REMA TIP TOP

// ONE BRAND // ONE SOURCE // ONE SYSTEM

1-/2- WAY TRUCK TIRE REPAIRS PREMIUM

with vulcanizing materials and machines

Repair instructions

Introduction

- Before starting any repair, always inspect the tire in a professional way according to appropriate criteria, such as the general state of tire, national repair limits, etc. before deciding if the tire is repairable. Check the whole tire for further hidden damage.

- Information given in these repair instructions only refer to the use of original REMA TIP TOP products.

- A proper repair requires not only the use of high quality repair materials and tools but also an appropriate working environment such as:

  - ↗ good illumination of the workplace,
  - ↗ periodical cleaning of the workplace and the tools (maintenance),
  - ↗ protection of the repair area against draught and direct sunlight during the repair process,
  - ↗ storage of all products according to the specifications (on the packs),
  - ↗ well serviced machines and tools,
  - ↗ well trained staff.

- We reserve the right to change our products and processes in order to carry out technical improvements.

- The solvents and adhesives listed in the instructions can be used both in a highly flammable, CKW- and aromatics-free version, as well as for the countries without restrictions in one version with trichlorethylene as solvent. In the EU the use of trichlorethylene and trichlorethylene containing products in accordance with REACH annex XIV defined expiration date since 2016-04-21 is prohibited without authorization. For details please see our RTT microsite http://www.rtt-tri-free.eu/en.

- Always observe the applicable REMA TIP TOP repair charts when selecting the appropriate repair materials.

Contents

In accordance with this manual, the following patches can be applied:

- RAD 100 PREMIUM
  Repair patches with rayon cord of high quality for durable repairs to all radial tire sizes and for all applications.
- RAD 300 STEEL PREMIUM
  Steel-reinforced repair patches ensuring long operating times with high rigidity and casingoptimized design.
- RAD 500 ARAMID PREMIUM
  The repair patch for professional repairs. Aramidreinforced repair patches ensuring long operating times with a low weight and a high degree of flexibility perfectly suiting to the tire contour as well as the rolling behavior of new-generation tires.
- PN-DIAGONAL PREMIUM
  Repair patches with nylon cord of high quality for durable repairs to all BIAS tire sizes and for all applications.

1. General information

1.1 General safety instructions

Carefully read the operating and application instructions enclosed with the corresponding products/ machines. Always observe the safety instructions.

- Before starting work on large tires, ensure that the tires are secured against turning over, rolling or any other movement. Otherwise, there is a high risk of personal damage with significant injuries.
- When using rotary tools, solvents or any other dangerous tools and substances, always wear safety goggles.
- When working in an environment with a high noise level starting from 85 dB (A) (e.g. near noisy machines or tools), use ear protection according to labour protection regulations. However, an appropriate ear protection is reasonable even at lower figures.
- The use of S1-class safety shoes (toe protection cap, fully closed heel, antistatic and penetration-resistant) is prescribed for the operations described in this manual. These shoes must be equipped with a metal or plastic toe protection cap and a penetration-resistant, antistatic sole.
- When working with sharp-edged tools, aggressive solutions, hot devices or hot materials, always wear suitable safety gloves.
- When skiving out the injury with a rotary tool or during other work with a risk of projection of hot, pointed or sharp-edged drops, chips and sparks, face protection is recommended.

Safety symbols:


Use eye goggles!


Wear ear protection!


Wear safety shoes!


Wear protective gloves!


Face protection recommended!

When using solvents and vulcanizing cements, observe the safety instructions and symbols on the containers and the Safety Data Sheets.

Safety Data Sheets are available at:
http://www.rema-tiptop.com/products/safety-data-sheets/

Pictogram	Code	Hazard designation
 Exploding bomb	DANGER GHS01	Unstable explosives, mixtures and products containing explosives, self-reactive substances and mixtures, organic peroxides
 Flame	DANGER / ATTENTION GHS02	flammable, self-heating, self-reactive, pyrophoric, water-reactive, organic peroxides
 Flame over circle	DANGER GHS03	oxidizing hazards
 Gas cylinder	ATTENTION GHS04	gases under pressure, compressed, liquefied, frozen, dissolved gases
 Corrosion	DANGER / ATTENTION GHS05	for corrosive damage to metals, as well as skin, eyes
 Skull and Crossbones	DANGER GHS06	acute toxicity
 Exclamation mark	GHS07	div. health hazards
 Health hazard	DANGER / ATTENTION GHS08	div. health hazards
 Environment	ATTENTION / DANGER GHS09	may cause damage to the aquatic environment

Ensure that the concentration of the pollutant is under the occupational limit values. These are country-specific and specified in the safety data sheet, chapter 9 of each country. Not in every country limits have been defined for every chemical substance.
Especially when working with solutions inside the tire it is important to provide adequate ventilations as limit values might be exceeded quickly in closed areas. Flammable solvents can also lead to an explosive atmosphere. Solvent vapors are usually heavier than air and need to be extracted near the floor.

- When using chemicals or solvents, do not eat, drink or smoke.

- Tire repair equipment and tools have to be in good condition. They must never be left unattended when in use. Damaged or unserviceable safety equipment such as defective safety switches or similar devices expose the staff working near them to high risks.

- Working under bad illumination is dangerous. Good illumination and a clean work place are essential conditions for safe work. Reflective jackets are recommended in areas where vehicles are handled.

- Always keep dangerous tools, solutions, etc. out of the reach of children and unauthorized persons.

- Always observe the specific regulations for prevention of accidents from the employer's liability insurance association and the general safety regulations which apply in the countries concerned. In principle, a risk assessment for all activities in the respective working environment must be carried out before the start and adjusted in case of changes.

1.2 Tire terms

Tread
Plain or grooved rubber composite which ensures the contact with the road surface. It withstands wear and also protects the body plies together with the belts from cuts, punctures or any other damage resulting from running conditions. The tread includes the belts (protection plies and working stabilizer belts).

Shoulder
The area where the stepped belt edges are located. It begins at the upper end of the sidewall and ends at the compact belt package. The term denotes a critical repair area, as this area is subject to increased temperatures and irregular movements. This area tends to be a possible area to develop (ply or edge) separations.

Sidewall
Area between the bead and the tire shoulder. It determines the flexing behaviour of a tire. It contains the body ply including the extended ply turn-up.

Bead area (NRZ)
The part of the tire which is in contact with the rim. This part anchors the body ply and seals the tire against the rim. This part of the tire is described as NRZ (non-repairable zone or area). This term refers to the area between the bead toe and the centring rib.

Tire carcass
The radial body ply is the reinforcing support which offers resistance to the compressed air enclosed in the tire. At the same time it transfers the bearing capacity from the rim to the tread and to the bearing belt plies. The build specification according to US standard for new tires is listed under SIDEWALL.

Belt package
The belt package stabilizes the thread and improves the pressure distribution of the ground contact area. Furthermore, it fulfils a protecting function. The build specification according to US standard for new tires is listed under TREAD.

Inner liner
An air/gas-tight rubber layer inside the tire. The inner liner usually consists of butyl rubber.

1. General information

1.3 Terms regarding tire repair

Hot / warm vulcanization
Method of vulcanizing rubber fillings and repair patches on repair areas by means of heat and pressure.

Self vulcanization
Method of vulcanizing repair patches on injuries at room temperature at least + 18°C / 65°F.

Puncture channel
Hole made by a foreign body penetrating into the tire casing/belt.

Skive filling
Uncured rubber compound for filling the puncture channel before hot/warm vulcanization.

Pre-cured rubber insert (e.g. REMASTEM)
Pre-cured rubber plug for filling the puncture channel. It can be used only for punctures to the tread.

Combi repair unit (e.g. MINICOMBI)
One-piece repair unit which serves as a repair patch and fills the puncture channel at the same time. It can be used only for punctures to the tread.

Repair patch
Flat repair unit whose size and strength are adapted to the individual tire and injury sizes.

Reinforcement
Textile or steel cord which forms the plies of a tire and is also used in repair patches from a specific size on.

Drying time/Test with the back of the finger
The minimum drying time and the maximum permissible drying time have to be observed during the application of vulcanizing solutions and cements.
The right moment for the application of a repair patch is when the coat feels a little sticky when touched with the back of the finger but does not adhere to the finger or leave a wet residue on the finger; the coat should be dry, but still tacky. This "test with the back of the finger" is always carried out on the edge of the coated surface area.

LS (Low Speed)
Low speed – low speed rotary tool with
2 500 – 7 500 RPM preferred for machining rubber.

HS (High Speed)
High speed – high speed rotary tool with
16 000 – 30 000 RPM, preferred for machining steel.

RMA = Retreader Manufacturer Association

1.4 General rules for tire inspection and repair

- Before starting any repair, check whether it is technically safe and economically viable to repair the tire. Also check the whole tire for further hidden damage. Always examine the tire taking into account its general state outside the repair area.
- If a small injury is difficult to locate, slowly inflate the tire step by step to the operating pressure, permanently checking the whole tire for any noticeable defects.
- Always demount the tire from the rim in order to check whether repairing it is technically safe and economically viable, and to carry out the repair.
- After preparing the injury, select the appropriate repair materials depending on the size and position of the injury.
- The injury area has to be prepared correctly using the appropriate tools. Further damage arising from the injury which may be found during this operation also has to be included in the evaluation of the tire's repairability.
- Always observe the country-specific regulations on the repair of tires.

