

	Standard	Technology
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Compiled by

**J Hlabangana
Senior Engineer**

Date: 13/03/2013

Approved by

**A Wiid
Corporate specialist**

Date: 13/03/2013

Authorised by

**I Atiya
Acting Discipline Manager
Bulk Materials Handling**

Date: 13/03/2013

Approved by TDAC

**D Odendaal
TDAC Chairperson**

Date: 23/7/2013

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1. INTRODUCTION

- a. This working document identifies steps to be followed by Generation Group personnel when splicing textile/ply conveyor belt and conducting a quality review during splicing.
- b. This document is to be used to control quality during splicing of the textile/ply belting throughout Eskom Power Stations, it also outline the responsibility of different parties.
- c. In undertaking splicing, the Splicer, his personnel and the personnel of the client shall comply to the ruling Safety Regulations and Codes of the client.
- d. The instruction and procedures given in this docement shall be observed at all times during the preparation and manufacture of joints in conveyor belting.

2. SUPPORTING CLAUSES

2.1 SCOPE

- a. Even with recent improvements in the rubber chemistry relative to static and dynamic ply adhesion, splices continue to represent the weak link in conveyor systems and even more so in fabric reinforced textile/ply belting.
- b. The splice is needed to join the ends of a length of conveyor belting to create an endless belt and needs to be done in-situ. The splicing activities are often executed under difficult atmospheric conditions and time constraints.

2.1.2 Purpose

2.1.3 Applicability

To increase the splice life expectancy on textile/ply belting on all Power Stations by providing the user with the quality manual to be used for quality control during belt splicing.

- Literature survey.
- Site visits to witness textile belt splicing.
- Develop splicing procedure illustration for textile/ply belt.
- Compile Quality Control Plan (QCP).

2.2 NORMATIVE/INFORMATIVE REFERENCES

In order to increase the splice life expectancy on textile/ply belting, this quality plan should be followed as outlined under the following topics:

2.2.1 Normative

- [1] Appendix A: Reference checklist Appendix B: Tool checklist
- [2] Appendix C: Quality control plan Appendix D: Inspection checklist Appendix E: Data sheet
- [3] Appendix F: Shore hardness mapping Appendix G: Procedure illustrationAppendix A: Reference checklist Appendix B: Tool checklist
- [4] Appendix C: Quality control plan Appendix D: Inspection checklist Appendix E: Data sheet
- [5] Appendix F: Shore hardness mapping Appendix G: Procedure illustration

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2.2.2 Informative

None

2.3 DEFINITIONS

2.3.1 Classification

Controlled Disclosure: Controlled Disclosure to external parties (either enforced by law, or discretionary).

2.4 ABBREVIATIONS

Abbreviation	Description
Portfolio	MATERIALS HANDLING - POWER GENERATION
Report Number	RES/RR/02/19324
Project Number	PRJ02-00246600-1350
Project Leader	Goitse Choabi
Contact Number	629 5424
Customer	Research

2.5 ROLES AND RESPONSIBILITIES

None

2.6 PROCESS FOR MONITORING

None

2.7 RELATED/SUPPORTING DOCUMENTS

None

3. TEXTILE PLY BELT SPLICING QUALITY CONTROL STANDARD

3.1 CONCLUSIONS

Following a proper stringent splicing procedure and quality control is crucial when splicing conveyor belt to ensure the following:

- Increased splice life expectancy
- Increased splice strength
- Reduced down time due to splice failures
- Increased reliability and availability of conveyor systems
- Reduced expenditure on belt jointing

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3.1.1 RECOMMENDATIONS

- a. It is recommended that this document be read in conjunction with Procedure for on-site Splicing of Plied Textile Conveyor Belting (document no: GGP 1045).
- b. This quality plan should be compiled as an Eskom guideline to support Procedure for on-site Splicing of Plied Textile Conveyor Belting (document no: GGP 1045).

3.1.2 INDUSTRY PERSPECTIVE

Splicing is undertaken in all Eskom Power Stations utilising conveyor belt systems to transport material. These splices are often incorrectly undertaken due to time constraints and unavailability of formal procedure, resulting in premature failures.

3.1.3 KEYWORDS

- a. Textile/Ply belt, Textile/Ply reinforced conveyor belting, Quality assurance, Technical requirement, properties, splicing, test, inspection, checklist, material certification, vulcanising, safety guidance, splicing geometry. RETURN ON INVESTMENT
- b. In total, Eskom Power Stations utilise about 173 km of textile / plied belting to convey both ash and coal. Assuming an average failure rate of textile/ply splice to be once every two years per belt (based on experience), all coal fired Eskom Power Station combined, spend about R 848 620.00 and an additional 3 hours per splicing down time averaged per annum.
- c. The implementation of the quality control plan can double the textile/ply splice life expectancy, yielding a potential saving of about R 424 310.00 and a reduction of 50 % in production loss averaged per annum.

3.2 APPENDIX A (REFERENCE CHECKLIST)

- a. A reference checklist to procedure no. GGP 1045 REV 0 "PROCEDURE FOR ON-SITE SPLICING OF PLIED TEXTILE CONVEYOR BELTING". This procedure provides details from arranging a permit until the splice is commissioned. The procedure outlines the responsibilities of each party (the generation group representative and the splicer). On completion of the splicing, this document must be signed by both the splicer supervisor and the generation group supervisor or engineer.
- b. The client may employ a third party inspection agent or use its own personnel to implement, witness and enforce hold points if necessary. The Contractor shall not proceed beyond a witness point until agreed by third party inspectorate or the client's supervisor.

3.2.1 Appendix B (Tools checklist)

The checklist indicates the minimum tools that are recommended for belt splicing. These tools must be brought to site by the splicing team. Condition of the tools must be checked before leaving to the site and also to ensure that the calibration certificates are valid.

3.2.2 Appendix C (Quality control plan)

A quality control plan supplying the following information:

- The site where splicing is to be carried out.
- The plant where this splice is to be carried out.
- Belt to be spliced.
- Vulcanising press to be used.

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- Splice vulcanising time parameters.
- Comment on the condition of the splice once it is completed.
- The details of the splicer as well as generation group representative.

3.2.3 Appendix D (Inspection checklist)

The client's representative shall have access at all reasonable times to inspect the following during splicing:

- Setting up splicing equipment,
- Alignment of the belt,
- Preparation and assembly of the belt
- Splicing material,
- Curing
- Testing

3.2.4 Appendix E (Data sheet)

- a. Completing the datasheet must commence as soon as the press is switched on. Both the top and bottom element should be recorded against time (every five minutes) for ramping, vulcanising and cooling periods as well as the vulcanising pressure.
- b. The curing parameters are as follows:
 - Temperature: 145°C+/- 2°C
 - Minimum Pressure: 1.2 MPa
 - Time: 3 minutes/mm belt thickness
- c. Note: that it is advisable to consult the materials manufacturer's recommendations with regard to curing times.

