

MULTIPLY CONVEYOR BELTS

INSTALLATION HANDBOOK

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CHAPTER 1

RUBBER CONVEYOR BELT STORAGE

1.1) PACKING

Rubber conveyor belts are generally packed in rolls strapped on the outside. On customer request or for sea freight, the packages used are the following ones:

- Polypropylene cover
- Reels or wooden cases
- Metallic reels (for belts with a weight higher than 15 tons)
- Wooden pallets

1.2) STORAGE

Rubber belts shall be stored, with the reel axis put on horizontal position, preferably in places protected and isolated from the floor by means of wooden axis, pallets or stands (Fig. 1-2-3)

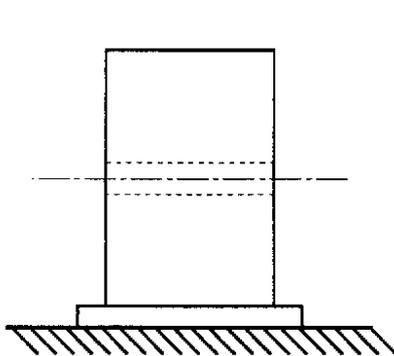


Fig. 1

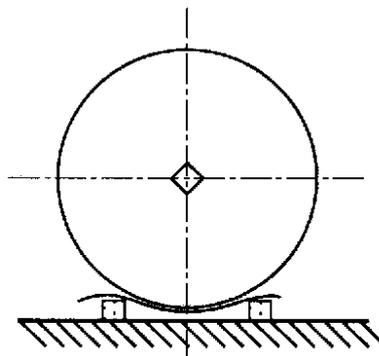


Fig. 2

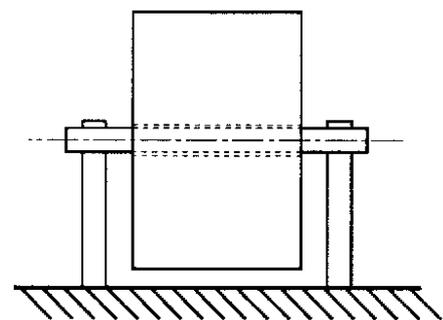


Fig. 3

If the belt is stored outdoors, it shall be laid with the horizontal axis on pallet or wooden pallets and protected with plastic material opportunely punched in order to avoid backwater (Fig. 2).

If the storage lasts more than 90 days, products shall be handled in such a way as the surfaces most exposed to the atmospheric and environmental agents can be alternated.

The rubber belts which are not correctly protected during the storage, could suffer some changes of the physical characteristics and become also useless owing to hardness, breaks, cracks or other weathering.

These changes can be caused by a particular factor or by combination of factors as: time, oxygen action, ozone, light, atmospheric agents, heat and humidity sources.

The storage temperature must be included between -10°C and 40°C , with ideal band between 10°C and 25°C ; extreme temperatures or swift and continuous variations can cause a deterioration and can accelerate the ageing process such as to compromise the running and the life of the product.

The storerooms shall not contain equipment which are able to generate ozone as fluorescent or mercury-vapour lamps and high voltage electrical equipment which can generate sparks or electrical discharges; besides they must not be particularly damp.

The rubber surfaces shall not come into contact with liquid or semisolid products, in particular solvents, acids, volatile components, oils and greases, metals as copper, manganese and their compounds, which are known for their harmful effects on the vulcanised rubber.

Even though the low temperature effects (lower than -10°C) don't cause irreversible damages, they determine a partial stiffening; so it is very important to take care during the handling and the installation in order to avoid harmful distortions, cracks and cuts. Particularly, before the installation on the plant, the roll temperature shall be stabilised on values higher than 10°C .

1.3) HANDLING

To lift and transport a belt roll, the most suitable system consists in inserting a steel spacing bar (round or square) into the central hole of the reel and slinging it at the ends by means of ropes or chains applied to a balancer mounted on the lifting apparatus (see Fig. 4).

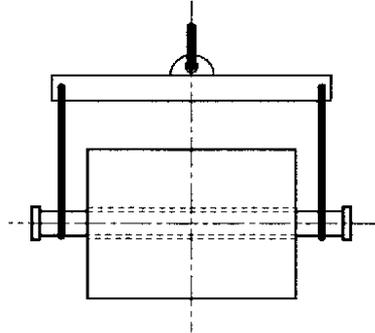


Fig. 4

The balancer and the spacing bar shall have such a length as to prevent the belt edges from being damaged by means of lifting equipment.

If a textile or plastic material sling with a sufficient length and capacity is available, it will be possible to lift the roll inserting it directly into the central reel hole, without using the spacing bar (see Fig. 5).

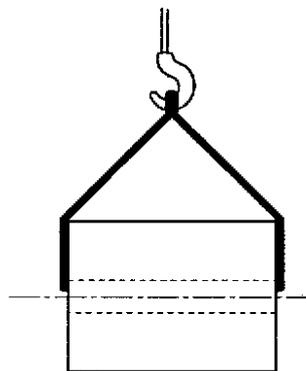


Fig. 5

The lifting shall not be carried out by means of slings which support the roll on the outside without using the central hole, since the non-uniform load distribution can cause the inclination and the fall of the reel. (See Fig. 6)

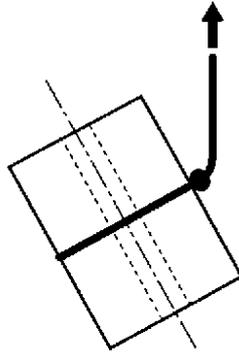


Fig. 6

A traditional fork elevator can be used taking care not to damage the outer side of the belt with forks (see Fig. 7).



Fig. 7

CHAPTER 2

RECOMMENDATIONS FOR THE INSTALLATION

2.1) BELT ASSEMBLY

Normally, belts are wound with the top cover towards the outside.

For a correct and easy belt assembly on the plant, you are advised to proceed as shown in Fig. 8, so that the bottom cover lays on the carrying idlers and on the drive and tail pulleys.

Obviously, in relation to the logistic necessities, it can be necessary to insert the belt beginning from the return section of the conveyor; in this case the top cover shall lay on the return idlers.

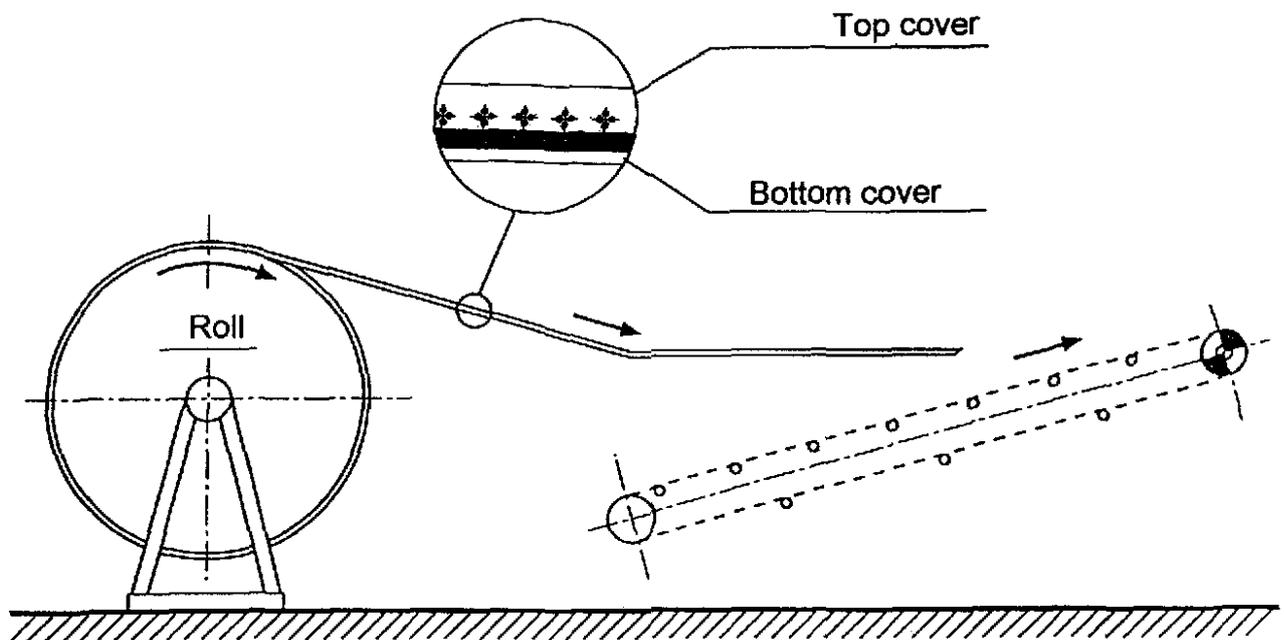


Fig. 8

In order to avoid troubles during the operation, in case of scrapers or discharge shares it would be better to respect the disposition of the ends to be spliced according to the direction of travel. (Fig. 9) In case different rolls must be joined together, for a higher homogeneity in the use, we recommend the installation with the surface marking always along the same side of the conveyor.