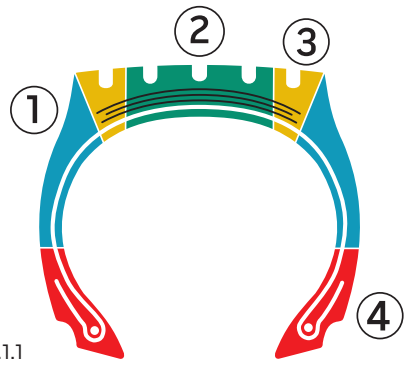
2.1 Preparations
2.1.1 Repair instructions

Classification of areas of a tire (fig. 2.1.1.1)
1) Sidewall

2) Tread

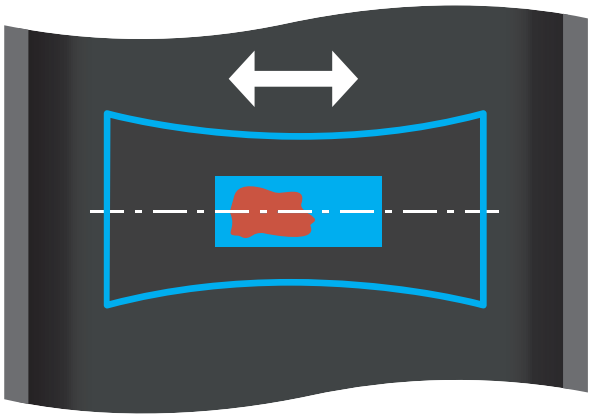
3) Shoulder

4) Bead (non repairable area)



2.1.1.1

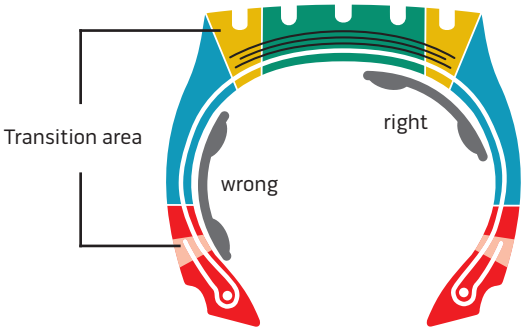
Patch centre (fig. 2.1.1.2)
The centre of the patch is identical to the centre of the injury. Do not move the patch in the axial direction. A radial move inside the marked area of the repair patch template is ok.



2.1.1.2

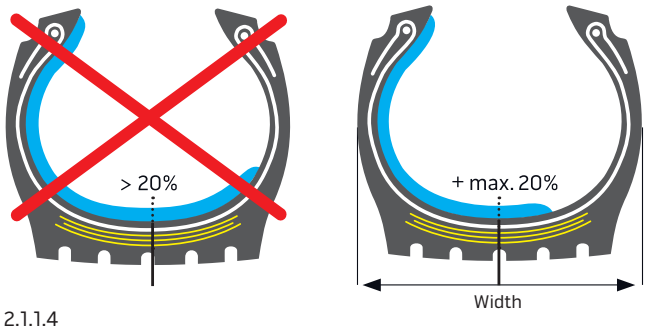
Flexing area (fig. 2.1.1.3)
When applying repair patches to radial tires, make sure that the cord ends of the repair patch do not end in the flexing area of the tire due to the risk of fatigue breakage in the repair patch. If the whole injury is still within the recess of the patch template, the repair patch can be shifted out of the flexing area in the radial direction.

The cord ends are under the raised areas at the ends of the repair patches. The punched hole for hang-up of the patch template indicates the position of the cord ends. This marking can be used to move the patch until the cord ends lie outside of the transitional area between the shoulder (broadest ply) and the sidewall.



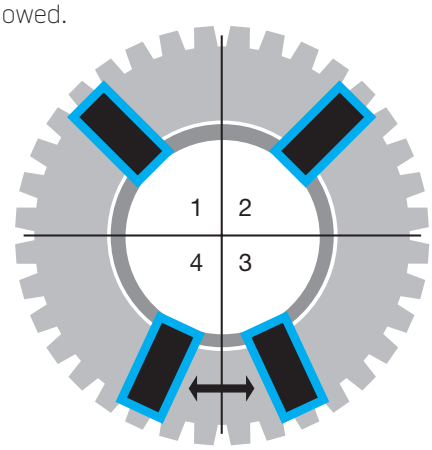
2.1.1.3

Bridge patch (fig. 2.1.1.4)
A patch may extended from the bead, a maximum of 20% across the middle of the tire width.



2.1.1.4

Maximum number of injuries (fig. 2.1.1.5)
Only one repair is allowed for each ply cord. In a tire divided into four quarters, only one repair patch in every quarter is allowed.



2.1.1.5

Distance check between the injuries
The minimum distance between two repair patches is equal to the width of the larger patch.

2. Repairs to radial tires

2.1.2 Preparation of the damaged area

- Note and record all tire data.
- Locate and mark the damaged spot on the tire. (fig. 2.1.2.1)
- Demount the tire correctly.

2.1.2.1

- Remove the foreign body without causing any further damage to the tire. (fig. 2.1.2.2)
  Screws should be screwed out of the tire.
- Check the whole tire inside and outside.
- Always check in a professional way according to appropriate criteria, such as the general state of the tire, national repair limits etc. whether the tire can be repaired. Also check the whole tire including existing repairs for further hidden damage.
- Clean the whole injury area inside the tire with LIQUID BUFFER.
- Immediately scrape the area with a liner scraper tool. (fig. 2.1.2.3)
- Remove residues of mounting agents.

2.1.2.2

2.1.2.3

- Remove all debris by vacuum. (fig. 2.1.2.4)

↗ **Notes:** The above process will remove all traces of silicone, graphite, and other mould lubricants from the liner. Scrape an area a little larger than the area of the expected patch.

2.1.2.4

2.1.3 Preparation of the injury

- Skive out the injury with the rotary gouge, giving it a concave shape. Rotary gouges cut much more easily when hot and sharp. (fig. 2.1.3.1)

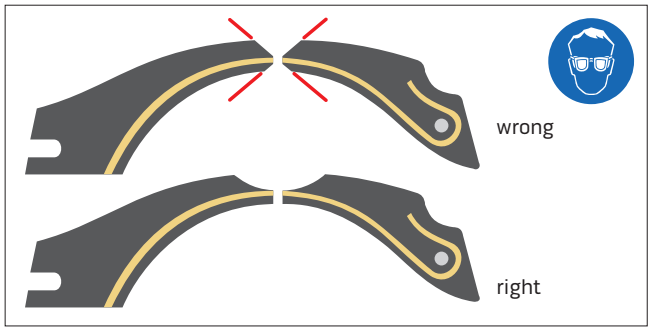
2.1.3.1

- Buff the skive with a suitable buffing wheel, giving the skive a concave shape.

↗ **Notes:** When working close to the steel, use a polywire brush to prevent steel or textile damage. (fig. 2.1.3.2)

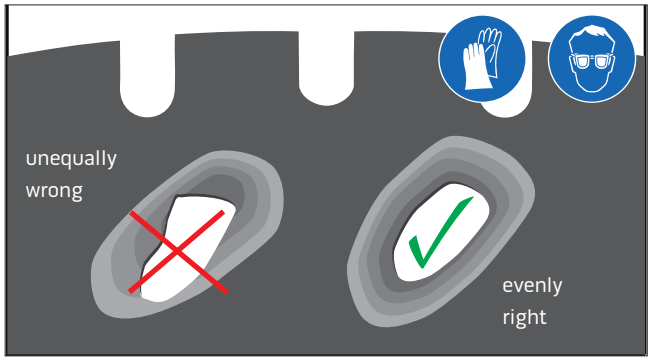
2.1.3.2

- Make sure that the skive is both regular in size and shape. If it is not shaped regularly, the tensions arising may cause the repair to fail. (fig. 2.1.3.3 and 2.1.3.4)
- Buff the rim of the skive with a buffing brush.
- Brush away the buffing dust with a soft hand brush to make the injury more visible.



2.1.3.3

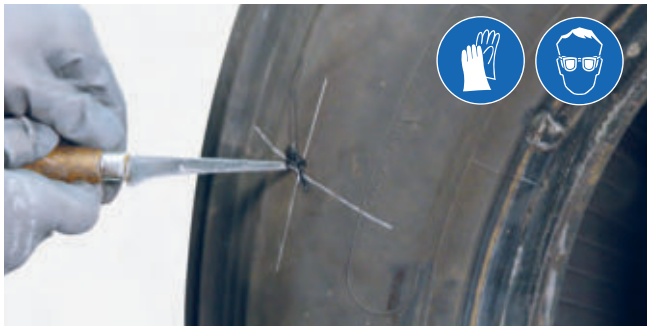
↗ **Notes:** Use the round surface of the rasps to help provide the correct shape.
Do not leave sharp edges on the rubber buff.