3.2.5 Appendix F (Shore hardness mapping)

- a. After completion of the splice, the splice hardness should be measured with a shore hardness tester once the splice has cooled to ambient temperature. Test results must be compared with the data sheet of the splice-kit supplier.
- b. Select 9 places on both the top and bottom covers (i.e. 3 across the leading edge, 3 across the centre and 3 across the trailing edge) and record the hardness obtained. (See page 22).
- c. The average Shore hardness obtained shall be within 50 of the nominal hardness as specified by the materials manufacturer.
- d. Any individual reading of more than 50 below the nominal hardness specified by the materials manufacturer shall be cause for investigation and possible rejection. This deviation must be reported to the client's representative.

3.2.6 Appendix G (Procedure illustration)

This illustrates step by step procedure for splicing textile/ply belting in the following categories:

- Setting up vulcanizing press and tables

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- Procedure for alignment and belt positioning
- Procedure for ply stripping
- Procedure for splice assembly
- Procedure for curing

3.3 APPENDIX H (SPlice COMMISSIONING)

When commissioning the belt after splicing, the following procedure should be followed;

3.3.1 Test and Inspection 2.8.1.1 Dimensions

After dismantling the platens, the joints shall be checked for dimensions and straightness (the maximum edge length deviation is 1.5 mm) and also for any excess rubber which should be removed where necessary.

3.3.2 Soundness

The splice shall be visually examined for blistering and physically examined for soundness. If any sign of poor curing is visible the splice shall be examined by the Splicer Supervisor and the client's representative. The client's representative will decide on the acceptance / rejection of the splice.

3.3.3 Hardness

See Appendix F above

3.3.4 Clear the Permit to work (PTW)

After the splice is completed the contractor has to clear the permit with the client supervisor before the commissioning of the conveyor installation.

3.3.5 Visual

By means of a chalk line create a grid across the entire surface of the splice as follows:-

- Lines at right angles to the belt travel at 100 mm centres.
- Lines in the direction of the belt travel at 100 mm centres. After running the belt check for gross distortion of the grid pattern.

3.3.6 Commissioning

The client's representative must give immediate feedback to the Splicer in respect of any non-conformance (e.g. Splice skewness etc.) after commissioning of the conveyor installation.

3.3.7 Requirements from Contractor by the Client

- a. The contractor when complete with his splice should provide the client with the following:
 - Completed data sheet;
 - Any concerns noted through the vulcanising procedure. 2.8.2 Marking Each splice shall be marked as follows:
 - Markings shall be a minimum of 1.5 mm to 2 mm deep and within 150 mm of the belt edge.
 - Steel stencil plates positioned within the vulcanising press on the return side of the belt.

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- Contractor's name or logo.
 - A unique splice number.
 - Month and year completed
 - Letter size shall be 50 mm (minimum) 2.8.3 Leaving site
- b. After establishing that the joint is sound and neatly made, all equipment shall be cleaned and removed. All waste material shall be removed and the immediate area around where the work has been carried out shall be cleaned.
- c. Finally, the belt shall be commissioned by the client ideally in the presence of the contractor and then re-inspected to ensure that the joint is satisfactory. Documentation, including the signing-off of any permit to work (Workmen's Register), shall be completed and the client advised that the work has been completed.

3.4 CONCLUSION

The success of a splice for textile belting relies on a number of principles that must be satisfied before the process can be continued. The main principles are:

3.4.1 Tools and Equipment

Suitable tools and equipment to complete the desired task within the prescribed time allowed. These tools and equipment must be in a safe and working order and the calibration certificates must be valid where applicable.

3.4.2 The Heating System

The elements must be calibrated in such a way that the desired 3 °C per minute ramp is achievable. The heating element circuit is checked as to provide constant heat across the face. In most cases any cooling facility would be an added advantage. High temperature accuracy is required especially in the vulcanising area of 145 °C zone. The thermocouple readings are normally 10 °C less than the surface contact probe. All monitoring of heating element temperatures should be monitored only with surface contact probes embedded on the raw rubber surface when vulcanising takes place. No thermocouple reading is recorded due to the deviation and influence for the air surrounding the press. Once the press is assembled a blanket is placed over the elements to control the temperature on top and bottom elements throughout the ramp, vulcanising and cooling stages.

3.4.3 The Control System

The control system is a very important part of the overall performance. The controller is viewed as important from the control point of view balancing the temperatures within the desired parameters and more important throughout the vulcanising period.

4. AUTHORISATION

This document has been seen and accepted by:

Name	Designation
	Document Approved by TDAC 16 July 2013

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5. REVISIONS

Date	Rev.	Compiler	Remarks
November 2012	0.1	E Seitei Senior Engineer	Draft Document for review created from RES-RR-02-19324
November 2013	1	E Seitei	Final Document approved

6. DEVELOPMENT TEAM

The following people were involved in the development of this document:

- None

7. ACKNOWLEDGEMENTS

- None

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APPENDIX A:REFERENCE CHECKLIST**8. REFERENCE CHECKLIST**

QP NO	ACTIVITY	ESKOM SPECIFICATION No GGP 1045 Rev 0 CLAUSE NO.	ACTION		
			SPLICER	BUSSINESS UNIT	THIRD PARTY
1	Arrange for permit to work	5.1.7	V	A	A
2	Establish type and class of belt	10.1.1	A		W
3	Establish work station	10.1.2	A		W
4	Check splice proximity	10.1.3	V		W
5 5A	Check materials	10.1.4	V A		V
	Record batch numbers and date of manufacture	10.3.5			W
6	Check splicing equipment	10.5	V		W
7 7A	Set up press and tables	10.6	A		W
	Inspect set up	Appendix F1			
8 8A	Align belt	10.7	A		W
	Inspect alignment	Appendix F2			
9	Remove covers	10.8	A	W	W
		Appendix F3			
10 10A	Trial assemble splice Inspect trial assembly	Appendix F3	A		W
11 11A	Final assemble splice Inspect final assembly	10.9	A		W
		Appendix F4			
12	Pre-cure inspection	Appendix F4			W
13 13A	Cure splice	10.10	A A		W V
	Record cure parameters	11.3.6 - 11.3.10			
14 14A	Inspect splice	6.0 and Appendix F6	A		A V
	Record dimensions	11.3.7			
15	Clear the permit	12.5	H	A	V
16	Commission splice	12.5	H	V	A

ACTION LEGEND: A - ACTION V - VERIFICATION H - HOLD W-WITNESS

NOTE:WHERE A THIRD PARTY IS NOT REQUIRED, THE DUTIES UNDER THE THIRD PARTY COLUMN SHOULD BE PERFORMED BY THE BUSINESS UNIT

SIGNED: _____

SPLICER SUPERVISOR

SUPERVISOR/ENGINEER

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APPENDIX B: TOOLS

The following minimum tools are recommended for belt splicing: These tools must be brought to site by the splicing team. Condition of the tools must be checked before leaving to the site

- Vulcanising press (Wagner or approved equivalent)
- Pressure roller
- Pressure roller (double acting)
- Wire cutter or cable shear
- Wire brush (rotary)
- Polisher
- Rubber mallet
- Standard mallet
- Soft hand brush
- Hand vice/eccentric clamp/frog clamp
- Ratchet rope puller and pulling cables
- Cutting pliers
- Chalk
- Chalk string
- Awl
- Pricker roller
- Scribing knife
- Saddler's knife
- Saddler's pliers
- Cutting knife (straight blade, Don Carlos or equivalent)
- Paring knife (offset blade)
- Scissors
- Screw clamps
- Whetstone
- Steel rule
- 5m Tape measure
- Rubber hardness meter
- Hand drill
- Buffing attachments
- Edge irons
- Set square
- Belt support frames (6 off)

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APPENDIX C: QUALITY CONTROL PLAN**9. QUALITY CONTROL PLAN****SITE INFORMATION**

Site Condition

Accessibility

Weather Temperature (°C) Humidity (%)

Time arrived on site h

PLANT DETAILS

Belt KKS No. Defect No.

