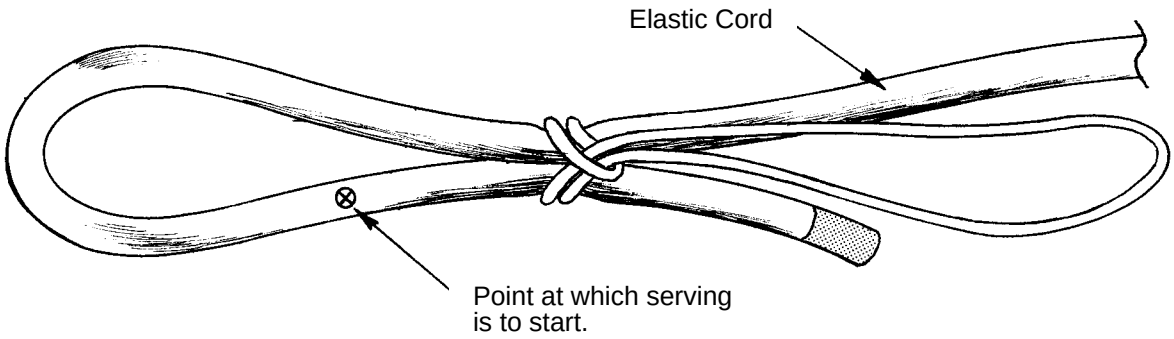

Figure 4 - Loop without Thimble

Step 2. Place the elastic cord loop over the bench hook and the stretch loop over the hook on the stretch winch.

Step 3. Using the winch, stretch the elastic cord loop to an elongation of l00% and secure the winch.

Step 4. Using the hand spool of serving cord, tie a clove hitch around one strand of the elastic cord.

- On terminals fitted with thimbles, position the clove hitch in line with the root of the thimble as shown in Figure 5.
- On terminals fitted with circular bushings, tie the clove hitch at the point where the two strands will touch when pulled together, as shown in Figure 6.
- On terminals with no thimble or bushing, tie the clove hitch at the point at which serving is to start (see Figure 4).