2.1.3.4

2. Repairs to radial tires

- Use the tapered knife to cut between exposed steel cords, cut as close as possible to the last broken or damaged ply. (fig. 2.1.3.5)



2.1.3.5

- Use a 3 mm carbide cutter at high speed to cut across the steel cables to be removed. This operation needs great care so as not to damage other undamaged cables. Do not lay bare cables or coils. (fig. 2.1.3.6)
  Use a **6 mm carbide cutter** at high speed to remove damaged material in the tread area.

2.1.3.6

↗ **Notes:** For tread injuries: remove all broken, damaged, separated, or rusted steel and cord. However, the injury should be kept as small as possible in order to retain as much of the original tire strength as possible. Try to keep the injury as round as possible by constant movement of the buffer in a circular motion.

- Trim the steel cord ends using high speed stones until the ends are completely embedded in rubber. (fig. 2.1.3.7)

2.1.3.7

- Buff the edge of the repair area using a rotary wire brush. (fig. 2.1.3.8)
- Clean the area with a brass brush and vacuum.

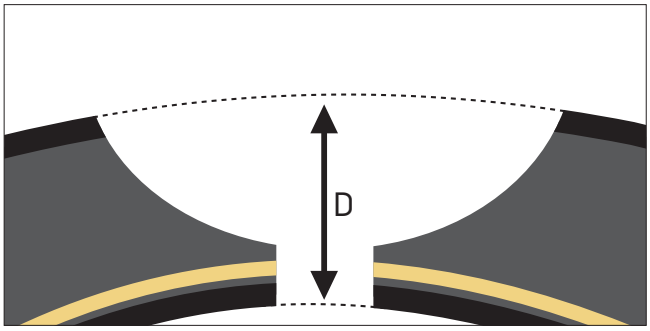
2.1.3.8

↗ **Notes:** Make sure no splits extend from the injury. Non-limited injuries cause failure of the repair and tire.

2.1.4 Measure injury/Select patch unit

- Measure the injury.

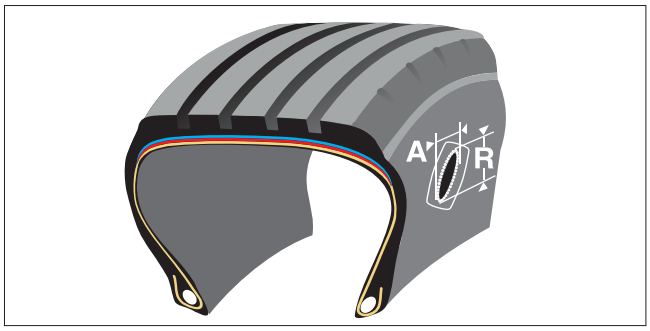
↗ **Note:** Measure the maximum tire thickness in the damage area and note it in order to calculate the curing time. (fig. 2.1.4.1)



2.1.4.1

For all full penetration injury, the maximum damage size in the body ply has to be respected.
Measure on the tire inside in the ply direction:

A (axial – across the direction of the cables of the body ply)
R (radial – in the direction of the cables of the body ply)
(fig. 2.1.4.2)



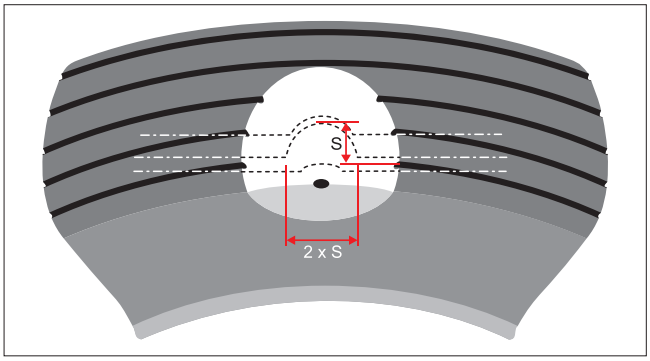
2.1.4.2

For sidewall injuries:
For injuries in the sidewall, without additionally damaging the belt package or the ply end:

Measure the values A und R in the body ply area.

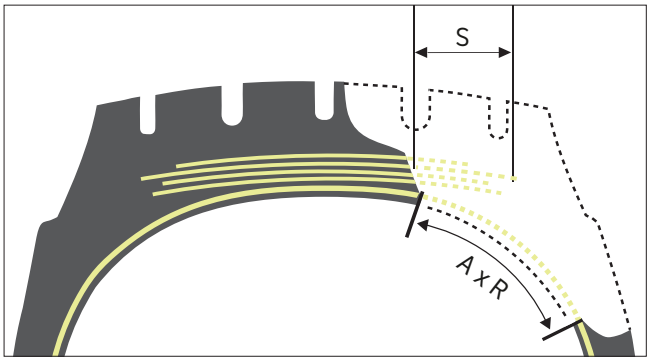
For shoulder injuries:
For 2 or more shoulder damages:
If just one belt ply is damaged, do not consider this for the patch selection. The rim of the belt shoulder can be detected if not all cord ends have a visible counterpart.

Measure the value S on the second damaged ply from the outside in axial and radial direction. The value S must not be bigger than the corresponding value in the repair patch chart. (fig. 2.1.4.3) In the axial direction, the value S must not be bigger than twice the corresponding value in the repair patch chart. If necessary, select a bigger patch. Additionally, measure the values A and R in the carcass so that the selected patch is big enough to cover all values S, A and R. (fig. 2.1.4.4)



2.1.4.3

↗ **Note:** The repair charts create a relationship between tire size, injury size, injury location, and the patch repair unit to be used. Only constant use of the repair charts will provide the necessary experience to read them correctly.



2.1.4.4

2. Repairs to radial tires

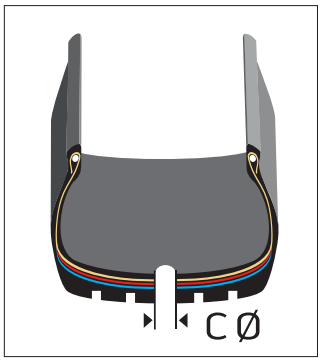
Full penetration injury in the tread area:

Value Ø C (tread damages)
(fig. 2.1.4.5)

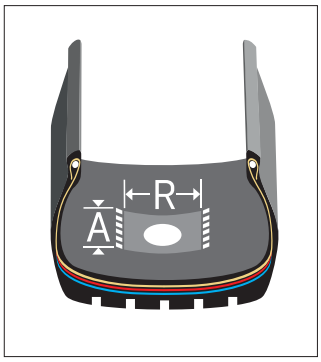
A (Axial)
R (Radial)
(fig. 2.1.4.6)

For 4 or more belt plies: Max. diameter of the damage in the third ply from the top. If value Ø C in the second ply is bigger than twice the value in the third ply, divide the value of the second ply in half in order to define the value. (fig. 2.1.4.7)

For 3 belt plies: Max. diameter of the damage in the second ply from the top. If twice value Ø C in the first ply is bigger than the value C in the second ply, divide the value of the first ply in half in order to define the value. (fig. 2.1.4.8)



2.1.4.5



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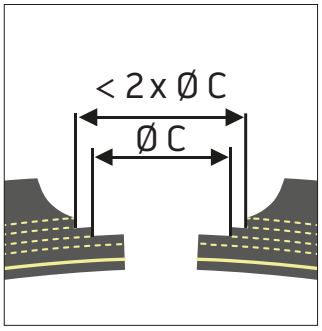
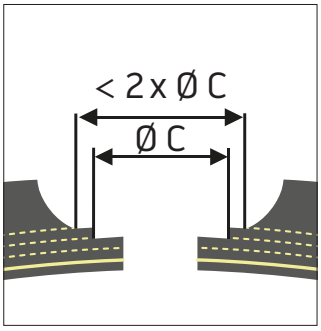


2.1.4.7



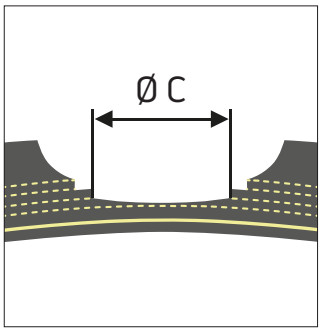
2.1.4.8

Non penetration injury in the tread area:

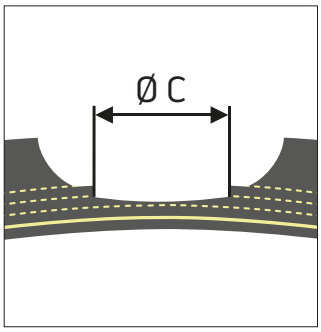
Value Ø C (tread damages)

For 4 or more belt plies: When the third belt ply is damaged, a patch has to be applied. Measure the value Ø C in the third ply that is damaged and select the corresponding patch size. (fig. 2.1.4.9)

For 3 plies: When the second belt ply is damaged, a patch has to be applied. Measure the value Ø C in the second ply that is damaged and select the corresponding patch size. (fig. 2.1.4.10)



2.1.4.9



2.1.4.10

↗ **Note:** Belt construction to be provided in accordance with the tire manufacturer's recommendations. (fig. 2.1.4.11)

2.1.4.11

- Chalk damage sizes on tire.
- Select the corresponding patch based on the latest REMA TIP TOP RADIAL repair chart.
- Chalk patch size number on tire.