Permit No.

Responsible Person Tel Fax:

Time PTW Issued :

Workers Register:

BELT DATA

Location of the conveyor

Incline conveyor ☐ Surface conveyor ☐ Belt Manufacturer

Belt Class:

Approx. Length Insert spec Number of Plies Cover Thickness Top Bottom:

General Condition of Belt :

Rubber Top Cover Type M ☐ Type N ☐Rubber Bottom Cover Type M ☐ Type N ☐Rubber Type Top SBR ☐ NR ☐ IR ☐ NBR ☐Rubber Type Bottom SBR ☐ NR ☐ IR ☐ NBR ☐ Belt Specifications

Batch No:

Belt Width (mm) :

SPLICE DETAILS (Type of Press Used)Press details Wagener ☐ Shaw Almex ☐Other ☐Hydraulic Yes ☐ No ☐Air Cooled Yes ☐ No ☐Water Cooled Yes ☐ No ☐

Press Manufacture

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Country Year of Manufacture Serial No.

Heater Elements 2 ☐ 4

Supporting Beams 3 ☐ 4 5 6

Gauges 2 ☐ 3 4 5

Manufacturer:

Thermometer Yes ☐ No ☐

Temperature (°C)

Difference in Temperature (°C)

Hydraulic Pump (bars) MAX

Compressor (bars) MAX

Power Supply 380V ☐ 525A ☐ 65A ☐

Mobile Diesel Generator Yes ☐ No ☐

Welding Socket Yes ☐ No ☐

Using Diesel Generator Total Amps Red Phase (Amps) White (Amps) Blue Phase (Amps)

SPLICE STANDARDS

Splice type (bias): Normal ☐ Curve Arc ☐ Finger ☐

Splice type: Aged to Aged ☐ New to Aged ☐

Time Started h Complete h

Length of Splice (mm) Hot: ☐ Cold: ☐

Marking of Splice Yes ☐ No ☐

Top Cover Removed Yes ☐ No ☐

Removed Bottom Cover Yes ☐ No ☐

Buffed Leading and Tailing Edge Yes ☐ No ☐

Marked Centre-line of Belt (two tape measures)

Assembled Press Bottom Beams:

Assembled Lower Heater Elements:

Marked and Installed Bottom Cover:

Thickness One Sections Two Sections

Place sections of Belt on Rubber Yes ☐ No ☐

Centre-line Yes ☐ No ☐

Start from Centre Outwards Yes ☐ No ☐

SPLICE VULCANISING TIME

Assembled Press h

Start Diesel Generator/Welding Socket h

Record Amps on Diesel Generator Yes ☐ No ☐ Ambient Temperature Reading (thermometer) (°C)

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Reaching145°C h
Vulcanising Period (X minutes/mm of belt) .
Total Thickness of Belt (mm)
Total Period calculated from belt thickness
Completed Vulcanising Period h (minutes)
Ambient Temperature (°C)
Cooling Down Period (145°C)(START) h
Cooling Down Period (125°C)(COOLING) h
Cooling Down Period (100°C)(COOLING) h
Cooling Down Period (80°C) (COOLING) h
Cooling Down Period (60°C) (COOLING) h
Completed Cooling Down h
Removing of Press h
Cleaning of Area h

CONDITION OF SPLICEPhysical Condition Acceptable Yes ☐ No ☐

Comments:

SPLICER

Date:

Splicer Name:

Contractor :

Job No:

Signature:

ESKOM APPROVAL

Date:

Name:

Position:

Department:

Unique No:

Order No:

Signature:

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APPENDIX D: QUALITY CONTROL PLAN

BUSINESS UNIT: _____ JOB NO: _____

SPLICER NAME: _____ CONTRACTOR: _____

CONVEYOR NO: _____ SPLICE NO: _____

SPLICE LENGTH: _____ SPLICE TYPE: _____ DATE: _____

a. F1 SET UP

- Work station suitable for splicing:
- Top surface of bottom platen level with top of troughing roller:
- Platen edges parallel to direction of run of belt:
- Wooden boards approximately 250 mm wider than belt:
- Top surfaces of boards are same level as top surface of bottom press platen:
- Tables are stable with a minimum length of 3 m:

b. F2 ALIGNMENT

- Belting is lined up in either direction for a minimum distance of 6m
- Belt is central on the conveyor supporting rollers
- Ends overlap on the bottom platen
- Overlap is sufficient
- Centre line is established for a minimum of 6 m
- Chalk reference lines are drawn across the ends of each belt
- Belt is firmly clamped to the platform (outside the splice area)
- Belt has been checked for age
- Splice length according to Table 2

c. F3 CORDS

- Sufficient rubber has been separated from the cords
- Cover strips removed producing a non smooth surface
- Thin layer of rubber covering the steel cord
- Rubber between cords removed leaving a thin film of rubber over the cord.
Cords checked for damage and corrosion Cords suitably protected against Corrosion
- Cords tied together in bundles
- Cords brushed with clean dry brush

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SUPERVISOR/ENGINEER**CONTROLLED DISCLOSURE**

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APPENDIX D: INSPECTION CHECKLIST

(continued)

BUSINNES UNIT: _____ JOB NO: _____

SPLICER NAME: _____ CONTRACTOR: _____

CONVEYOR NO: _____ SPLICE NO: _____

SPLICE LENGTH: _____ SPLICE TYPE: _____ DATE: _____

d. F4 SPLICE ASSEMBLY

- Edges of diagonal cut in the vulcanised rubber chamfered Length of splice is correct
- Roughed with a polisher and buff attachments
- No degradation
- Chamfer cleaned
- Bonding compound cleaned with solvent and dry
- Shirting fabric placed over the bottom platen and smoothed
- Non-vulcanised bottom cover cut to size and shape. Bonding layer uppermost
- Bonding layer and steel cords coated
- Belts aligned
- Cords are parallel
- All cords included in the joint
- No individual cords are cut out
- All spaces filled with bonding compound
- Cords are dry
- Edge of the splice cover stock level with top of cords
- Top cover laid onto cord carcass with bonding layer downwards
- Edges of un-vulcanised splice trimmed to width
- Shirting fabric overlaps ends of the splice Shirting fabric 100 mm wide over each join

e. F5 CURING

- The temperature of the platen is within manufacturers recommendation
- Upper platen is positioned to mach lower platen
- Transverses correctly positioned
- Curing temperature reaches manufacturers recommendation ± 5 °C
- Pre-tensioning bolts are uniformly tightened
- Pressure reaches Manufacturers recommendation