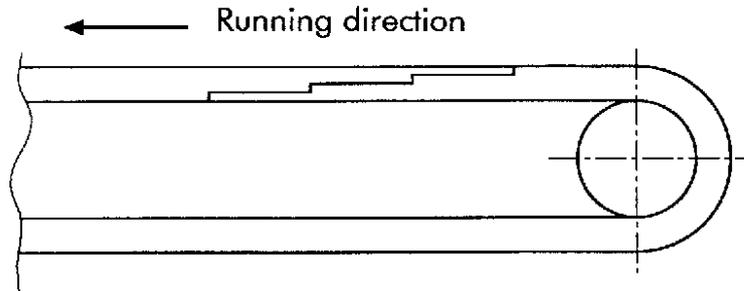


Fig. 9

An easy belt positioning on the plant can be granted by using two metallic clamps fixed at its head so as to avoid sliding which could damage the fabrics.

2.2) PREPARATION OF THE WORKING ZONE

For obvious comfort reasons, if you splice more rolls one with the other, it would be better to carry out all the splicing in a point of the plant only, chosen in the most accessible and functional place to carry out the operations and to handle the reels.

For the preparation of the working zone on the plant, first of all it is necessary to disassemble an adequate quantity of idler stations in order to create, by means of wooden tables, a steady and comfortable working surface.

Besides, it would be better to choose a point easily accessible by the press, where suitable electrical power, absolutely necessary for the operation, is available. Before starting the splicing, place the lower part of the press on the working zone, by fixing it to the metallic frame and put a plate which covers the surface completely.

This zone must be as much clean as possible and must be protected from the atmospheric agents (rain and wind in particular).

2.3) BELT CLAMPING

Lock the counterweight at about 50 cm from the upper limit.

During the last splicing, before locking the belt for the preparation of the ends (see Chapter 5), it is necessary to assure a pretensioning in each point so as to determine an elongation by 1% at least.

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For belts with a certain length this could mean operate a pretension every 200/300 m ca.: after locking one belt end to the structure, it will be possible to tension the first 200 m, lock the belt and repeat the operation on the next stretch, up to the free end.

The belt shall stay in this position at least 12 hours in order to allow further tensioning before the splicing. In the meantime in fact, the permanent elongation occurs and if it is not opportunely hard-won it causes a counterweight lowering in the first operation hours.

If you can't wait for the above mentioned period of time, it will be necessary to assure an higher pretensioning, at the limit of the counterweight shifting.

Before starting the preparation of the ends for the splicing, it is necessary to cut the possible belt excess since the available measurement in metres can be more than needed.

CHAPTER 3

GENERAL INFORMATION FOR SPLICING OF MULTIPLY CONVEYOR BELTS

3.1) GENERAL INFORMATIONS

The splicing stands for the junction of the ends of a rubber conveyor belt in order to allow the handling and the material conveyance.

A correct splicing is fundamental for the operation, the linearity, and for the conveyor efficiency.

The life of a correctly carried out splicing depends on the belt maintenance and on the correct use of the entire plant. In fact, it is in any case the weakest part of the belt; as a consequence, all the possible lacks, defects and problems of the mechanical parts of the plant as scrapers, rolls, pulleys, counterweights, hoppers and motors are transferred to the belt and even more to the splicing itself.

Even if there are different types of mechanic splicing suitable for textile belts, the systems for the hot vulcanization or the cold gluing are the best and the most used ones for industrial belts subject to strong stresses.

3.2) INSTRUCTIONS FOR SPLICING

Splicing are carried out connecting each ply of the two ends head by head, appropriately pre-settled.

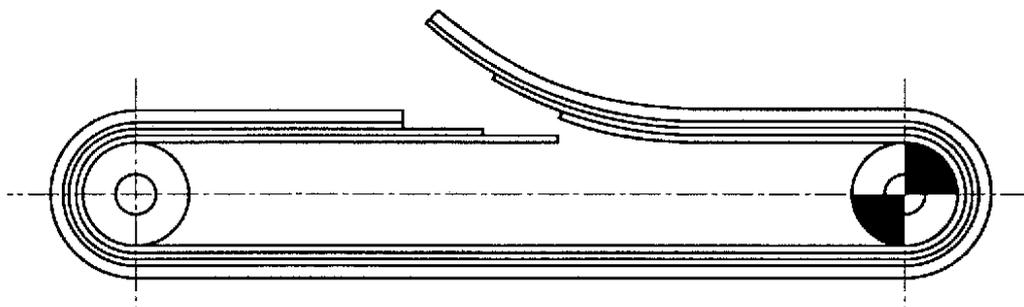


Fig. 10

To obtain an endless belt with S development (the endless development is the inside circumference of the ring, subject to the fixed ISO tolerances) it is necessary to have an open belt having a length L_1 equal to:

$$L_1 = S + L \times g$$

Where g = number of splicing to be carried out
 L = length necessary to carry out a splicing

The S development is defined as the sum of different and subsequent measurements carried out from plain stretches along the whole length of the endless belt.

To improve the operation conditions, reducing the stresses on the splicing during pulleys wrapping and the passage on the tern of idlers, the splicing is normally carried out according to a generating line inclined in comparison with the longitudinal axis of the belt.

Higher inclinations of the generating line allow a better distribution of the stresses, but also an higher splicing length and therefore the necessity of presses with higher dimensions and weight. The compromise rule, defined by the standard DIN.22102/91, is the following one:

$$L_a \cong 0,3 \times B$$

where L_a = length of the bias
 B = belt width

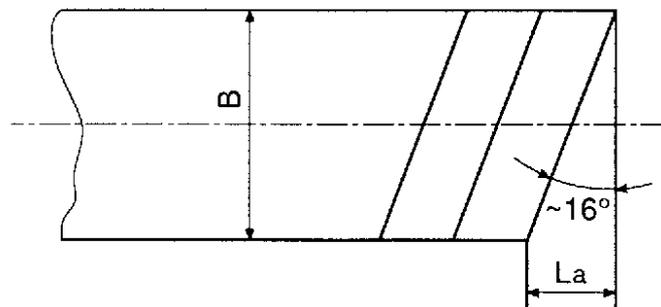


Fig. 11

Alternative inclination, typical of US tools, is 22° : in this case $L_a \cong 0,37 \times B$

In case the pulley diameters are lower than the minimum suggested for the specific belt, it is preferable to increase the inclination $L_a = (0,4 \div 1,0 \times B)$, with consequent angle of $25 \div 45^\circ$. As lower the pulley diameter is, as higher the inclination has to be.

In Tab.1 the values of the standard bias (for 16° - 22° inclination) according to the standard belt widths are shown.

B (mm)	300	400	500	600	650	800
L _a (mm)	90 - 110	120 - 150	150 - 185	180 - 220	200 - 240	240 - 300
B (mm)	1000	1200	1400	1600	1800	2000
L _a (mm)	300 - 370	360 - 445	420 - 520	480 - 590	540 - 665	600 - 740

Table 1 – Length of the bias

The total length L of the splicing depends not only on the inclination but even on the number of plies, which determines the number of steps n_{st} (equal to the number of the plies minus one), and on the tensile strength of the same ones, which establishes the step length L_{st}.

With reference to the Fig. 12, the total length of the splicing L is equal to the sum of the splicing length L_s and of the inclined stretch length L_a :

$$L = L_s + L_a$$

Where:

$$L_s = L_{st} \times n_{st} = L_{st} \times (n_t - 1)$$

and so:

$$L = L_{st} \times (n_t - 1) + 0,3 \text{ (or } 0,37) \times B$$

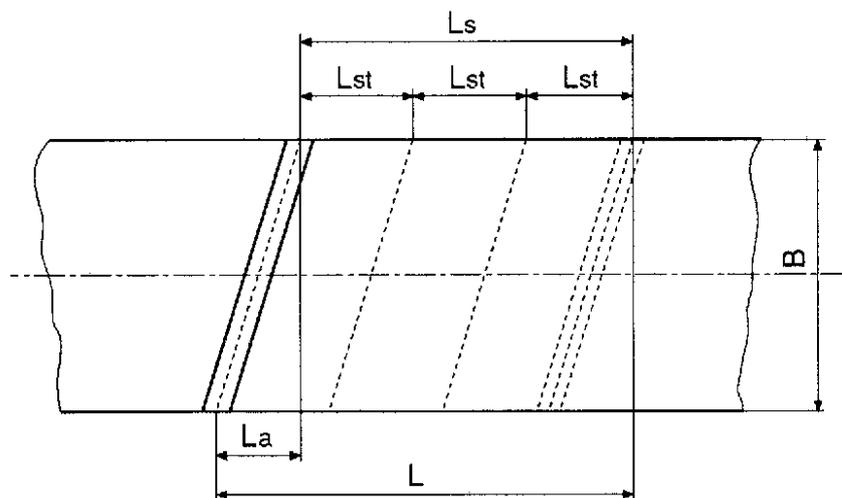


Fig. 12

In Tab.2 the minimum dimensions recommended for multiply belt splicing are shown:

Belt style	No. of plies n	Ply tensile strength N/mm	Step length*** L _{st}	Splicing length L _s	No. of steps (n-1)
250/2	2	125	250 (200)	250 (200)	1
400/3	3		250 (200)	500 (400)	2
500/4	4		200 (150)	600 (450)	3
630/5	5		200	800	4
315/2	2	160	250 (200)	250 (200)	1
500/3	3		250 (200)	500 (400)	2
630/4	4		200 (150)	600 (450)	3
800/5	5		200	800	4
1000/6	6		200	1000	5
400/2*	2	200	300	300	1
630/3	3		300 (250)	600 (500)	2
800/4	4		250 (200)	750 (600)	3
1000/5	5		250	1000	4
1250/6	6		250	1250	5
500/2*	2	250	300	300	1
800/3	3		300 (250)	600 (500)	2
1000/4	4		250	750	3
1250/5	5		250	1000	4
1500/6	6		250	1250	5
1000/3*	3	315	400	800	2
1250/4	4		350	1050	3
1600/5	5		300	1200	4
1900/6**	6		300	1500	5
1250/3*	3	400	400	800	2
1600/4	4		350	1050	3
2000/5	5		300	1200	4
2400/6**	6		300	1500	5
1500/3*	3	500	500	1000	2
2000/4	4		400	1200	3
2500/5	5		350	1400	4
3000/6	6		350	1750	5
2000/3*	3	630	500	1000	2
2500/4*	4		400	1200	3
3150/5	5		350	1400	4

Tab. 2

* Belt styles for special applications, not recommended for standard uses

** Not standard belt styles, typically used in heavy applications.

*** In round brackets usable values in case of short endless rings (max 20 m) or safety factor higher than 20; anyway, pulley diameters must be higher than suggested minimum values (see product catalogues).

The following figures stand for two examples of splicing, for 2 and 4 plies belt.

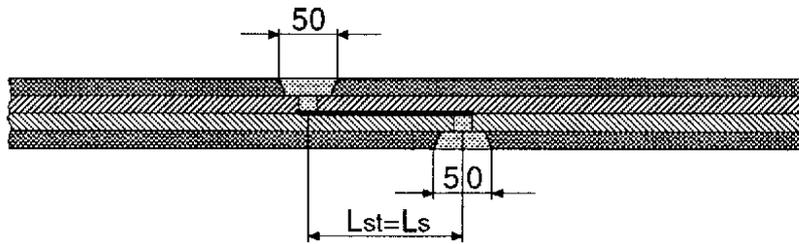


Fig. 13

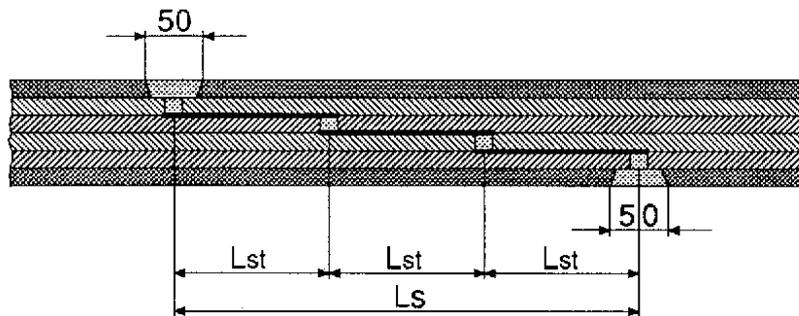


Fig. 14

In order to know the tensile strength of the plies, it is necessary to divide the nominal tensile strength of the belt by the number of the plies.

Example :

TEXTER® 500/3 (Tensile strength 500 N/mm - 3 plies)

Tensile strength of one ply: $500 / 3 = 167$ N/mm that is nominally 160 N/mm

Step length $L_{st} = 250$ mm (Tab. 2)

Splicing length $L_s = 250 \times (3 - 1) = 500$ mm

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The splicing of belts for handling of materials with temperatures over than 125 °C follows the same procedure above mentioned, but imply steps with higher length in order to compensate the degradations of fabrics and rubber caused by the thermal action.

In the table here below the lengths recommended for the splicing of these belts are shown:

Belt type	No. of plies n	Ply tensile strength N/mm	Step length L_{st}	Splicing length L_s	No. of steps (n - 1)
400/3	3	125	300	600	2
500/4	4		300	900	3
500/3	3	160	300	600	2
630/4	4		300	900	3
800/5	5		300	1200	4
630/3	3	200	350	700	2
800/4	4		350	1050	3
1000/5	5		350	1400	4
800/3	3	250	400	800	2
1000/4	4		400	1200	3
1250/5	5		400	1600	4
1000/3	3	315	450	900	2
1250/4	4		400	1200	3
1600/5	5		400	1600	4

Tab. 3

CHAPTER 4

MATERIALS FOR SPLICING

4.1) DEFINITIONS

Material for splicing includes all the components necessary to carry out the splicing and can be divided in equipment and raw material.

4.1.1) Equipment

- Electrical press complete with:
 - System for the regulation of the plane pressure;
 - Thermostat with the opportunity to adjust the temperature set point;
- 2 sheets with dimensions slightly higher than the heating planes;
- 2 steel bars for the lateral containment 1 mm more thick than the splicing thickness;
- Clamps to fix different components to the conveyor structure;
- 2 tie rods which keep the bars for the lateral containment in their position;
- Cutters with long and short blade for belt peeling and engraving;
- Hone for cutters sharpening;
- Lever tongs;
- Tirfort equipped with self-tightening clamps for rubber;
- Different rolls for surface pressing;
- Punch for the drilling of possible air bubbles;
- Brushes to apply the solution on the surfaces to be spliced;
- Wire brushes and abrasive disks with relevant equipment;
- Shears suitable for the cut of rubber skins;
- Rule and square;
- Silicone paper or similar material;
- Fabric with a maximum thickness of 2 mm to be positioned on contact with the heating planes.
- Solvent for surface degreasing.

4.1.2) Raw materials

4.1.2.1) For cold splicing:

SICOL® 3030: cold glue for cold splicing based on polychloroprene with **cyclohexane** solvent;

REAGENT®: hardener to be mixed to the **SICOL® 3030, 4% in weight**, in order to obtain a product apt to be applied on the parts which can be spliced.

4.1.2.2) For hot splicing:

SICOT2X00: solution for hot splicing;

SICOP2X19 0,5: uncured skin rubber 0,5 mm thick to be put between the plies to improve their adhesion; for special splicing (see Chap. 7) skin rubber with different thickness could be necessary.

SICOP2X02: uncured rubber of different thickness (from 2 to 4 mm) and quality used to reassemble the covers of the belts to be spliced.

Note: "X" identifies the typology of material used according the the belt type: 5=wear resistant, 6=superior heat resistant, 7=oil resistant, 8=heat resistant; 9=selfextinguish.

4.2) STORAGE OF THE RAW MATERIALS

The raw materials are packed and sealed in cases if they are liquid or in carton boxes if they are solid.

The standard packages report the packing date and the period of validity according to the undermentioned conditions and shall be applied for the transport by road only.

In case of transport by sea or by air it will be necessary to produce special protecting packages according to the regulations in force.

All the raw materials for the splicing shall be stored as follows:

- Places shielded from atmospheric agents and which are not subject to extreme conditions.
- Packed and sealed in the original packages.
- Room temperature between 5 ad 20°C (70°F).

4.2.1) Recommendations

The period of validity means the life period at the conditions above mentioned.

After a partial use, the products shall be hermetically sealed and/or packed as at the beginning.

Besides, SIG SpA refuses all responsibility for possible alterations suffered by the products during the transport, for the use of the material already expired or packed without respecting the previous conditions.

4.3) PRESS STORAGE

During the transport and the use, take care not to expose the material to collisions and to the water in order not to cause damages to the press components as manometers and thermometers. Protect from water and humidity all the electronic components.

During unused period the material shall be stored in a covered area which must be protected from the water. Besides, keep all the locking bolts oiled.

CHAPTER 5

SPLICING EXECUTION

This chapter mentions two different types of splicing finishing: with butt strap and with overlapping.

The butt strap is a rubber stripe of about 25 mm interposed between two edges of the cover in order to cover the splicing point between the first plies of each end of the belt (Fig. 24).

On the contrary it is possible to realise the overlapping only when the two edges perfectly match; it is a system quicker than the previous one, as much effective as it but implying a properly done carrying out. (Fig. 25).