2.2 Two-way system

In the two-way system the curing of the rubber fill is carried out prior to the application of the patch unit.
The patch repair unit is cured chemically at a minimum room temperature of (+18°C / 65°F) for 24 hours.

2.2.1 Preparation of the injury

- Buff an approx. 5 mm-wide area around the injury on the tire inside. **(fig. 2.2.1.1)**

2.2.1.1

- Clean the repair area with the brass brush. **(fig. 2.2.1.2)**

2.2.1.2

- Remove all debris by vacuum.
- Check the outside skive to make sure it is clean, if not, buff it lightly with the polywire brush and the brass brush, and then vacuum.

↗ **Note:** Coat repair area immediately after buffing.

- Apply an even coat of SOLUTION MTR-2 to the tire outside first, then to a smaller inside area.
(fig. 2.2.1.3 and 2.2.1.4)

2.2.1.3

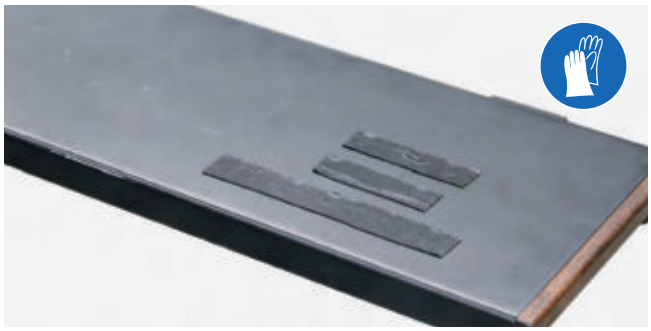
- Turn the tire so that the repair area is in the **3 or 9 o'clock position.**

2.2.1.4

2.2.2 Filling

- Observe the drying time before applying **RUBBER MTR. Drying time knuckle test (10-45 minutes).**

↗**Note:** Do not speed up the drying of the solution using any artificial means. Make sure that before rotating the tire back into its initial position after the drying process is complete, no remaining dust falls into the tire contaminating the dried solution.



2.2.2.1

- Cut RUBBER MTR-UNI.
- Pre-heat RUBBER MTR-UNI up to **80°C [176°F].** **(fig. 2.2.2.1)**
- Stitch 2 pieces RUBBER MTR-UNI in the repair area inside the tire. **(fig. 2.2.2.2)**

2.2.2.2

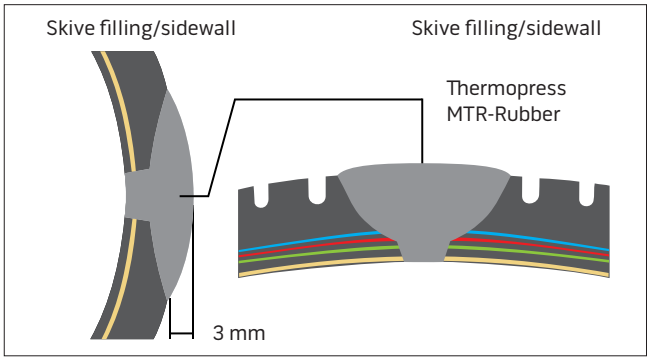
- Stitch RUBBER MTR-UNI layer by layer on the tire outside to avoid air traps. **(fig. 2.2.2.3)**

Alternatively:
Apply RUBBER MTR-EXT with an extruder and stitch at regular intervals in order to avoid air traps.

2.2.2.3

- Overfill slightly to prevent shrinkage during curing. Overfill by 2 to 3 mm. **(fig. 2.2.2.4)**

↗**Note:** Seal open grooves near the filling in the tread area with adequate material in order to avoid running of the rubber.



2.2.2.4

2.2.3 Cure the fill rubber

- Apply SOLUTION MTR-2 to both the inside and outside filling. After 2-3 minutes cover with heating foil to avoid dirt or machine parts sticking to the rubber fill. (fig. 2.2.3.1 and 2.2.3.2)

2.2.3.1

2.2.3.2

- Cure using a vulcanizing press or another system. (fig. 2.2.3.3)

  Always follow the manufacturer's instructions for use of the particular curing equipment.
  The curing temperature for **warm/hot curing starts from +100°C / 212°F)**

  Use specially shaped plates and bags to maintain the best normal tire contours during the cure.

2.2.3.3

- Check the skive filling immediately after removing the tire from the vulcanizing device. In order to do so, press the tire probe into the skive filling. If it leaves a durable mark (rubber not fully vulcanized), the whole curing process will have to be repeated. If gas bubbles are found upon inspection, the repair has to be repeated. (fig. 2.2.3.4)

↗ **Note:** When satisfied with the curing allow to cool to ambient room temperature.

2.2.3.4

2.2.4 Mark the contours of the repair patch

- Also draw auxiliary lines which will help to centre the patch unit. These lines must run through the middle of the injury, slightly beyond the edge of the patch placement area. (fig. 2.2.4.1)

2.2.4.1

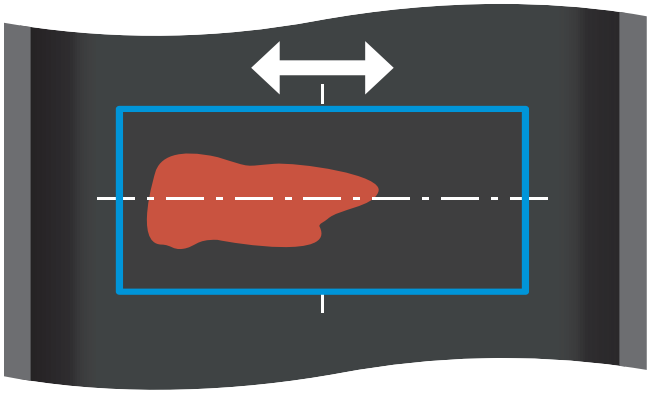
- Use a tire marking pen (or a piece of chalk) and a template to mark the liner area to be buffed. (fig. 2.2.4.2 and 2.2.4.3)

  The use of templates is a must to locate the patch unit accurately. REMA TIP TOP offers patch templates made of plastic. Additionally, the patch templates are printed on the packaging of the patches. Just cut out the templates in the marked areas in order to be able to use them.

2.2.4.2

2.2.4.3

↗ **Note:** Patches may be shifted in the radial direction in order to position the patch cord ends under the covers outside the transition areas. The damage has to be positioned within the marked contours of the template.(fig. 2.2.4.4) The patch must not be shifted in the axial direction. Tread repair patches must not be shifted at all.



2.2.4.4

↗ **Note:** If any problem is noted with the inner liner such as looseness or soft smearing, remove the inner liner completely from the patch placement area (chapter 2.4.1) and laminate the patch unit (chapter 2.4.2).

2.2.5 Buff the liner

- If any additional silicone scrape is required it should be completed now. Then, mark the contours of the repair patch again **(see section "Clean the liner").**

- Buff the liner with a 36 grit Dome rasp.
  (fig. 2.2.5.1 , 2.2.5.2, 2.2.5.3 and 2.2.5.4)
  When buffing the liner all vent lines or vent patterns must be removed Use only light pressure while buffing and do not allow the tool to remain stationary in one spot.

↗ **Note:** The 36 grit dome rasp will provide a nice and even buffing texture. RMA 3 texture is correct for patch unit application. If during the buffing process any problem is noted with the liner such as looseness or soft smearing, it is recommended to remove the liner from the patch placement area **(see section "liner removal")**.

↗ **Note:** Coat repair area immediately after buffing.

2.2.5.1

2.2.5.2

2.2.5.3

2.2.5.4

2. Repairs to radial tires

2.2.6 Cement application

- Finally clean with a brass bristled brush and remove all dust by vacuum. **(fig. 2.2.6.1 and 2.2.6.2)** Never use compressed air to remove buffing dust, always use a vacuum together with a brass cleaning brush.

2.2.6.1

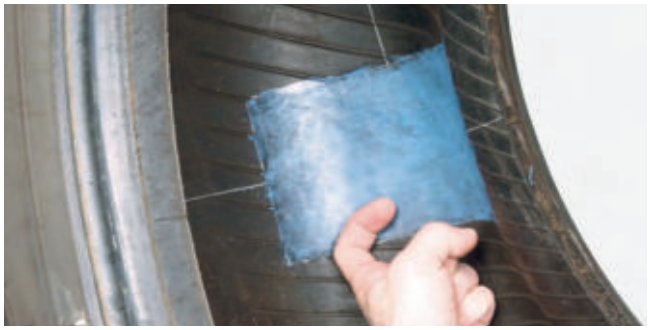
2.2.6.2

- Apply an even coat of CEMENT SC-BL to the buffed liner inside. **(fig. 2.2.6.3)**
- Turn the tire so that the repair area is in the **3 or 9 o'clock position.**
- Observe drying time prior to patch application.