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SUPERVISOR/ENGINEER**CONTROLLED DISCLOSURE**

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APPENDIX D: INSPECTION CHECKLIST

(continued)

BUSINESS UNIT: _____ JOB NO: _____

SPLICER NAME: _____ CONTRACTOR: _____

CONVEYOR NO: _____ SPLICE NO: _____

SPLICE LENGTH: _____ SPLICE TYPE: _____ DATE: _____

f. F6 TESTING

- Dimensions within tolerance
- Edges straight
- No excess rubber
- No blistering
- No lack of adhesion
- Shore hardness within
- tolerance No gross distortion
- of the grid Commissioning
- satisfactory

SPLICER SUPERVISOR

SUPERVISOR/ENGINEER

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APPENDIX E: DATA SHEET

10. DATA SHEET

[illegible]

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APPENDIX F: SHORE HARDNESS MAPPING

11. SHORE HARDNESS MAPPING

COMPLETE CURE RESULTS					
LOCATION	THICK. Mm	SPLICE LENGTH mm	HARDNESS (65 SHORE A +/-5)		
			LOCATION	TOP BRIDGE	BOTTOM BRIDGE
Leading edge			Left hand		
Centre			Centre		
Trailing edge			right hand		
Average hardness					
Nominal hardness					
Conveyor belt hardness					

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APPENDIX G: PROCEDURE ILLUSTRATION

12. PROCEDURE ILLUSTRATION

The quality of the finished splice is highly dependent upon the cleanliness of the work area during all stages of splice preparation. Good work practices and cleanliness go hand in hand and are essential in achieving this goal.

12.1 SPLICE DIMENSION

Individual splice drawings for each splice will be furnished specifying the proper dimensions for assembly.

12.2 MASTER LINE

This is normally the first line to be made on the belt on each of the two ends. The master line is a line drawn straight across the belt width at a distance from the belt end equal to the splice length plus the bias length plus a 50 mm tab length. This method of locating and squaring the master line is as follows:

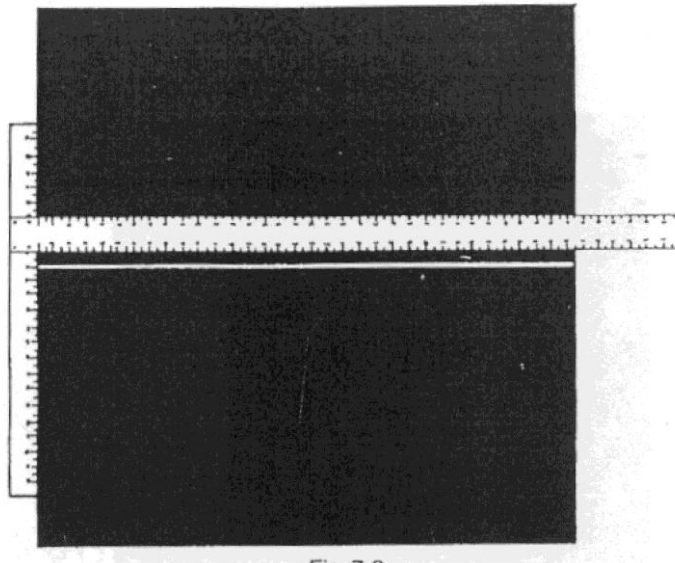


Figure H 1: Square and Straight Edge

- From the end of belt, measure the length of splice plus trim allowance.
- Use a square and straight edge to draw master line
- Check the master line by laying the square along the opposite edge. Repeat the procedure on the other belt.

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12.3 MARKING AND PREPARING FIRST END

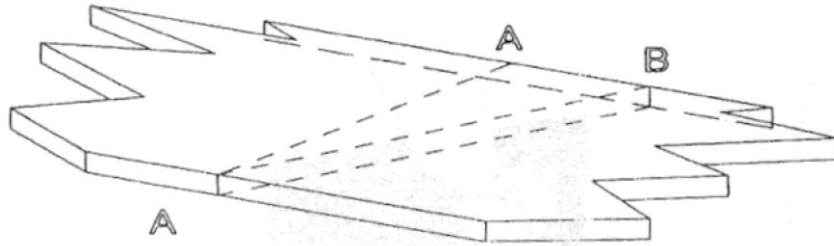


Figure H 2: Square and Straight Edge

- Measure the bias length on the correct edge and mark Point B. The bias length is selected so that the bias will match the vulcaniser angle.
- Draw the bias line AB and mark the edges with a vertical line at these points for opposite cover marking. As in Figure H-3

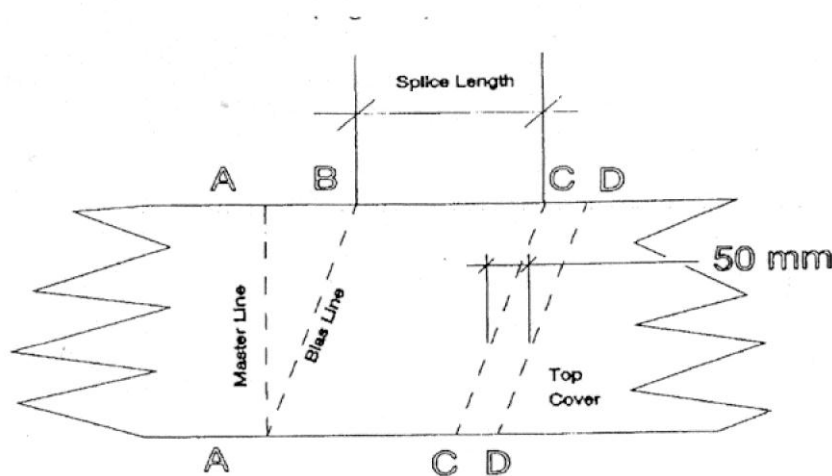


Figure H 3: Square and Straight Edge

- From A, measure the splice length and mark point C
- From B, measure the splice length and mark point C. Join C and C
- From C, measure 50 mm and mark point D
- From C, measure 50 mm and mark point D. Join D and D
- Remove a strip of cover rubber about 12 mm wide down to the plies by cutting at approximately 45° on either side of line DD
- Place a suitable piece of lumber underneath the belt to facilitate cutting and prevent the cut off saw from damaging the underlying belt or splice press platen.
- Cut the belt along line DD

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12.4 SPLICING THE BELT

- a. The belt shall first be checked to ensure that there is no twist in it. The centerline of the belt shall be marked out over the joint length by measuring off 5 to 6 points in the center of the belt width for a distance of 2 to 3 cutbacks into the belt from the end and joining these together. This centerline shall be used as a datum for all other measurements; the belt edge shall not be used as a reference.
- b. The technique for splicing fabric belt is essentially the same for any number of plies. A 3 ply construction is illustrated in sketches and instructions which follow:

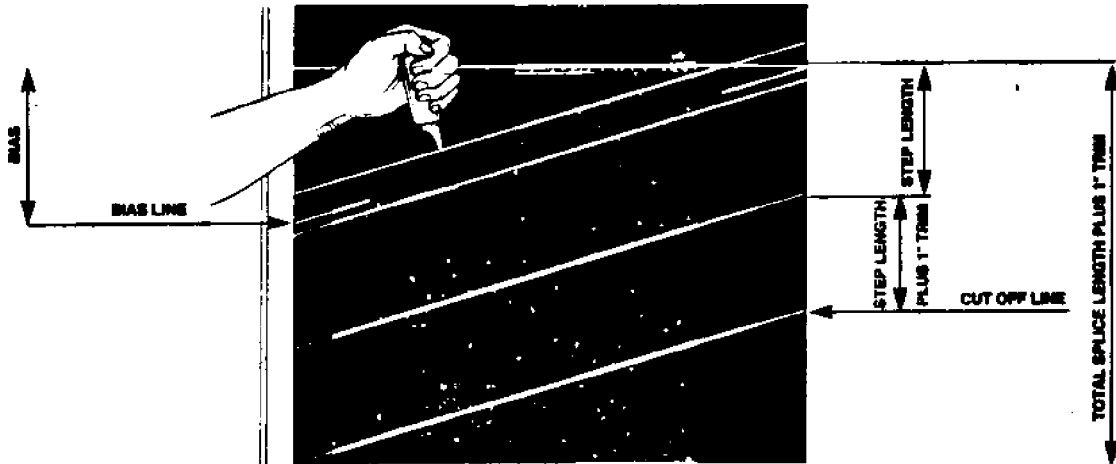


Figure H 4: Square and Straight Edge

- c. Measure the splice length plus 25 mm trim starting from the end of the belt (Fig H-4). Draw the master line. A square and straight edge is generally used to mark the master line on the belt as described somewhere in this report. In checking both edges if there is a difference it can be halved and the result will usually give an accurate line.

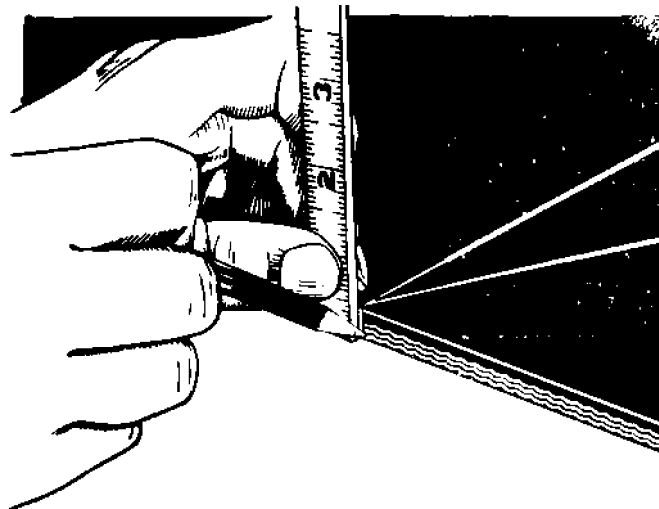


Figure H 5: Square and Straight Edge

- d. Measure off the bias length and draw the bias line to the end of the master line on the opposite edge (fig H-5). This line marks the location of the top ply cut after the cover gum is removed.

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- e. Extend the end of the bias line down over the belt edge.
- f. From the bias line measure towards the end of the belt a distance equal to the total number of steps plus 25 mm trim.

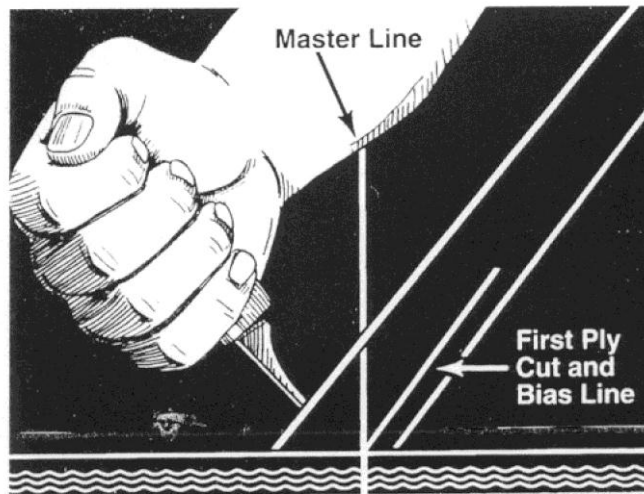


Figure H 6: Square and Straight Edge

- g. Lay out the cover strip for removal. Draw one line parallel to and approximately 13 mm from the bias line and on the splice side. Draw a second line on the belt side of the bias line but at a distance of 50 mm (Fig H-6)
- h. Cut along the two cover cut lines just made. The line on the belt side of the bias line should be skived per fig H-6. The other cut may be vertical. Do not cut too deep. If you feel fabric you have damaged the belt.
- i. Cut off the belt at the cut-off line (Fig H-4)

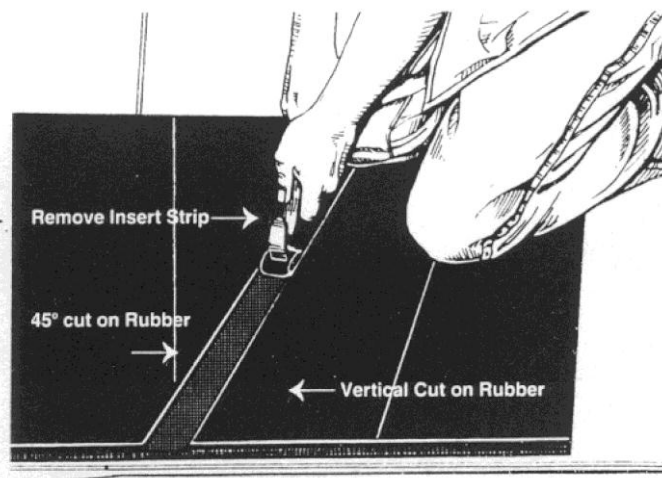


Figure H 7: Square and Straight Edge

- j. Remove the cover strip. Note the one skived and one vertical cut in the cover (Fig H-7)

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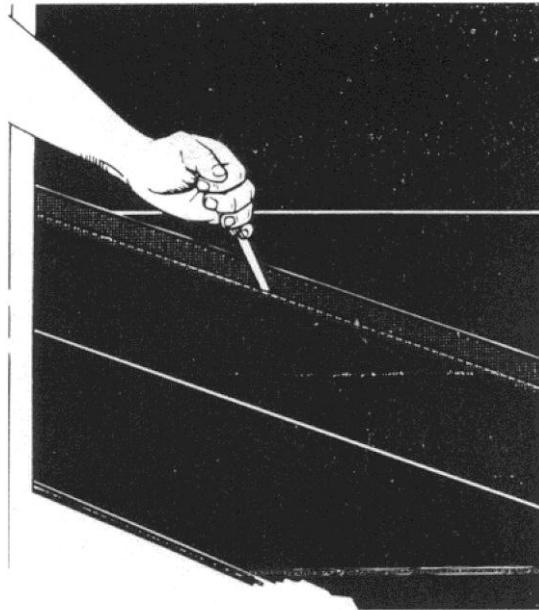


Figure H 8: Square and Straight Edge

- k. From the marks made down the edges, redraw the bias line where the cover was removed. Then cut the top ply along this line (Fig H-8).