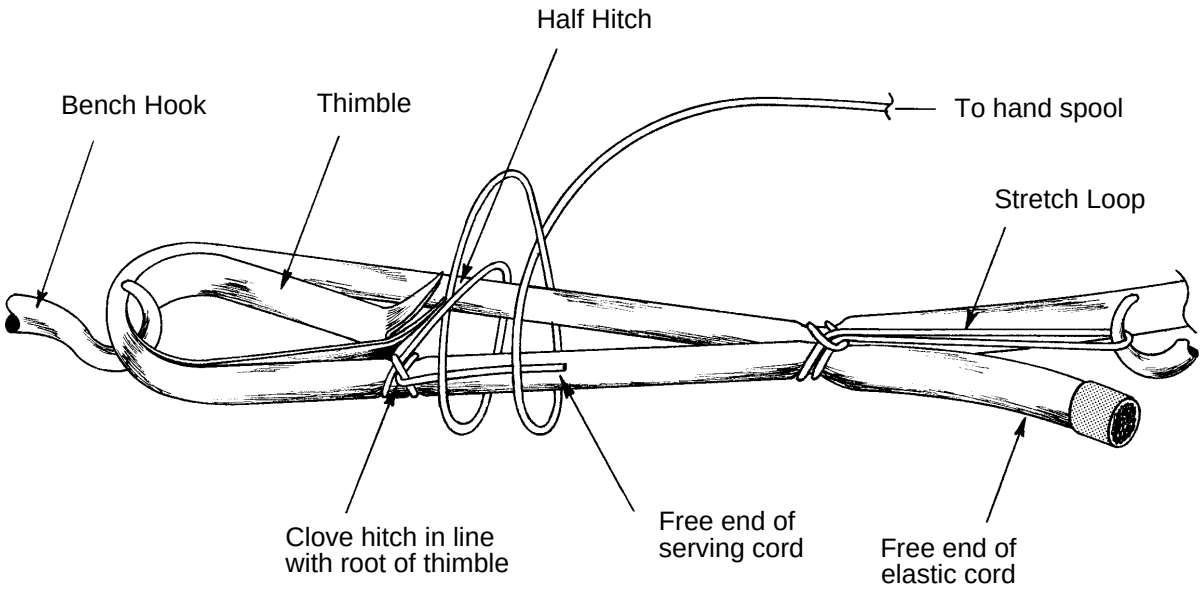

Figure 5 - Starting Serving on Loop with Thimble

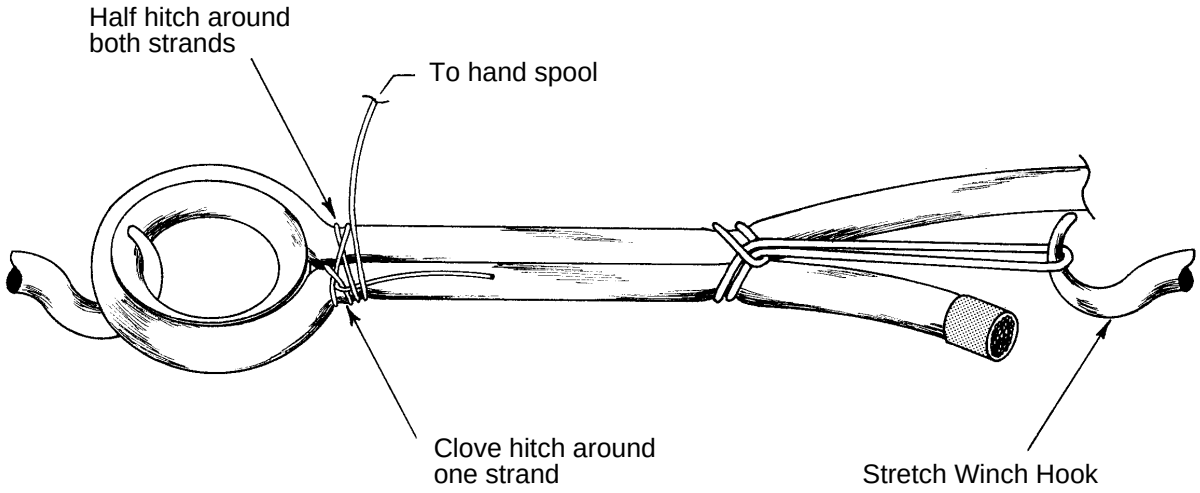

Figure 6 - Starting Serving on Loop with Bushing

Step 5. Cut the free end of the serving cord leaving approximately 1" and place it along the elastic cord. With the other end of the serving cord, tie a half hitch around both strands of the elastic cord as shown in Figure 5, and draw the two strands together, as shown in Figure 6. If a thimble is used, the half hitch and first few wrappings must pass under the upturned points of the thimble.

Step 6. Wrap the serving cord so that each turn butts tightly against the previous turn while maintaining a constant tension. Lock the serving every fourth turn using a half hitch and tighten with a sharp pull on the hand spool. The length of the first layer of serving shall be approximately 5 times the free diameter of the elastic cord and shall be finished with a clove hitch. Do not cut the serving cord.

Step 7. On terminals fitted with thimbles, apply 1 1/2 turns of 1/2" wide fiberglas tape to cover the serving under the thimble points, lightly tap down the points of the thimble until they lie flat against the fiberglas tape and apply 1 1/2 turns of 1/2" wide fiberglas tape to cover the thimble points.

Step 8. Apply the second layer of serving, wrapping the serving cord so that each turn butts tightly against the previous turn while maintaining a constant tension. When the serving is within the last eight to ten turns, place the prepared service loop along the serving as shown in Figure 7 and complete the second layer of serving. If thimbles are used, ensure that the second layer of serving extends approximately 3/16" beyond the root of the thimble and completely covers the fiberglas tape (see Figure 8). For all other types of terminals, completely cover the first serving.