2.2.6.3

Drying time knuckle test (10-45 minutes). (fig. 2.2.6.4)

↗ **Note:** Do not speed up the drying of the solution using any artificial means. Make sure that before rotating the tire into its initial position after the drying process, no remaining dust falls into the tire contaminating the dried solution. When renewing the coat, respect the drying time of **at least 60 minutes** for the first coat.
Apply the patch after the regular **drying time knuckle test (10-45 minutes)** after the second coat.



2.2.6.4

2.2.7 Patch application

- Relax the tire beads before applying the patch (do not spread them). Position the injury at the **6 o´clock position.**
- Draw auxiliary lines which will help to centre the patch unit.
- Test the dryness of the cement **(knuckle test).**
- Loosen the patch backing paper but place it back to protect the bonding layer. **(fig. 2.2.7.1)**
- Align the patch correctly inside the tire with the help of the auxiliary lines.
- Start removing the patch backing paper on the first half of the patch from the centre first and stitch from the centre working outwards. **(fig. 2.2.7.2)**

2.2.7.1

2.2.7.2

- Then also remove the patch backing paper on the second half of the patch from the centre first and stitch from the centre working outwards.
- Make sure that the whole patch area is stitched down. **(fig. 2.2.7.3 and fig. 2.2.7.4)**
- Finally stitch the patch border area.
- Record any required data on the patch unit using the marking pen.

2.2.7.3

2.2.7.4

2.2.8 Final inspection

- Check whether the patch has been applied correctly with no air or gas entrapment under it.

↗ **Note:** The patch unit will need to be left for a **minimum of 24 hours** to allow it to chemically vulcanize at a minimum temperature **of 18°C / 65°F.**

- Inspect the complete tire, including the inside and the patch repair unit.
- Apply INNERLINER SEALER to the patch border area and any buffed over area. **(fig. 2.2.8.1)**

As an alternative, apply RCF SEALER-PLUS.

- Buff the skive filling with **max. 1 bar** filling pressure when the tire is mounted in order to adapt it to the tire contour. Initially the **65 mm** dome rasp can be used to remove the overfill. However it is recommended to finally improve the appearance by using a fine grit buffer ES45. **(fig. 2.2.8.2)**
- Regroove the tread pattern to match the original. **(fig. 2.2.8.3)**

↗ **Note:** Inspect the complete tire (including the inside and the patch repair unit) before returning the tire to normal service.

2.2.8.1

2.2.8.2

2.2.8.3

2.3 One-way system

In the one-way system, the curing of the rubber fill and patch repair unit is carried out simultaneously.

2.3.1 Mark the contours of the repair patch

- Draw auxiliary lines which will help to centre the patch unit. These lines must run through the middle of the injury, slightly beyond the edge of the patch placement area.(fig. 2.3.1.1)

2.3.1.1

- Use a tire marking pen or a piece of chalk and a patch template in order to mark the liner area to be buffed. (fig. 2.3.1.2 and fig. 2.3.1.3)

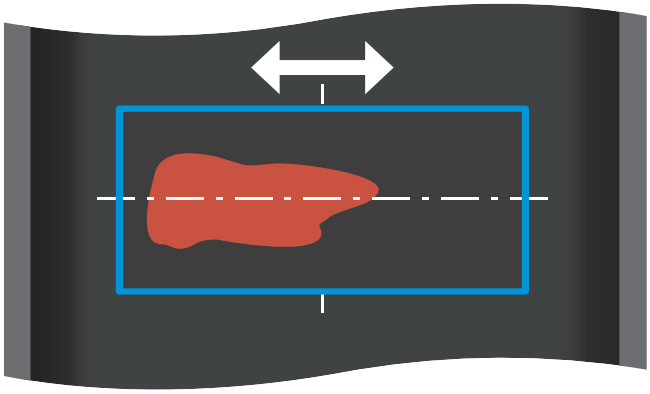
  The use of templates is a must to locate the patch unit accurately. REMA TIP TOP offers patch templates made of plastic. Additionally, the patch templates are printed on the packaging of the patches. Just cut out the templates in the marked areas in order to be able to use them.

2.3.1.2

2.3.1.3

↗ **Note:** Patches may be shifted in the radial direction in order to position the patch cord ends under the covers outside the transition areas. The damage has to be positioned within the marked contours of the template. (fig. 2.3.1.4) The patch must not be shifted in the axial direction. Tread repair patches must not be shifted at all.

↗ **Note:** If any problem is noted with the inner liner such as looseness or soft smearing, remove the inner liner completely from the patch placement area (chapter 2.4.1) and laminate the patch unit (chapter 2.4.2).



2.3.1.4

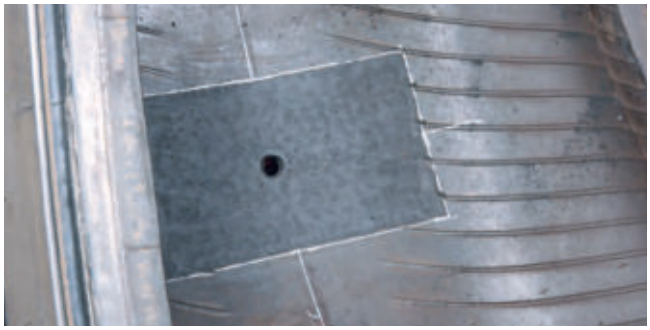
2.3.2. Buff the liner

- If any additional silicone scrape is required it should be completed now. Then, mark the contours of the repair patch again **(see section "Clean the liner").**

2.3.2.1

- Buff the liner with a 36 grit dome rasp. **(fig. 2.3.2.1, 2.3.2.2 and 2.3.2.3)** When buffing the liner all vent lines or vent patterns must be removed. Use only light pressure while buffing, and do not allow the tool to remain stationary in one spot.

2.3.2.2



2.3.2.3

- Finally clean with a brass bristled brush and remove all dust by vacuum. Never use compressed air to remove buffing dust, always use a vacuum together with a brass cleaning brush. **(fig. 2.3.2.4)**

↗ **Note:** The 36 grit dome rasp will provide a nice and even buffing texture. A RMA 3 texture is recommended. If any problem is noted with the liner such as looseness or soft smearing, remove the liner completely from the patch placement area **(see section "liner removal").**

↗ **Note:** Coat repair area immediately after buffing.

2.3.2.4

2.3.3 Cement application

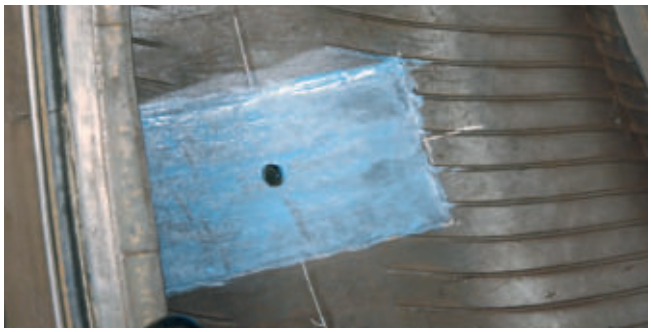
- Apply SOLUTION MTR-2 to the outside skive area evenly. (fig. 2.3.3.1)

2.3.3.1

- Apply CEMENT SC-BL to the buffed liner inside evenly. (fig. 2.3.3.2 and fig. 2.3.3.3)
- Turn the tire so that the repair area is in the 3 or 9 o'clock position.
- Observe the drying time prior to the patch application. Drying time knuckle test (10-45 minutes). (fig. 2.3.3.4)

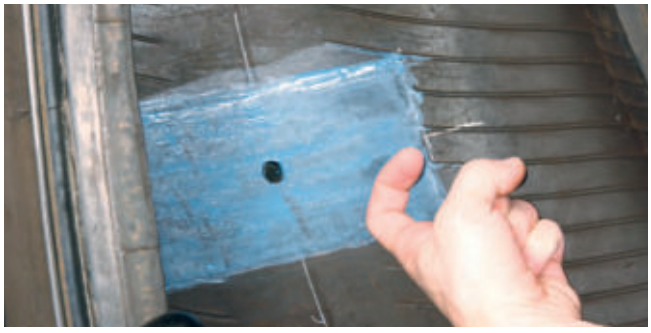
2.3.3.2

> ↗ **Note:** Do not speed up the drying of the solution using any artificial means. Make sure that the drying process is complete before rotating the tire back into its initial position and make sure no remaining dust falls into the tire contaminating the dried solution. When renewing the coat, respect the drying time of at least **60 minutes** for the first coat. Apply the patch after the regular **drying time knuckle test (10-45 minutes)** after the second coat. Waiting time before vulcanization: **12 hours.**



2.3.3.3

- If interruptions of the curing process are anticipated, use SOLUTION HR **drying time knuckle test (15 - 180 minutes)** instead of CEMENT SC-BL, **provided that the one-way system is used in a hot/warm curing process (starting from +85°C / 185°F) and the waiting time before vulcanization is max. 14 days.**
- Shorter drying times can be achieved using CEMENT FD-BL **drying time knuckle test (5 - 15 minutes), provided that the one-way system is used in a hot/warm curing process (starting from +100°C / 212°F) and the waiting time before vulcanization is max. 4 hours.**