5.1) SPLICING PREPARATION

The content of this paragraph shall be applied both for cold gluing and hot vulcanization, with the exception of the point 5.1.8 which shall be applied for hot splicing only. Besides, at point 5.1.7, the cold glue solution SICOL[®] 3030 is used for cold splicing instead of the SICOT[®] solution. For the use of SICOL[®] 3030 see Par. 5.4.

5.1.1) Tracing of the cut lines

Make sure that the ends of the belt are well squared up; otherwise, remove the excess with the help of a square.

On the head of the open belt, transversally on the belt, draw and on the top cover, a reference line AB at a distance L from its end (see Tab. 2 and 3 Par. 4.2).

In case of *overlapping splicing*, it will be necessary to draw a reference line AB back of about 10 ÷ 15 mm in order to assure the overlapping of the two belt ends.

Starting from the end A of this line, trace an inclined line AC so that the resulting segment BC, on the edge, is equal to 0,3 x B (angle BAC of about 16°) or 0,37 x B (angle BAC of about 22°). Alternatively, Tab. 1 shows the right length of BC, according to the belt width B.

We recommend to increase the bias in case of small pulleys, as described at page 11.

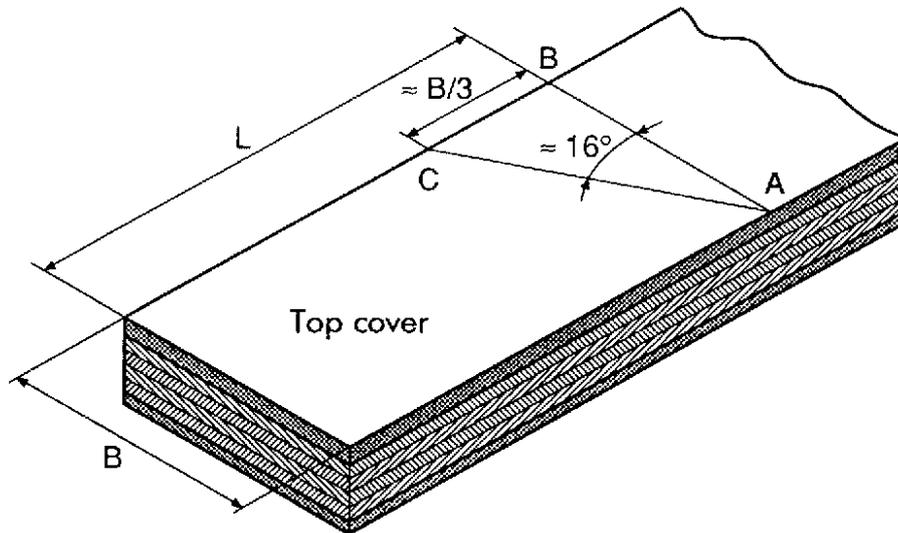


Fig. 15

5.1.2) Engraving and removal of top cover and first ply

Engrave, by keeping the cutter slightly inclined, along the line AC the top cover and the first ply of the carcass taking care not to engrave the ply below.

By a suitable lever tongs, lift the cover edge together with first ply and, by the means of a tirlfort, effect the removal. If the operation is difficult, we suggest you the removal with longitudinal strips of about 50 mm, taking care during the cut not to engrave the plies below.

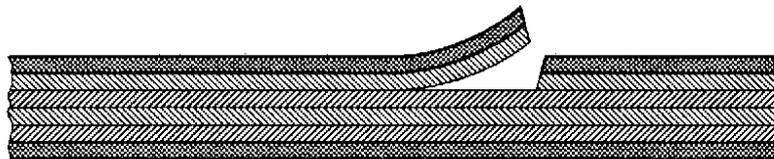


Fig. 16

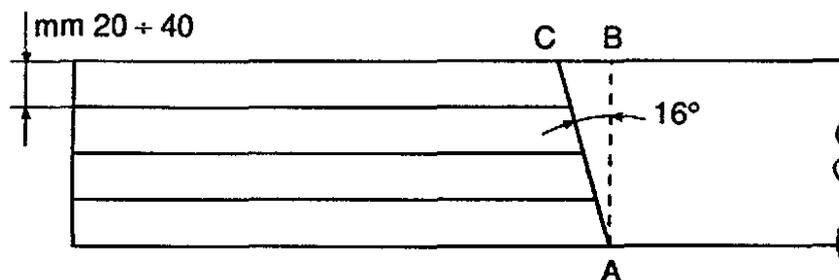


Fig. 17

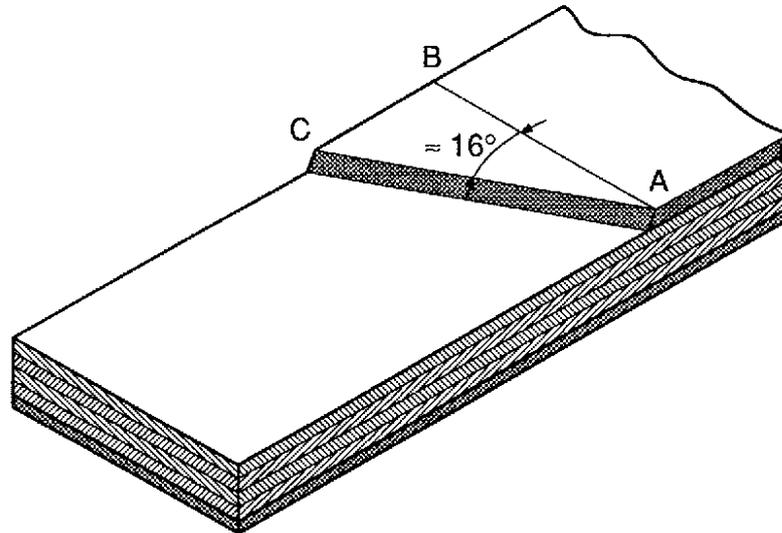


Fig. 18

5.1.3) Removal of a top cover strip for the butt strap carrying out

Parallely to the line AC at a distance of 25 mm on the top cover, draw a line A₁C₁ and by a slightly inclined cutter, engrave along this line the top cover only, without damaging the ply below. As thicker the cover is, as higher the cut inclination has to be; over 6 mm it is recommended to incline the cutter of aprox 45°.

Bend the belt edge and remove this rubber strip.

This operation, together with the similar one described at the point 5.1.5, is effected for the carrying out of the splicing with butt strap only.

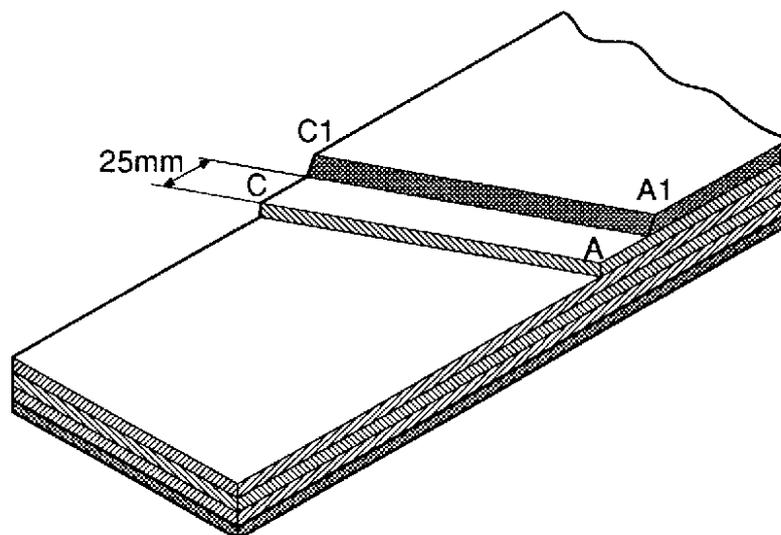


Fig. 19

5.1.4) Step carrying out

Parallely to the line AC at a distance of L_{st} (step length), on the second ply, draw a line A_2C_2 . By means of a special cutter, engrave the second ply along this line (taking care not to engrave the one below), then remove it, as explained at the point 5.1.2.

By the same method, carry out the steps along the lines A_3C_3 e A_4C_4 .

By a special tirfor these operations can be faster.