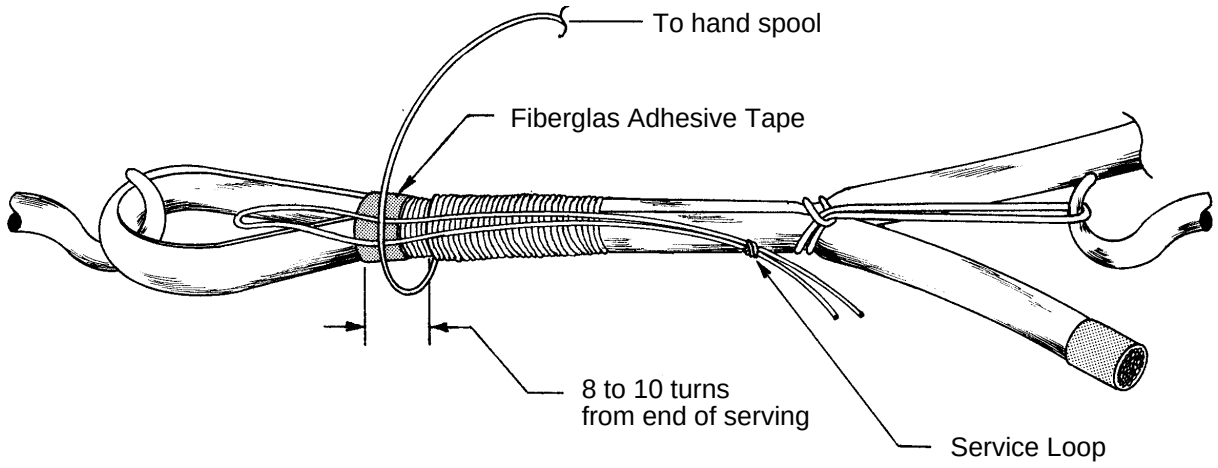

Figure 7 - Placement of Service Loop

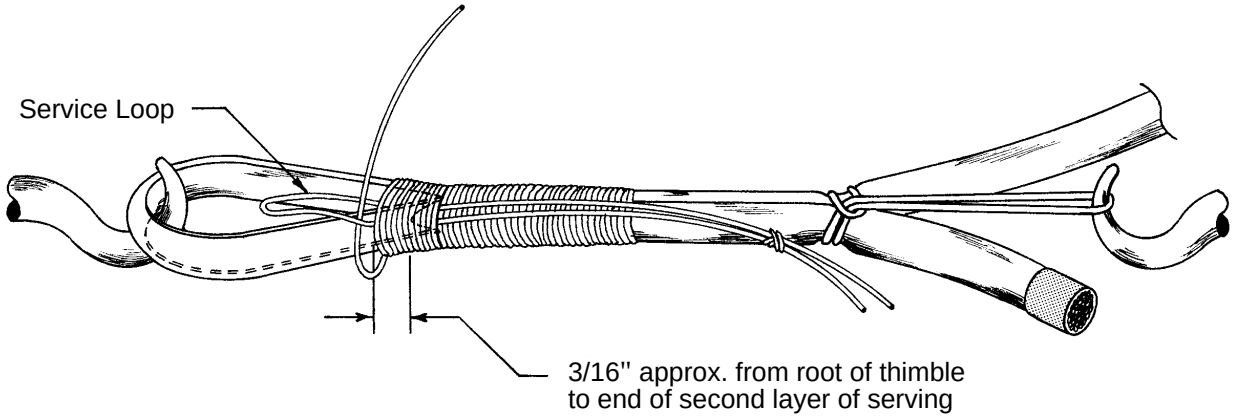

Figure 8 - Completing the Serving

Step 9. Cut the serving cord leaving a free end approximately 2" long.

Step 10. Pass the free end of the serving cord through the service loop as shown in Figure 8 and use the service loop to pull it underneath the serving. Take care to avoid pulling the free end through in an area where a cavity exists under the serving.

Step 11. Trim the free end of the serving cord close to the serving.

Step 12. Release the winch tension and remove the stretch loop from the assembly.

Step 13. Gently tap the serving with a rubber mallet to equalize pressure in the serving,

Step 14. Wrap the free end of the elastic cord, as close to the serving as possible, with 1 1/2 turns of 1" wide fiberglas tape.

Step 15. Trim the free end of the elastic cord to a length equal to 1 1/2 times the cord diameter as shown in Figure 9.