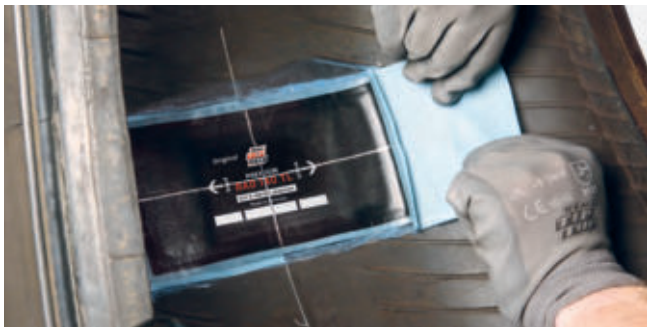
2.3.3.4

2.3.4 Patch application

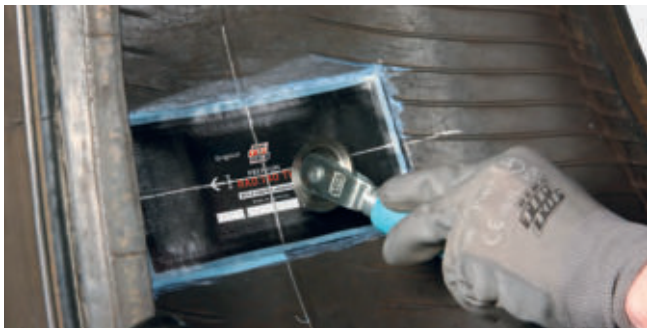
- Relax the tire beads before applying the patch (do not spread them). **Position injury at the 6 o´clock position.**
- Draw auxiliary lines which will help to centre the patch unit.
- Test dryness of cement **(knuckle test).**
- Loosen the patch backing paper but place it back to protect the bonding layer.
- Align the patch unit correctly inside the tire with the help of the auxiliary lines. **(fig. 2.3.4.1)**
- Remove the patch backing paper on the first half of the patch from the centre first and stitch from the centre working outwards. **(fig. 2.3.4.2 and 2.3.4.3)**
- Then also remove the patch backing paper on the second half of the patch from the centre first and stitch from the centre working outwards.
  Make sure that the whole patch area is stitched down. **(fig. 2.3.4.4)**
- Finally stitch the patch border area.
- Record any required data on the patch unit using the marking pen.
- Apply INNERLINER SEALER to the patch border area as well as any other area that has been buffed.
  This operation can also be carried out after the curing during the final inspection.

↗ **Notes:** For systems using inner and outer envelopes or curing tubes, it is recommended to apply talcum over the INNERLINER SEALER in order to prevent sticking.

2.3.4.1



2.3.4.2



2.3.4.3

2.3.4.4

2.3.5 Filling

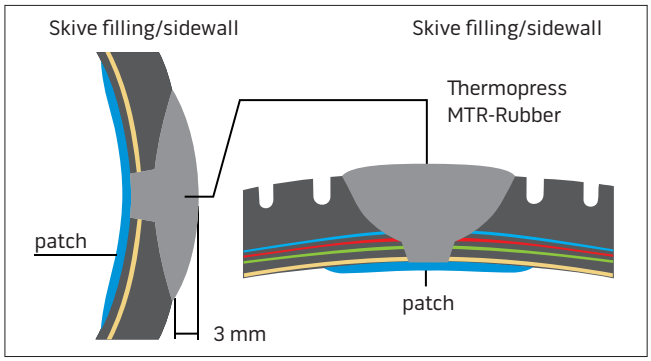
- Apply RUBBER MTR-EXT with an extruder. (fig. 2.3.5.1)
- Stitch at regular intervals in order to avoid air traps. (fig. 2.3.5.2)

Alternatively:
Cut RUBBER MTR-UNI, pre-heat it up to 80°C [176°F] and stitch layer by layer on the tire outside.

2.3.5.1

2.3.5.2

- Overfill slightly to prevent shrinkage during curing. Overfill by 2 to 3 mm. (fig. 2.3.5.3)



2.3.5.3

- Apply SOLUTION MTR-2 to the fill. After 2-3 minutes cover with heating foil to avoid dirt or machine parts sticking to the rubber fill. (fig. 2.3.5.4)

↗ Note: Seal open grooves near the filling in the tread area with adequate material in order to avoid running of the rubber.

2.3.5.4

2.3.6 Curing

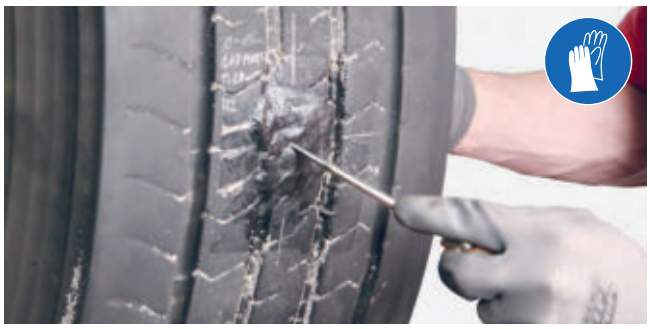
- Cure using a VULCSTAR, an autoclave or another curing system, according to the one-way system. (fig. 2.3.6.1) Always follow the manufacturer's instructions for use of the particular curing equipment.

↗ Note: Complete the curing within a 12 hour period when using the one-way system with CEMENT SC-BL.

2.3.6.1

2.3.7 Final inspection

- Check the skive filling immediately after removing the tire from the vulcanizing machine. In order to do so, press a tire probe into the skive filling. If it leaves a durable mark, the rubber has not fully been vulcanized and the whole curing process needs to be repeated. If gas bubbles are found upon inspection, the repair has to be repeated as well. (fig. 2.3.7.1)



2.3.7.1

- Check whether the patch has been applied correctly with no air or gas entrapment under it.
- Allow the tire to cool to ambient temperature.
- Inspect the complete tire including the inside and the patch repair unit.
- Apply INNERLINER SEALER to the patch border area and over any buffed area. (fig. 2.3.7.2)

2.3.7.2

As an alternative, apply RCF SEALER-PLUS.

- Buff the skive filling with max. 1 bar filling pressure when the tire is mounted in order to adapt it to the tire contour. Initially the 65 mm dome rasp can be used to remove the overfill, however it is recommended to finally improve the appearance by use of a fine grit buffer ES45. (fig. 2.2.8.3)

2.3.7.3

- Regroove the tread pattern to match the original. (fig. 2.3.7.4)

2.3.7.4

↗ **Note:** Inspect the complete tire, including the inside and the patch repair unit before returning the tire to normal service.

2. 4 Additional working procedures – if necessary

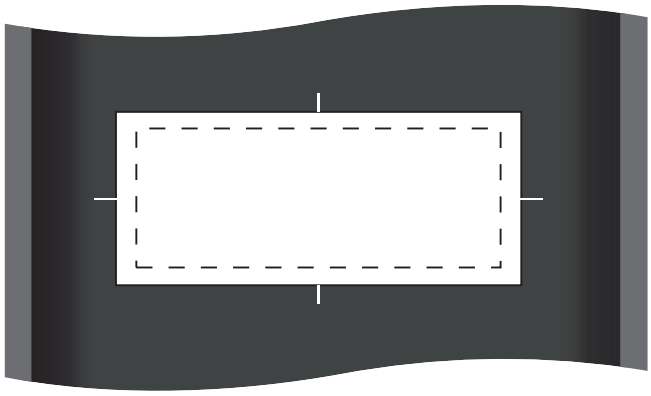
2.4.1. Inner liner removal

- Use a tire marking pen or a piece of chalk and a patch template in order to mark the contours of the repair patch unit accurately. (fig. 2.4.1.1)

2.4.1.1

- Remove the patch unit and mark a second auxiliary line approx. 20 mm inside the patch markings. (fig. 2.4.1.2)

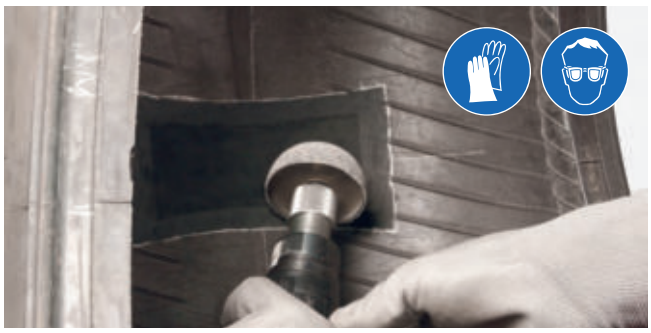
- Carefully remove the liner from the inner marked area using a 65 mm dome rasp buff. Make sure that the radial body ply is not damaged. The buffed surface area should have a fine and even buffing texture equivalent to RMA 3.



2.4.1.2

- Now buff the remaining 20 mm outer edge. (fig. 2.4.1.3 and 2.4.1.4) Make sure to produce a transition or gradual ramp to the liner level. Focus on the correct direction of the rotation of the buffing tool and do not rotate the tool against the inner liner edge.