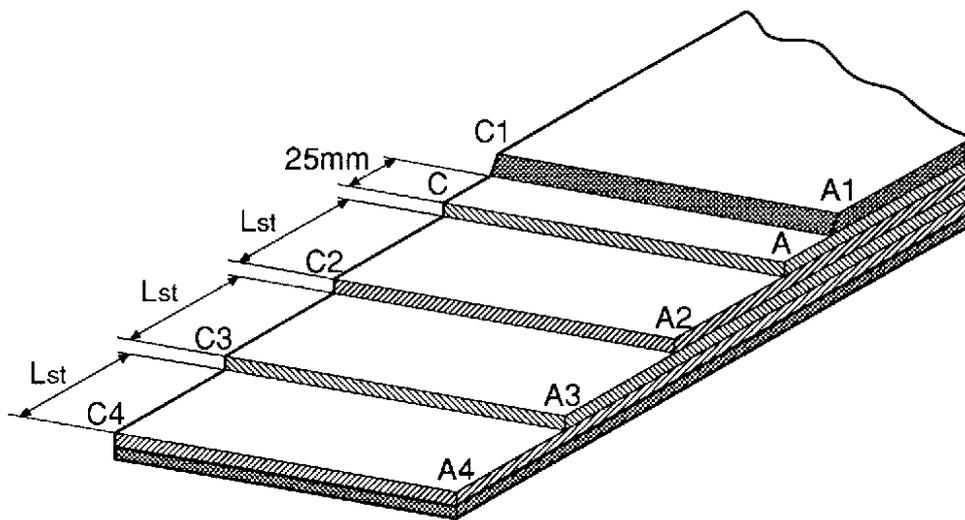


Fig. 20

5.1.5) Removal of a bottom cover strip for the butt strap carrying out

On the bottom cover draw a line parallel to the line A_4C_4 and at a distance of 25 mm from it (Fig 21). As for the top cover, by the slightly inclined cutter, engrave the cover without damaging the ply below.

Remove this rubber strip. This operation, together with the similar one described at the point 5.1.3, is effected for the carrying out of the splicing with butt strap only.

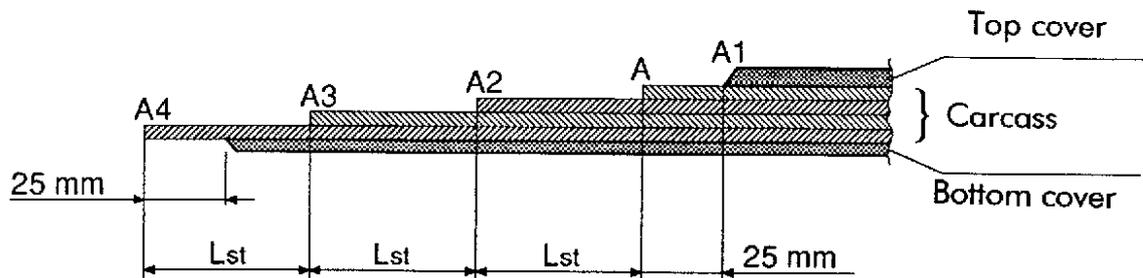


Fig. 21

5.1.6) Preparation of the second end of the belt

On the opposite head of the belt, prepare the complementary splicing part. The operations shall proceed as specified for the first head, but beginning from the bottom cover side (instead of the top one), with steps with the same inclination but in the opposite way as regards the first head, in order to obtain a perfect overlapping of the parts.

5.1.7) Solution application

By an abrasive disk dress the surface to be spliced, the butt strap or the overlapping zone, avoiding to damage fabrics. It would be better to leave a slight rubber coat on the fabrics.

Clean, by brush or puff of air, in order to eliminate the possible rubber dust. For this operation do not use solvents or dirty cloths.

Put, on the uncovered step surfaces of both the belt ends, two coats of SICOT® solution with a quality suitable for the belt rubber. Leave the solution dry for about 15 minutes between a coat and the other one, in order to avoid the formation of air bubbles during the vulcanisation.

5.1.8) Skin rubber application

After the second coat, apply on the more thick end a coat of uncured skin rubber with same quality of the belt and having a thickness of 0,5 mm, previously dressed with solvent and sprinkled with solution SICOT® (Fig. 22-23). Roll well and drill possible air bubbles by means of a punch.

For belts with closed edges, it is necessary to apply a 10÷20 mm further uncured rubber strip also along the two edges for the whole splicing stretch.

5.1.9) Head connection

Connect the two belt ends prearranged for the splicing, so that the steps perfectly match (Fig. 22). According to the splicing finishing follow one of the two points hereafter. At the end, roll well.

5.1.9.1) Butt strap finishing

Apply in the respective seats of the top and bottom cover, an uncured rubber strip, called butt strap, with thickness equal to the covers and width of 50 mm. (Fig 24). The quality of the rubber shall be as the one of the belt covers.

Please keep in mind to apply two coats of solution to the uncovered fabric and to the butt straps, before inserting them. Besides, if the rubber of the butt strap does not have the sufficient characteristics for the adhesion to the fabric, interpose a skin rubber strip previously wetted with solution.

5.1.9.2) Overlapping finishing

By means of a cutter, remove the exceeding belt (Fig. 24), being sure that the ends perfectly match. In the union point of the two edges interpose skin rubber strips to assure the adhesion of the parts.

This finishing is particularly suitable when the rubber used for the cover is not the same of the belt.

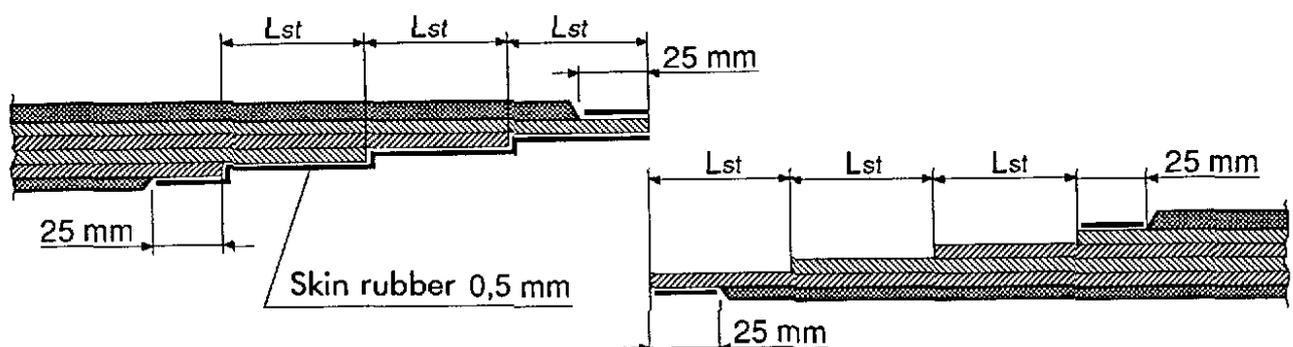


Fig. 22

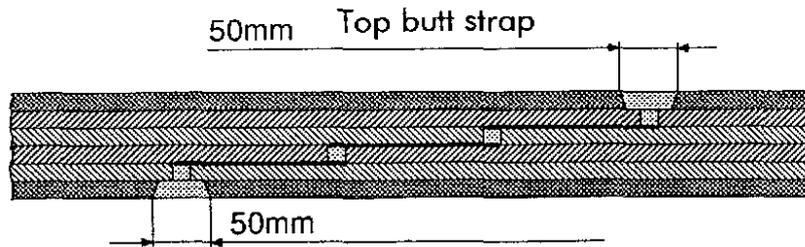


Fig. 23

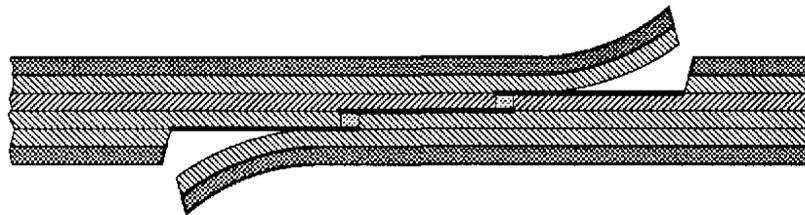


Fig. 24

5.2) HOT VULCANIZATION

Now we enter the vulcanisation phase which allows the adhesion of the different coat of the skin rubber and of the butt straps (if foreseen) in order to obtain an endless belt as requested.

5.2.1) Press installation

Insert the splicing under press between two sheets putting two containing bars near the belt, one for each side, having a thickness one millimetre lower than the thickness of the splicing to be vulcanised, in order to assure the correct carrying out of the edges. Make sure that these bars are well fixed to the structure or in any case that they cannot be enlarged by the rubber pressure.

It would be better to interpose some cotton heavy fabric bearings with a maximum thickness of 2 mm between the sheets and the hot plates to guarantee the best pressure distribution.

For a splicing as much aesthetically valid as possible, interpose a silicone paper sheet or an equal material, as long as this material does not adhere to the rubber, between the splicing and the plates.

5.2.2) Vulcanisation

Close the press acting on the pressing systems, up to a specific pressure on the belt of **8÷12 Kg/cm²** and heat the plates at the proper temperature as shown in the Tab. 4. Lower specific pressure (**7÷8 Kg/cm²**) is acceptable only in case of vulcanising press with air pillow, thanks to the homogeneous pressure distribution over the whole splice surface. The vulcanisation time is calculated since the press plates reach the fixed temperature.

At the end of the fixed time it will be necessary to cool the tables up to the agreed temperature, and then open the press and discharge the belt. If necessary, finish the edges of the belt again removing by means of a cutter the rubber in excess.

It is necessary waiting for the complete cooling of the splicing before tensioning the belt.