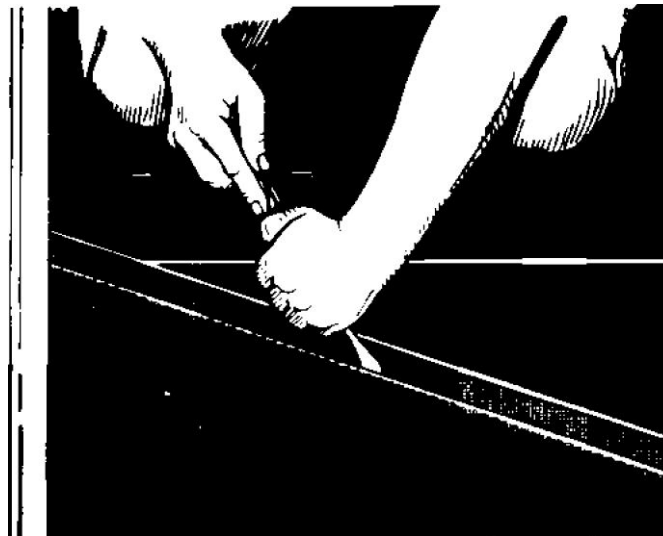


Figure H 9: Square and Straight Edge

- l. Prod the top ply loose along the bias line where the cut was just made. Be very careful as you can easily damage the fabric (Fig H-9).

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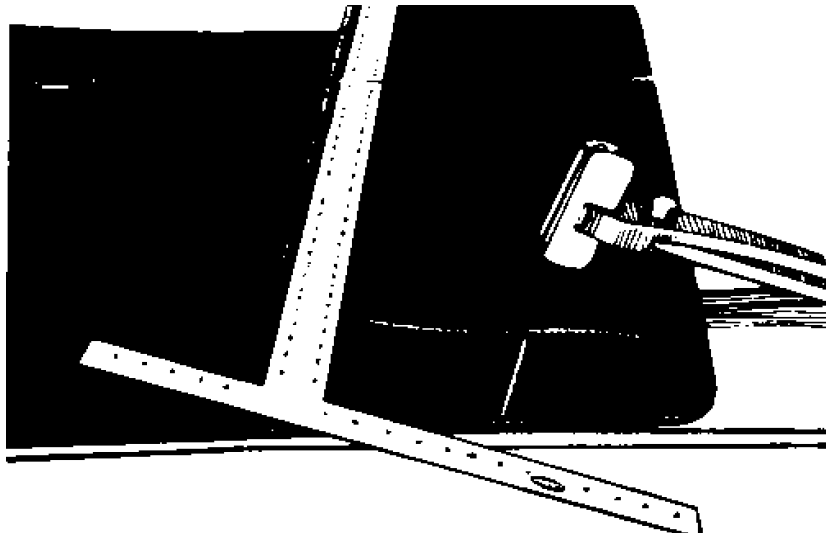


Figure H 10: Square and Straight Edge

- m. Turn the belt end over and mark the cover strip for removal (Fig H-10)

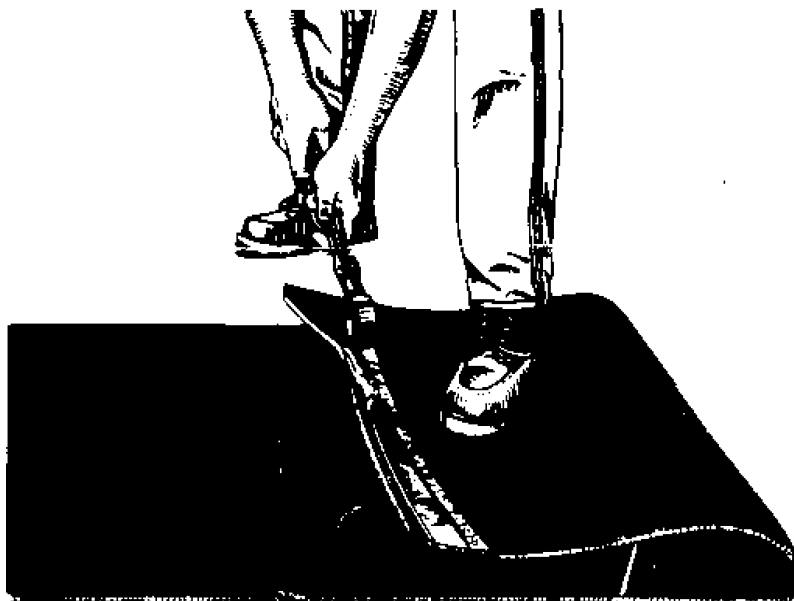


Figure H 11: Square and Straight Edge

- n. Cut and remove this cover strip (Fig H-11)

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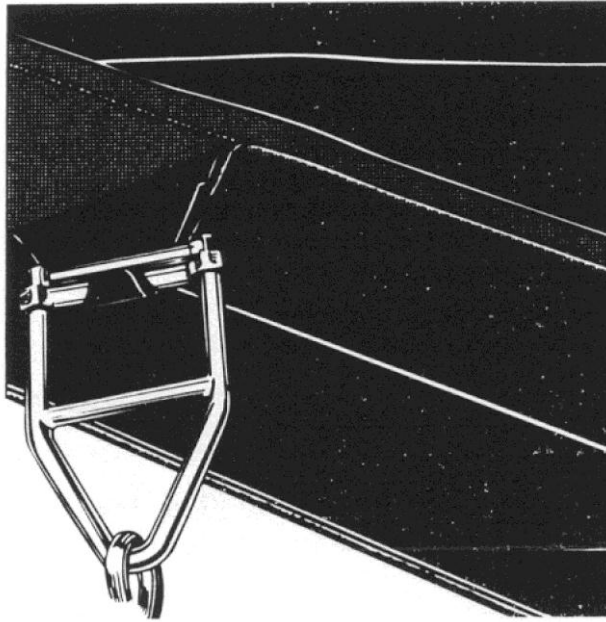


Figure H 12: Square and Straight Edge

- o. Turn the belt end back down and remove the cover and top ply (Fig H-12). This is a very difficult pull. If a winch or equivalent is not available, use a come-a-long and very carefully cut the inside gum with a ply knife, do not nick the fabric. Damage to the underneath ply will cause premature splice failure.
- p. The other end of the belt is torn down from the opposite side using the same system. Note the bias length on this end must be measured from the opposite edge that was used on the first end.

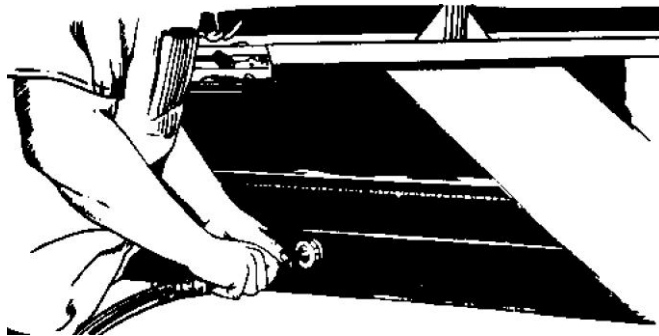


Figure H 13: Square and Straight Edge

- q. Use a lightweight, high-speed buffer with a wire wheel brush and remove most of the gum from the fabric (Fig H-13). Do not contact the fabric. Buffing the fabric not only reduces its strength but removes the chemical treatment from the fabric which reduces adhesions. Roughen up the cover cut edges on top and pulley side as well as an inch or so of cover surface adjacent to the cuts. Blow or brush away all rubber dust.