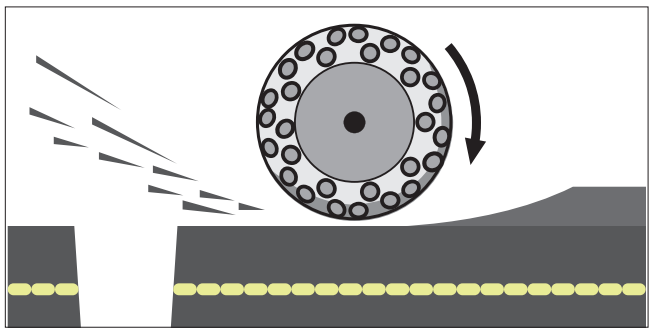
- Finally clean with a brass bristled brush and remove all dust by vacuum. Never use compressed air in order to remove buffing dust.



2.4.1.3

↗ **Note:** Coat repair area immediately after buffing.

- Apply a thick and even coat of SOLUTION MTR-2 to the previously buffed area in the tire. Turn the tire so that the repair area is in the 3 or 9 o'clock position. Observe the drying time before applying the patch unit. Drying time knuckle test (10 - 45 minutes).



2.4.1.4

↗ **Note:** After the drying time, a suitable laminated repair patch has to be ready for application. If carcass rubber should be detected in between the inner liner and the patch unit, cover it up with a layer of rubber and vulcanize it with the patch.

2.4.2. Patch lamination

- If the inner liner has been removed, the patch unit will have to be laminated.

↗ **Note:** Apply RUBBER SV-GUM when using the 2-way system, for repairs according to the 1-way system apply RUBBER MTR-CUS and SOLUTION MTR-2. As an alternative to RUBBER MTR-CUS, apply RUBBER SV-GUM and CEMENT SC-BL provided that no autoclave with open steam is used during vulcanization.

2.4.2.1

- Cut a piece of cushion gum larger than the patch unit and have it ready without soiling the bonding surface to the patch.
- Completely remove the patch protective foil without touching or soiling the bonding layer. Then put the patch with its top side on a clean surface.
- Apply an even and thick coat to the patch bonding layer. **Drying time knuckle test (10-45 minutes).** **(fig. 2.4.2.1)**
- Laminate the patch with the cushion gum and stitch on with a wide roller-stitcher in order to avoid air entrapment **(fig. 2.4.2.2 und 2.4.2.3)**

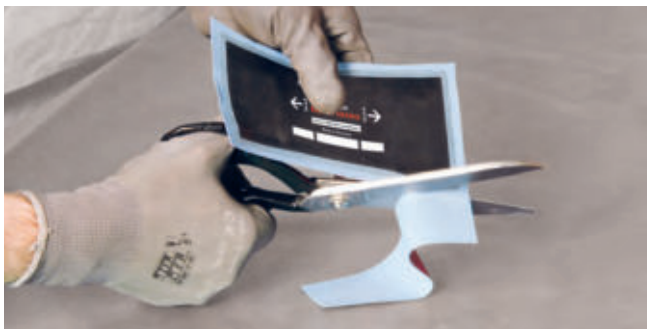
2.4.2.2

2.4.2.3

- The cushion gum should be approx. **5 mm** larger than the patch on all sides. **(fig. 2.4.2.4)**
- Cut in the centre of the protective foil without cutting through the cushion gum.

Waiting time between lamination and patch application: **2 hours.**

Vulcanization: the self-vulcanizing of the laminated patch requires an ambient temperature of at least 18°C (65°F) and a curing time of 48 hours.



2.4.2.4

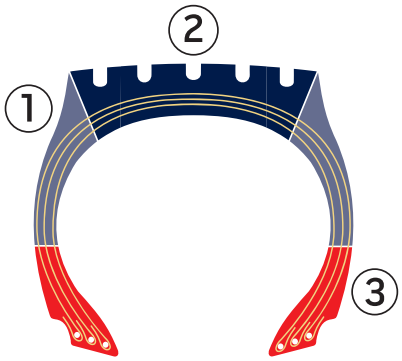
3. Repairs to BIAS tires

3.1 Preparations
3.1.1 Repair instructions

Classification of areas of a tire (fig. 3.1.1.1)
1) Sidewall

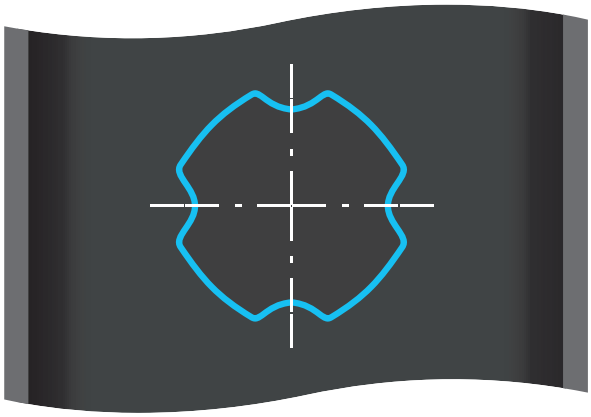
2) Tread

4) Bead (non repairable area)



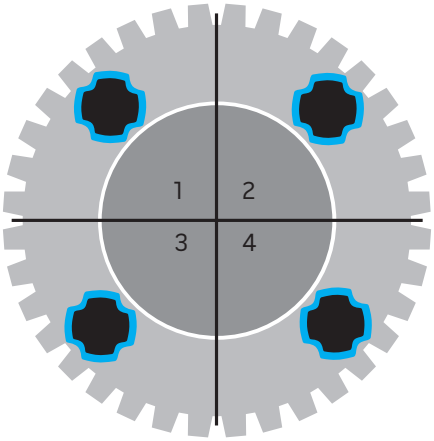
3.1.1.1

Patch centre (fig. 3.1.1.2)
The centre of the patch is identical to the centre of the injury. Patches applied in the shoulder area can be trimmed (see chapter 3.1.5. "Shoulder patch")



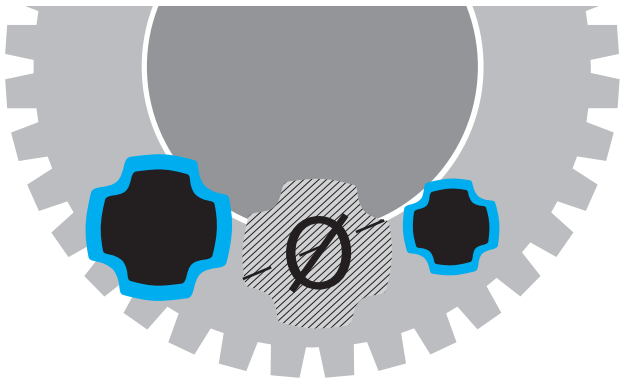
3.1.1.2

Maximum number of injuries (fig. 3.1.1.3)
In a tire divided into four quarters, only one repair patch in every quarter is allowed.



3.1.1.3

Distance check between the injuries (fig. 3.1.1.4)
The minimum distance between two repair patches is equal to the diagonals of the larger patch.



3.1.1.4

3. Repairs to BIAS tires

3.1.2 Preparation of the damaged area

- Note and record all tire data.
- Locate and mark the damaged spot on the tire. (fig. 3.1.2.1)
- Demount the tire correctly.

3.1.2.1

- Remove the foreign body without causing any further damage to the tire. (fig. 3.1.2.2)
  Screws should be screwed out of the tire.
- Check the whole tire inside and outside.
- Always check in a professional way according to appropriate criteria, such as the general state of the tire, national repair limits etc. whether the tire can be repaired. Also check the whole tire including existing repairs for further hidden damage.
- Clean the whole injury area inside the tire with LIQUID BUFFER.
- Immediately scrape the area with a liner scraper tool. (fig. 3.1.2.3)
- For clean work, remove the mounting paste from the tire.

3.1.2.2

3.1.2.3

- Remove all debris by vacuum. (fig. 3.1.2.4)

↗ **Notes:** The above process will remove all traces of silicone, graphite, and other mould lubricants from the liner. Scrape an area a little larger than the area of the expected patch.

3.1.2.4

3.1.3 Preparation of the injury

- Skive out the injury with the rotary gouge, giving it a concave shape. Rotary gouges cut much more easily when hot and sharp. **(fig. 3.1.3.1)** When removing rubber near the cord plies, use a buffing wheel in order to avoid damages of the textile plies.