If the splicing length is higher than the press length, the vulcanisation shall be carried out at different times following the procedure above mentioned.

VULCANISATION CONDITIONS				
Belt Type	Cover Quality	Vulcanisation		Cooling at °C
		Temp. °C	Min. time	
TEXTER®	CL	145 - 150	15	80
	EC	145 - 150	15	80
RIPSAVE®	AS	145 - 150	15	80
RUGOTEX®	CX	145 - 150	15	80
PIPEX®	MX	145 - 150	15	80
SPINATEX®	TX	150 - 155	20	70
TEXRIGID®	OM	145 - 150	15	80
CROSSRIGID®	OH	145 - 150	15	80
	AG	145 - 150	15	80
All other multiplies belts	BS	145 - 150	15	80
	TS	145 - 150	15	80
	EX	145 - 150	15	80

Tab. 4

ATTENTION: the vulcanisation times shown in the table shall be applied only for the belts having a thickness lower than 10 mm; for higher thickness, add 1 minute every millimetre. For TX compound add 1,5 minutes every millimetre.

5.3) COLD GLUING

This system allows to obtain the splicing of the belt ends without using vulcanisation equipment but only through the adhesion of the two surfaces by means of **SICOL® 3030** cold solution.

For the preparation of the belt ends, refer to the par. 5.1, with the exception of the point 5.1.8 since the skin rubber application is not foreseen; besides, use the **SICOL® 3030** cold gluing instead of the SICOT® solution.

Such as for the hot carrying out, it is possible to finish the splicing with butt strap or overlapping. In the first case, after the splicing closing, it will be necessary to apply a vulcanised rubber strip to each butt strap, by means of the **SICOL® 3030** cold solution. In both cases, the perfect gluing of the cover edges is very important for the splicing. In fact, if on some steps or points the two ends don't perfectly match, in a short time they become the opening points of the splicing.

The SICOT® solution, in the proportion of about 2÷3 kg/m², is applied by a brush on both surfaces of the splicing. The number of the applications depends on the solution absorption and on the carcass structure; at least two applications are generally necessary. It is necessary waiting for the perfect drying of the first coat, **at least for 30 min**; when also the second coat is applied, it will be necessary waiting for the surface to become sticky before proceeding to the splicing closing. **In case of total drying of the second coat, proceed with a further one.**

The solution shall be applied well and uniformly in order to avoid the formation of clots; surfaces are therefore usually cleaned with care using the non-grease solvents to remove as much impurities as possible, and then dress them by a slight rasping by means of a abrasive disk or a wire brush taking care not to damage fabrics. Also after the treatment, keep the surfaces clean and dry since a dust or humidity rate higher than 60% can compromise the gluing result.

During the overlapping of the two ends, make sure that the splicing steps perfectly match. Then, use a roll to press well the surface from the inside towards the outside, press by a rubber hammer and finally lay an homogeneous weight in order to obtain a perfect adhesion between the parts.

Wait at least 12 hours before using the belt.

5.4) RECOMMENDATIONS FOR THE SICOL® 3030 COLD GLUE USE

SICOL® 3030 is a solution based on polychloroprene with cyclohexane solvent.

To be suitable for the use, it implies for its activation to be mixed with the REAGENT®. The standard reagent ratio is 4% in weight, which can be increased up to the 8% for special applications as for example for belts which transport oily or hot materials.

REAGENT® shall be added to the solution just before being used and mixed with care to the solution. It would be better to prepare only the quantity strictly necessary for the use, since the solution, once it has been activated with the reagent, has a short applicability time (about two hours with normal temperatures).

We suggest you to apply SICOL® 3030 in uniform coats and in a sufficient quantity, according to the surfaces state.

The maximum adhesive conditions occurs after at least 12 hours; we suggest to wait this time before using the products.

The 1 kg standard packages of SICOL® 3030 are supplied with packages of 4% already proportioned reagent; when you need bigger quantity of reagent, ask for additional quantity of REAGENT®.

The necessary quantity of SICOL® 3030 is 500 g/m² for each coat; this value shall be considered just as an indication since the conformation of the different fabric typologies determine different absorption degrees.

5.5) DIFFERENCES BETWEEN VULCANIZATION AND COLD GLUING

The cold gluing system has the advantage to be more practical, faster and besides it doesn't imply expensive equipment as the press for the vulcanisation.

The inconveniences concern a greater delicacy of the cold splicing which shall be properly carried out by skilled workers in order to avoid the imperfect gluing of the parts. Besides, the cold system needs a waiting time of at least 12 h before the belt use.

CHAPTER 6

INSTRUCTIONS FOR THE CHEVRON SPLICING

This type of splicing is usually carried out on SPINATEX® belts, chevron type. Unlike the normal splicing, where the step inclination is constant along the whole belt width, in the chevron splicing, steps are chevron type with the vertex on the central-longitudinal axis of the belt itself. As regards to the disposition of the steps and of the chevron vertex see Fig. 25.

Usually the angle of the inclined stretch is 45°, that is in such way that its length is B/2. The splicing length is:

$$L = (n_t - 1) L_{st} + B/2$$

In some cases, the step inclination can be different according to the cleat inclination or when, for vulcanisation exigencies, you wish to reduce the length of the inclined stretch.

For the carrying out of this type of splicing, proceed as shown in Chap. 5, cutting the cleats in the joint area or using suitable mould between belt and press in order not to damage the same cleats. Cut cleats have to be glued on the joint area after the vulcanization.

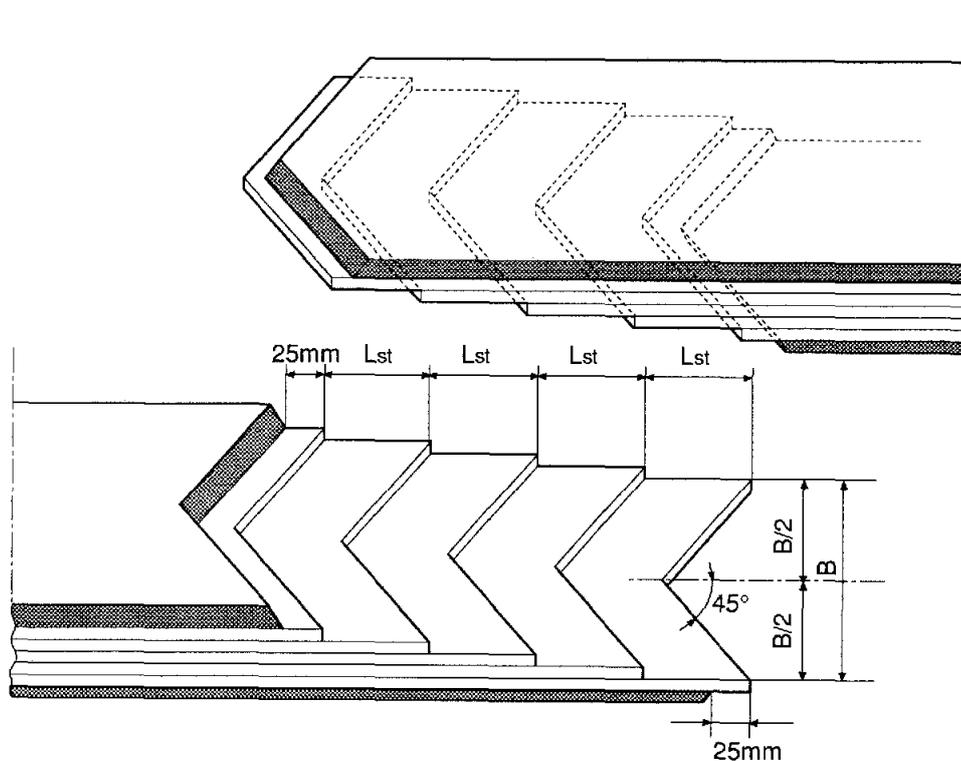


Fig. 25

CHAPTER 7

INSTRUCTIONS FOR PIPEX® BELT SPLICING

The main characteristic of PIPEX® belts is a transverse structure with variable profile. See Fig. below.

To splice these belts it is necessary to follow the operational scheme described in the Chap. 5, observing anyway some particular instructions, as shown hereafter.

- During the belt preparation (point 5.1.4) remove, with the plies, the rubber coat existing between them.
- For the splicing follow the usual procedure, assuring to restore the belt to its original structure, and inserting an uncured skin rubber coat with a suitable thickness (Fig. 26) into the zones where the rubber has been removed.
- Verify total joint thickness with instrument and by touch: it must be homogeneous all over the whole joint without evident steps, especially in the area of profile variation.