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- r. Mark a centerline on each end of the belt by connecting three center marks, the furthest being a minimum of three times the splice length distance from the master line. Align the belt using the center marks and dry fit the ends to ensure the steps fit together properly. Do not allow any steps to overlap, trim to fit as necessary. After completing adjustment, secure the belt ends in this position. It is common to C-clamp the belt to the work table and nail blocks of wood to the table flush with the belt edges to prevent lateral movement.

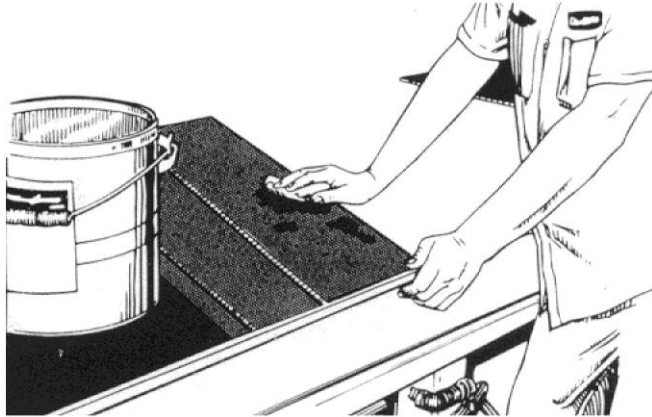


Figure H 14: Square and Straight Edge

- s. Clean all rubber areas with the appropriate solvent and allow to dry thoroughly (Fig H-14).

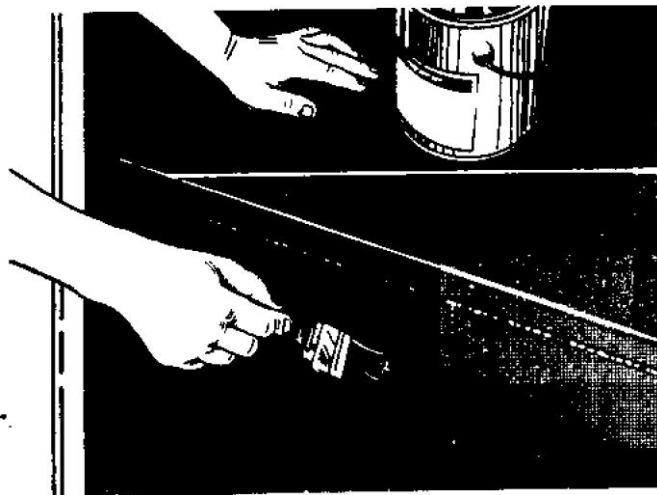


Figure H 15: Square and Straight Edge

- t. Apply two coats of proper cement over the entire fabric step area starting at the first ply fabric cut (Fig H-15). Allow first coat to dry thoroughly before applying second coat.

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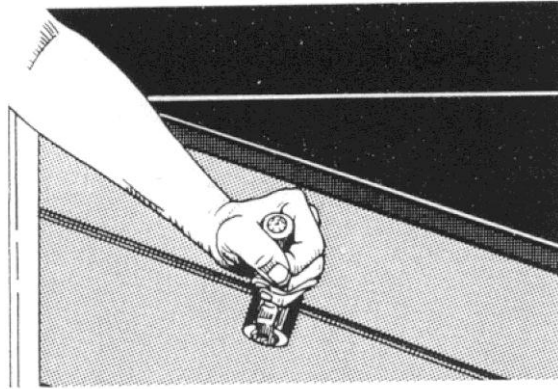


Figure H 16: Square and Straight Edge

- u. After cement is dry apply inside gum to the fabric step area starting at the first ply cut and proceeding to the end of the splice area (Fig H-16). Be sure the correct gauge gum and the proper number of layers are used. Roll gum thoroughly with a 50 mm roller. The gum is applied to only one of the stepped ends. Do not remove film from the gum at this time.
- v. On the end, which now has the splice gum, mark a ply cut-off line as follows: Measure both edges from the master line. On one other edge measure only the total step length plus bias length, on the other edge measure only the total step length then draw the cutoff line.
- w. Cut film, gum and the one ply with a smooth straight cut across the line just marked.
- x. About 50 to 75 mm from the cut just made, make a cut through the film only. Remove the 50 to 75 mm strip of film.
- y. Assemble breaker, fill-in gum and release material on the pulley side using the same system except the pulley gum is to overlap the original cover 1 to 2 mm.

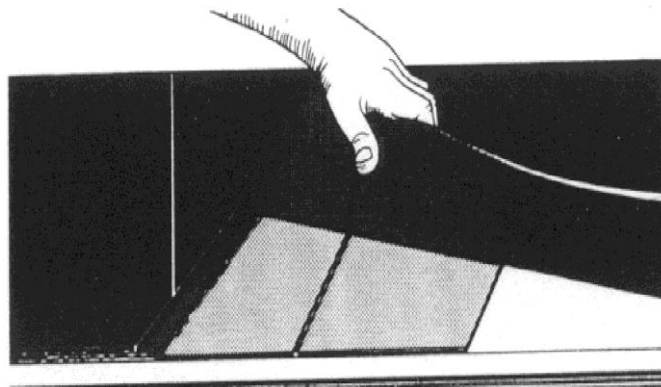


Figure H 17: Square and Straight Edge

- z. With the belt edges properly aligned, carefully lay the ends together making a tight uniform joint at the bottom ply. Make sure fabric is not overlapped (Fig H17).

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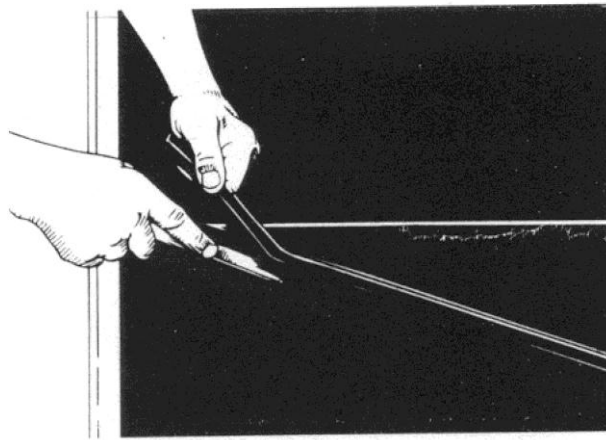


Figure H 18: Square and Straight Edge

- aa. Remove the remaining film and lower the remainder of the splice into place. Keep edges aligned.
- bb. Trim the top ply step making a tight joint with no gap (Fig H-18)