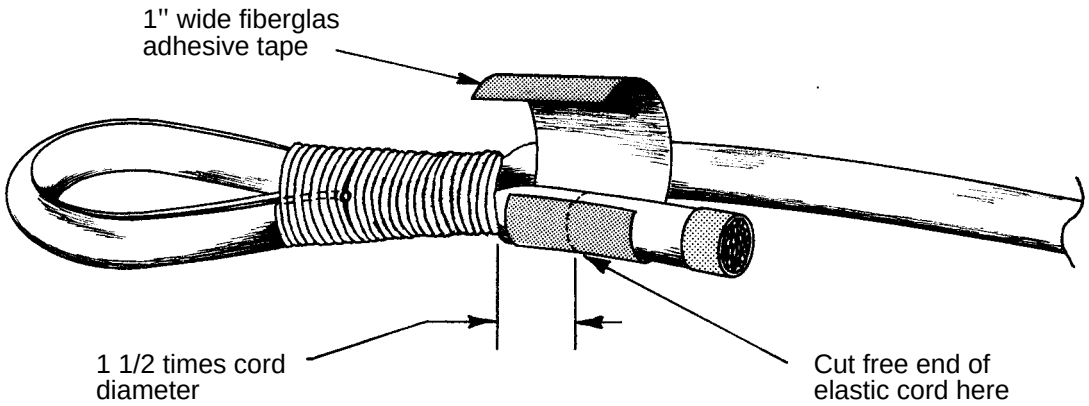

Figure 9 - Trimming Free End of Elastic Cord

5.3 Serving Double Strand Elastic Cord Assemblies

Step 1. Prepare the first terminal according to section 5.2.

Step 2. Form a loop with the elastic cord so that when the second terminal is made, the length of the assembly will conform to the engineering drawing requirement.

Step 3. Thread the end of the elastic cord through the thimble and form a snug loop around the first terminal.

Step 4. Tie this loop with the stretch loop and stretch to an elongation of 100% (see Figure 10).

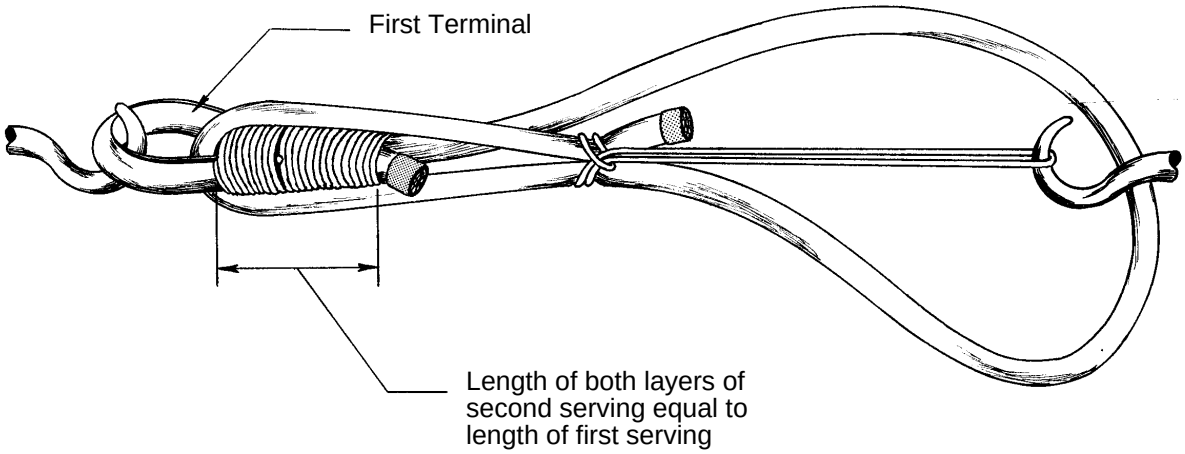

Figure 10 - Serving Double Strand Elastic Cord Assembly

Step 5. Using the hand spool of serving cord, tie a clove hitch around one strand of the elastic cord in line with the end of the first serving at the thimble.

Step 6. Serve the terminal according to section 5.2. The length of both layers of the second serving must be equal to the length of the first serving.