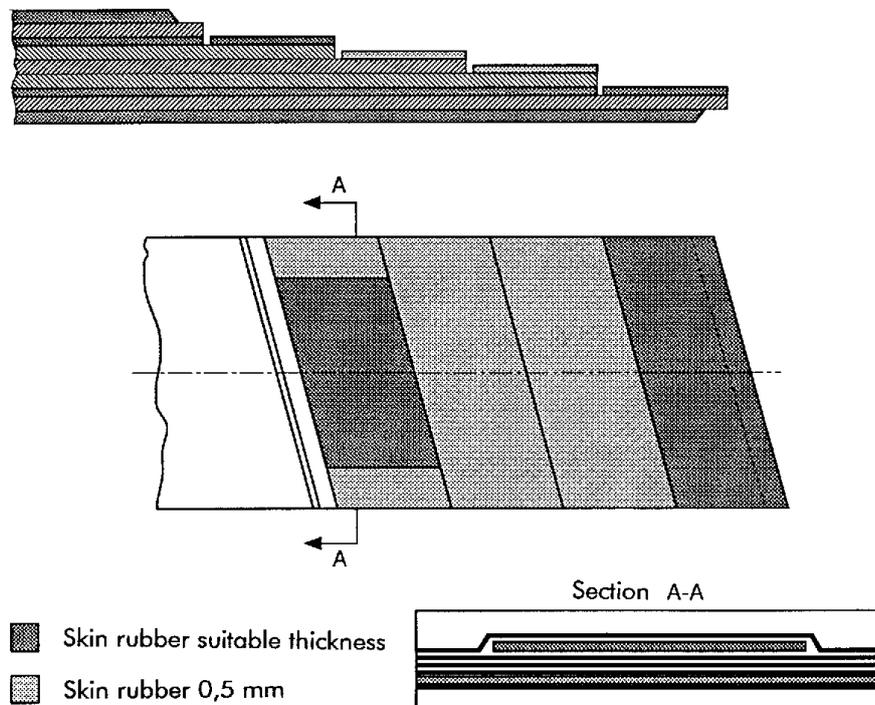


Fig. 26

CHAPTER 8

INSTRUCTIONS FOR FLEXOBORD® BELT SPLICING

The customer is supplied with FLEXOBORD® belts with edges and cleats already applied to the belt. Only at the two ends of the belt, edges are not connected to the base belt in order to make the preparation of the heads for the splicing easier. The belt is supplied together with some cleats which shall be glued after the splicing.

The operations to be carried out are the following ones:

- Carry out the splicing as it were a standard belt with cold or hot system.
- Apply cleats and edges at the splicing area by using the **SICOL® 3030** cold glue, as shown in the point 5.4. In order to carry out this operation it is necessary to remove, in the gluing zones, a thin and homogeneous coat of rubber from the top cover through a abrasive disk which allows a better adhesion between the two parts, taking care not to damage the fabrics below.
- Clean the zone previously prepared by using a simple brush to eliminate dust and rasping rests.
- Apply the two edges to the belt by the **SICOL® 3030**, following the instructions shown in the point 5.4.
- Prepare the cleats with the exact length so that they can be perfectly fixed between the two edges.
- Apply the cleats to the belt. If cleats should be bolted to the edges, it is necessary to carefully respect the pitch of the edge waves and then glue the cleats level with the inner point of the wave itself.
- Press edges and cleats by means of a special roll or hammer (if it is possible a pneumatic or electric hammer). To assure the perfect gluing of the edges, it would be better to put on the same a vertical pressure uniformly distributed (for example a wooden pallet suitably weighed down).
- If foreseen, apply the cleat locking bolts to the edges, by drilling the edge and the cleat through a common drilling machine.

In case of cleats and edges ungluing, they can be applied again in their original position after a suitable rasping of the two surfaces to be glued and after the application of the **SICOL® 3030** cold glue.

CHAPTER 9

INSTRUCTIONS FOR SPLICING OF RIPSAVE[®], TEXRIGID[®], CROSSRIGID[®] AND SEALTEX[®]

For special applications, textile belts can be produced with textile or metal special inserts, into the covers. These inserts have two different functions:

- transverse stiffening of the belt (for example TEXRIGID[®] “+2” and CROSSRIGID[®] for the production of FLEXOBORD[®] belts or SEALTEX[®] for sealing applications);
- increase of cut or impact resistance (for example RIPSAVE[®] belts).

With the exclusion of TEXRIGID[®] of type 400/3, 500/4 and 630/5 where the special stiff fabrics can be considered as standard EP fabric and the joint must be made as per TEXTER belts, these inserts does not have particular characteristics of longitudinal resistance; therefore, they are not taken into consideration in the splicing but only part of the covers: consequently, it will be necessary to remove them together with the covers. As the top cover, as well as the bottom, are removed from one belt end only, when the splicing is closed the insert is automatically restored.

See the following drawings for further details. For the complete procedure of splicing, see Chapters 3, 4 and 5.

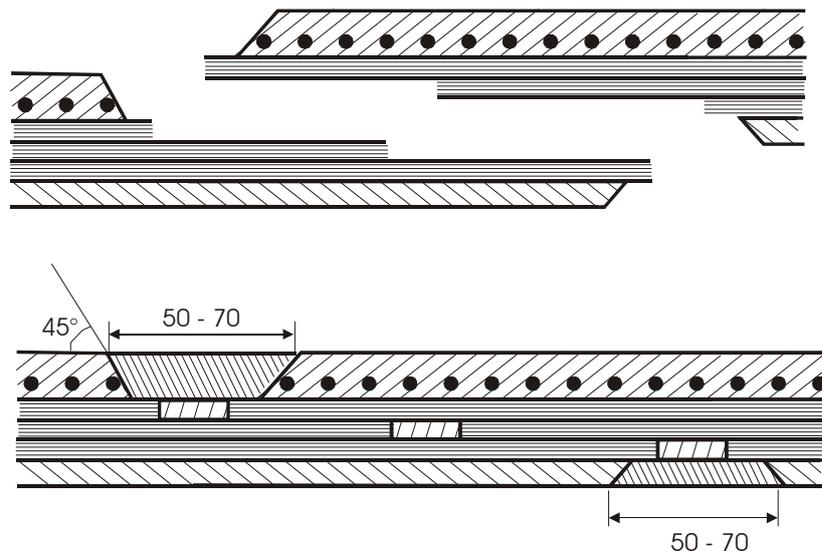


Fig. 26b

CHAPTER 10

INSTRUCTIONS FOR HOT REPAIRS

The belt repairs can concern the covers, the belt carcass the relevant covers, the rubber edges.

The materials to be used and the operating procedure are the same ones described in the previous chapters.

In case of carcass repairs (due to tearing or drillings) it will be necessary asking for a specific not cured rubber fabric corresponding to the type and the class of the damaged belt.

If the belt repair concerns a large part, it would be better to insert a new belt piece carrying out two splicing at a minimum distance of 5÷6 m.

10.1) COVER REPAIRS

Remove from the damaged zone, by engraving of the rubber without damaging the plies below, an old cover parallelogram and replace it with an uncured skin rubber of the same type and thickness.

Proceed as for the application of the butt straps (point 5.1.9.1).

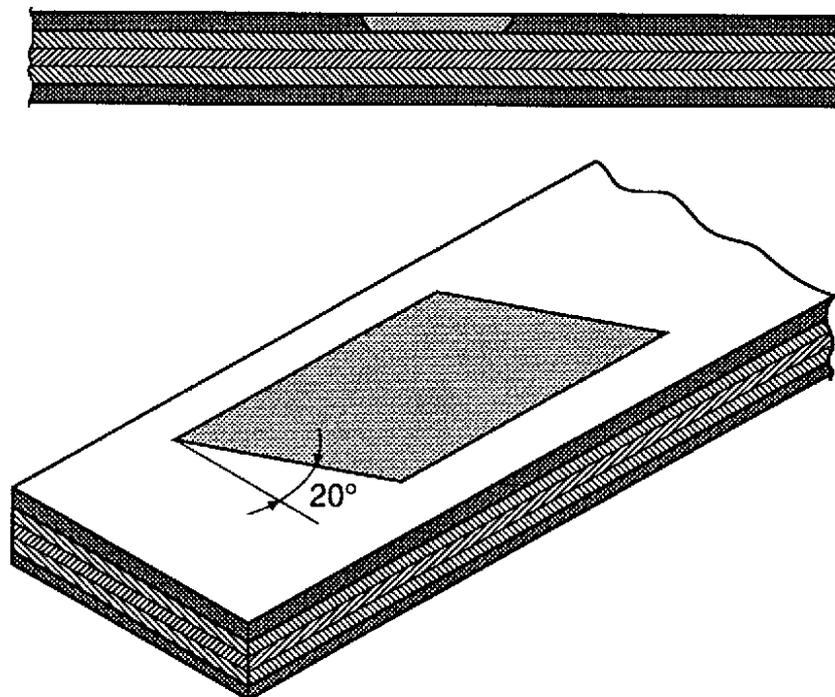


Fig. 27

10.2) CARCASS REPAIR

Remove from the concerned zone a parallelogram with the dimensions equal to the damage, scaling down starting from the cover up to the fabric removal. The engraving shall never damage the plies below (Fig. 28-29).