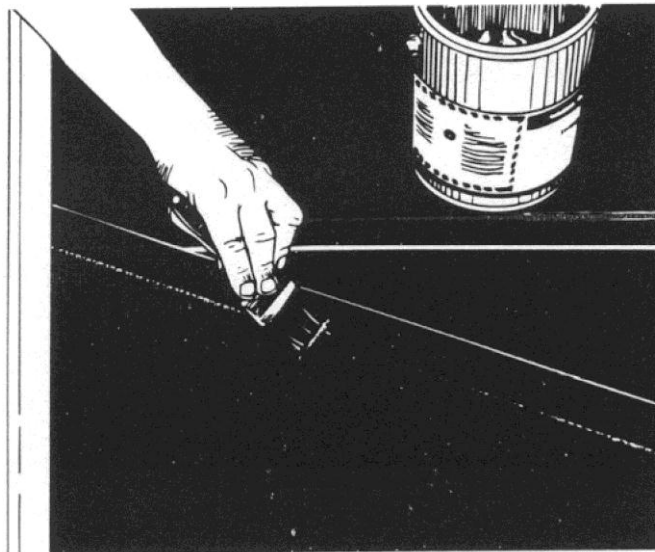


Figure H 19: Square and Straight Edge

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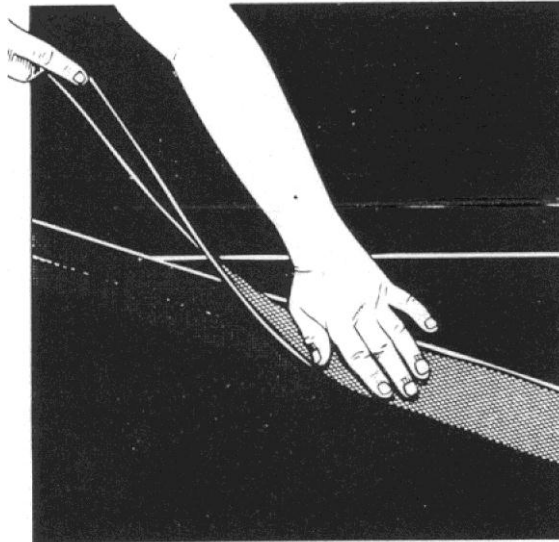


Figure H 20: Square and Straight Edge

- cc. Apply a second coat of the proper cement (after the first coat of cement is dry) to the fill-in area on the topside (Fig H-19). Lay in the breaker (Fig H-20). The breaker is 6 mm narrower than the exposed fabric.
- dd. Cement a strip of top cover, roll it into place and trim.

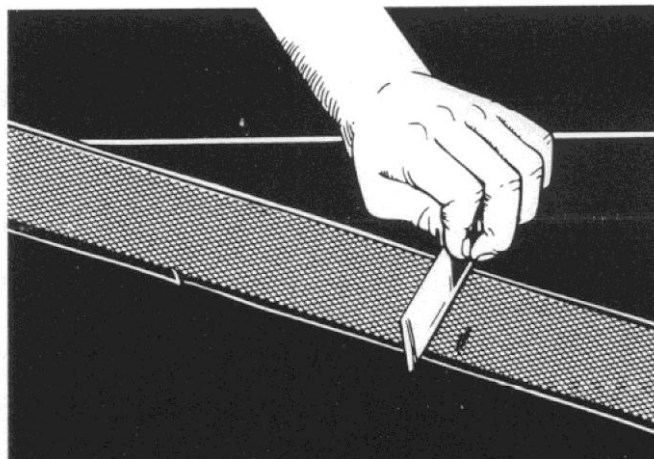


Figure H 21: Square and Straight Edge

- ee. Use a small straight edge to check for the proper gauge of fill-in gum. The straight edge should make imprints on the gum (Fig H-21). Any low spots should be built up.

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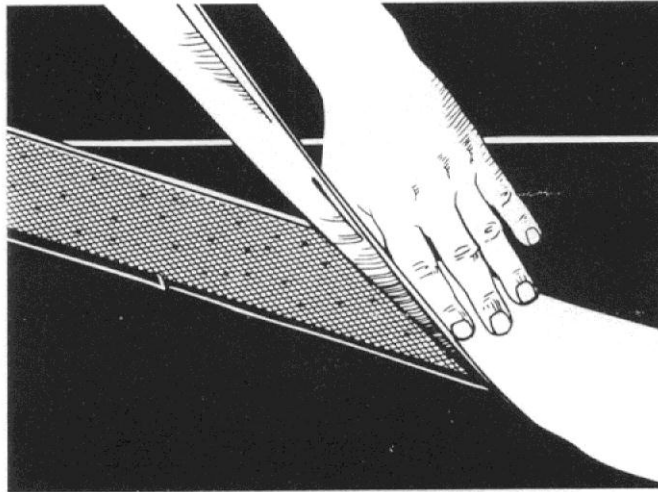


Figure H 22: Square and Straight Edge

- ff. Prick the fill-in gum with an awl to release trapped air. Cover with a cemented strip of release material 50 mm wider than the gum strip (Fig H-22).

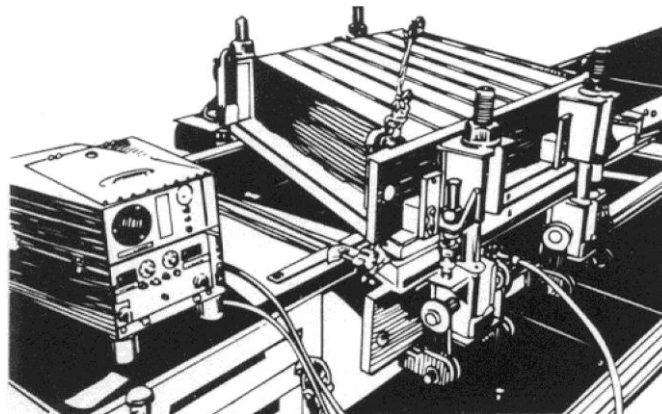


Figure H 23: Square and Straight Edge

- gg. To ensure solid edges, guides of the proper gauge must be used. The guides must contact the belt edges for the full length of the splice and extend 150 mm on both ends of the press (Fig H-23). Note: an exception to the above splice directions sometimes occur when splicing a new belt into an old one. If the old belt covers are badly worn then both ends of the new section should be stepped from the pulley side. This leaves new unworn top cover on both splice and will provide more uniform vulcaniser pressure. In doing this, one splice will run in reverse to the usual recommendation.
- hh. After cure, trim the edges of the splice. It is normal for the fabric joints to be spaced 6 mm or so during cure due to shrinkage.
- ii. Refer to section 10.10 of this procedure for vulcanising instructions.
- jj. The splice must not be put into service until it has cooled to ambient temperature.
- kk. Buff inserts and overflow, down to original belt gauge to prevent damage from scrapers.
- ll. Each joint shall be branded with the jointing contractor's identification and date.

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12.5 NOTE:

After preparing the belt ends, joint assembly and vulcanizing should be completed without delay in order to avoid contamination by moisture, dirt, etc. If it is necessary to leave the prepared ends for some time before vulcanization then they should be securely covered with, for example, plastics sheeting and extra care taken to ensure that the belt ends are clean before assembly and vulcanizing

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