Step 7. Prepare and serve the second terminal at the opposite end of the assembly according to section 5.2. Ensure that both cords are of equal length (see Figure 11).

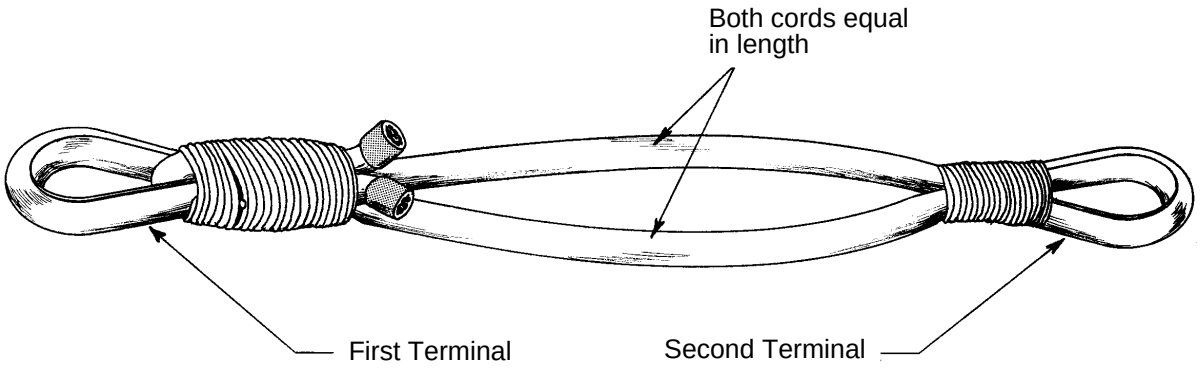

Figure 11 - Double Strand Elastic Cord Assembly

5.4 Sealing of Servings and Cord Ends

5.4.1 Seal the servings and cord ends by applying two coats of EC2262 sealer according to PPS 25.53. Allow 2 hours drying time between coats.

5.5 Part Marking

5.5.1 Part mark completed assemblies according to PPS 15.01.

6 Requirements

6.1 General

6.1.1 The serving on elastic cord assemblies must be of uniform appearance. Loose or torn strands on the serving are not acceptable.

6.1.2 The length of serving must be 5 to 6 times the free diameter of the elastic cord. If thimbles are used, the length of serving must extend approximately 3/16" beyond the root of the thimble and completely cover the fiberglas tape applied over the thimble points.

6.1.3 The serving and taped ends of the elastic cord must be coated according to section 5.4 on completion of serving.

6.2 Proof Loading

6.2.1 Proof load test all served elastic cord assemblies at an extension equal to 75 % of the original length for MIL-C-5651 Type I and II cord or 100 % of the original length for MIL-C-5651 Type III cord.

- The original length and proof load extension shall be measured between the servings of the assembly.
- “V” shaped assemblies shall have the two strands tested separately.
- There must be no evidence of slippage of the elastic cord through the serving or loosening of the serving strands.
- Check that the length of the elastic cord assembly after proof loading conforms to the dimensions specified on the engineering drawing. If the engineering drawing shows only one dimension for the length of the assembly, consider this dimension as being the maximum length; the minimum length being 1/4" shorter.

6.2.2 Proof load one assembly from each production batch for 16 hours as follows:

Step 1. Measure the length of each serving on the assembly and stretch the assembly, using a bench test fixture, to increase the length of cord between the two servings at an extension equal to 75 % of the original length for MIL-C-5651 Type I and II cord or 100 % of the original length for MIL-C-5651 Type III cord.

Step 2. After proof loading for 16 hours, remove the assembly from the test fixture.

Step 3. Allow 5 minutes for recovery and measure the length of each proof loaded serving. The maximum acceptable elongation of the serving after 16 hours proof load is 1/16". There must be no evidence of slippage of the elastic cord through the serving or loosening of the serving strands. If the assembly does not meet the requirements, refer the represented batch to MRB for disposition.

7 Safety Precautions

7.1 Observe general shop safety precautions when performing the procedure specified herein.

8 Personnel Requirements

8.1 Personnel responsible for serving elastic cord assemblies must have a good working knowledge of the procedure and requirements as specified herein and must have exhibited their competency to their supervisor.