It is necessary to use uncured rubber fabrics corresponding to the belt type and class. On the contrary it is not necessary to put an uncured skin rubber between the different fabric coats since a dressing of the contact surfaces with the solvent is enough.

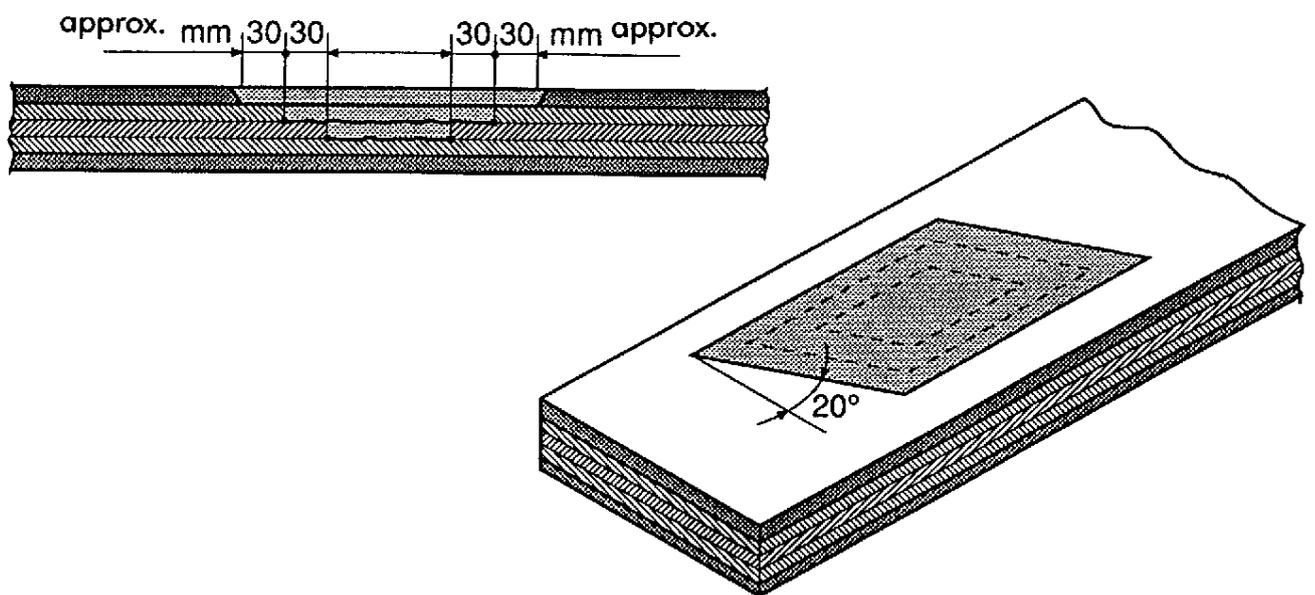


Fig. 28

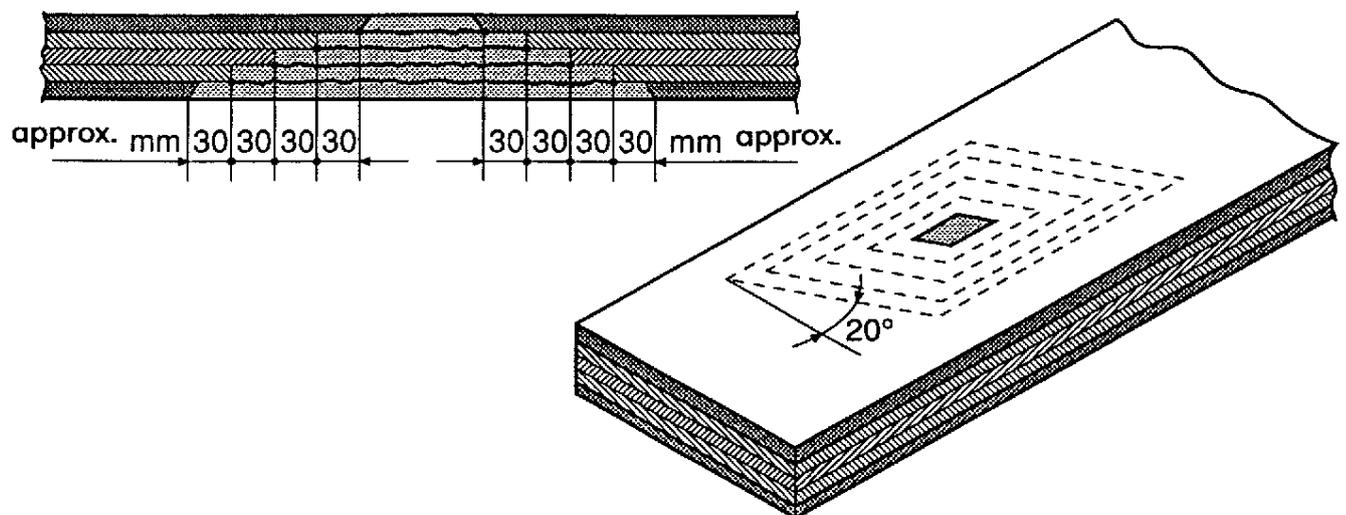


Fig. 29

10.3) RUBBER EDGE REPAIR (for belts with moulded edges only)

Remove the part of the damaged edge, clean the surface again and apply a coat of SICOT® solution; then restore the edge rubber by a suitable quantity of uncured rubber strips previously put in solution.

Proceed as described in the point 5.2 for the vulcanisation with a suitable press.

Uncured rubber with same quality of covers

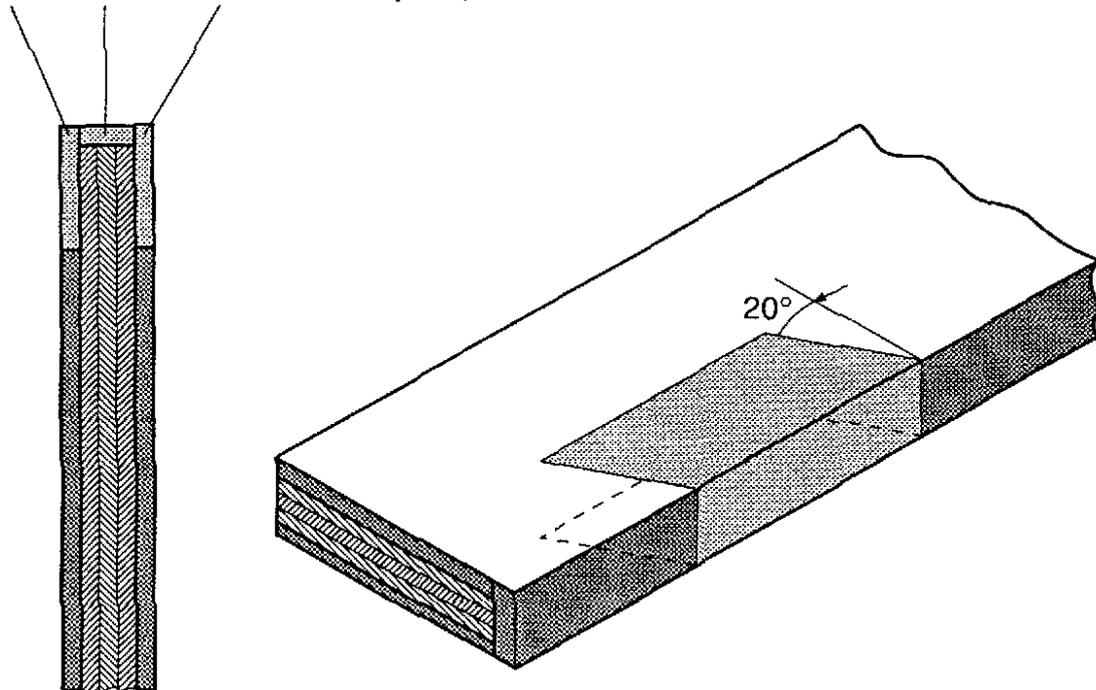


Fig. 30

CHAPTER 11

INSTRUCTIONS FOR COLD REPAIRS

In case of slight defects on the belt covers, as holes or grooving, the cold repair is possible by using self-vulcanising patches usually on the market. For their application, follow the indications contained in the par. 5.3 and 5.4.

On the contrary, when the repair concerns the belt edges or a large or deep cover zone, an hot repair is recommended since it assures a better resistance and lifetime.

INFORMATION

The information contained in this handbook constitute a general indication of the procedures and do not claim to be the only correct elements for splicing and repair procedures.

It stands to reason that the correct application of the above mentioned instructions make the final result easier but it does not determine it, since the responsibility for the actions is not included in the SIG S.p.A guarantees.

SIG S.p.A. as producer of conveyor belts and other rubber articles is responsible for their products and not for the specific technical choices for which the buyer is the only one in charge.