3.1.3.1

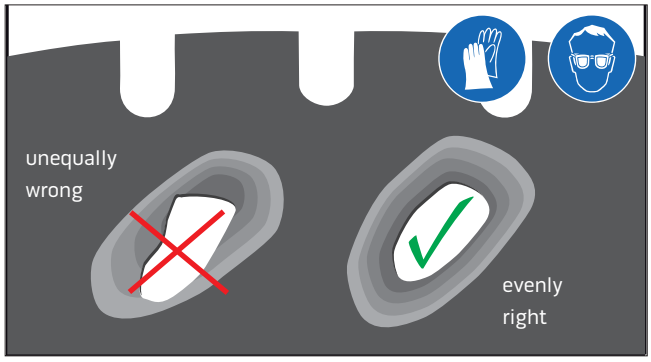
- Cut off damaged textile plies and limit the textile ends. **(fig. 3.1.3.2)**

3.1.3.2

- Buff the skive with a suitable buffing wheel, giving the skive a concave shape. **(fig.3.1.3.3)**

3.1.3.3

- Make sure that the skive is both regular in size and shape. If it is not shaped regularly, the tensions arising may cause the repair to fail. **(fig. 3.1.3.4)**
- Buff the rim of the skive with a buffing brush.
- Brush away the buffing dust with a soft hand brush to make the injury more visible.

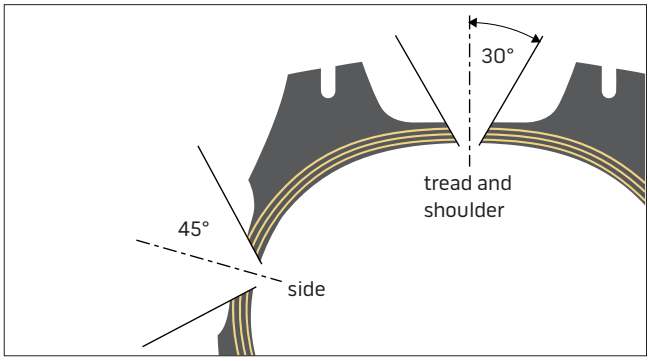


3.1.3.4

↗ **Notes:** Use the round surface of the rasps to help provide the correct shape. Do not leave sharp edges on the rubber buff. An alternative method is to immediately cut off the damage with a knife before skiving out the rubber.

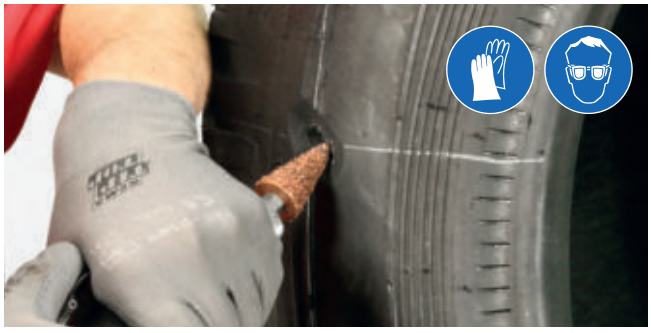
3. Repairs to BIAS tires

- Inspect the damage in detail.
- Use the tapered knife in order to cut out the major part of the damage. Angle the skive using the knife **with 45° for sidewall injuries and 30°** for tread, crown or shoulder injuries. **(fig. 3.1.3.5)** Remove all rotten or separated cords.



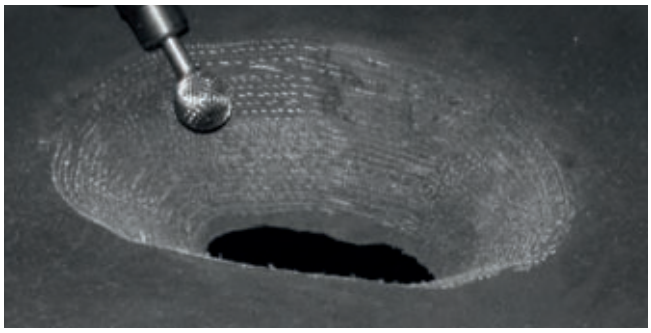
3.1.3.5

- Use a cone rasp and a pencil rasp in order to round off the injury. Observe the skive angle. Take care to limit tear proliferation (propagation). **(fig. 3.1.3.6)**



3.1.3.6

- Buff the cord plies using ball rasp or a limestone in order to avoid that the rubber surface will be overlapped by the textile cords. **(fig. 3.1.3.7)**
- Check if all textile cord is held tight within the rubber without any separations.



3.1.3.7

- Buff the edge of the repair area. Using a rotary wire brush, slightly buff the edge of the repair area on the tire outside and inside. **(fig. 3.1.3.8)**
- Clean the area with a brass brush and vacuum.

↗ **Note:** Make sure that no splits extend from the injury. Non-limited injuries cause failure of the repair and tire.

3.1.3.8

3.1.4 Measure injury/Select patch unit

- Measure the injury at the largest extent of the textile damage. (fig. 3.1.4.1 and 3.1.4.2)
- Measure the maximum tire depth in the damage area and note it in order to calculate the curing time. (fig. 3.1.4.3)
- Chalk the damage sizes as well as the tire depth on the tire.
- Note the PR-number of the tire. If not indicated on the tire itself, request information directly from the tire manufacturer of the ETRTO.
- Select the corresponding patch based on the latest REMA TIP TOP BIAS/PN repair chart.

↗ **Note:** The BIAS/PN repair chart features two types of damages:

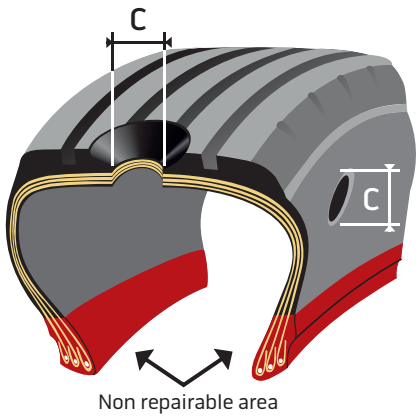
A) full penetration injury with at least 50% damaged cord plies
B) injuries with less than 50% damaged cord plies.

In order to determine the cord plies, use 2/3 of the given plies.

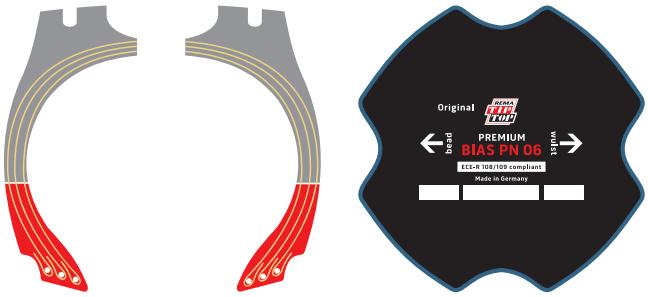
Example:
6PR-tire with 6 plies
6/3 * 2 = 4 installed plies
3 or 4 damaged plies are
type A) full penetration injury.
1 or 2 damaged plies are
Type B) injuries. (fig. 3.1.4.4)

Chalk patch size number on tire.

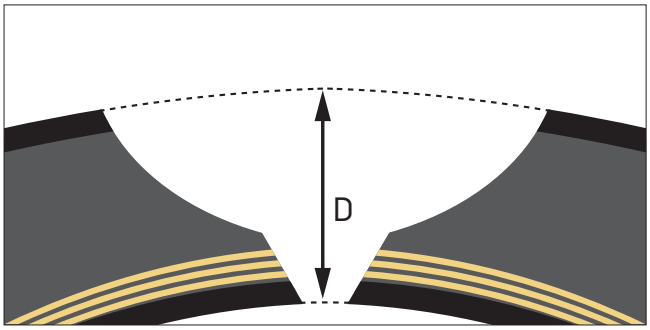
↗ **Note:** The repair charts create a relation between tire size, injury size, injury location, and the patch repair unit to be used. Only constant use of the repair charts will provide the necessary experience to read them correctly.



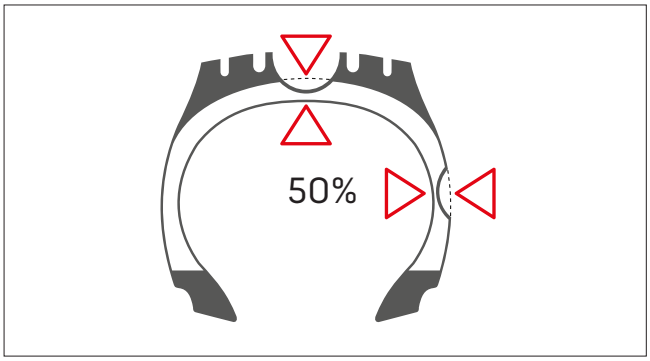
3.1.4.1



3.1.4.2



3.1.4.3

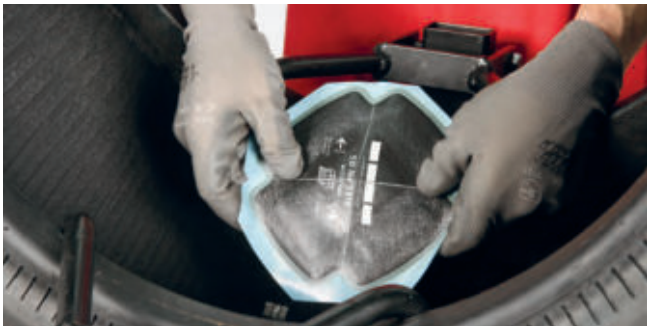


3.1.4.4

3. Repairs to BIAS tires

3.1.5 Sidewall patches

- Patches applied in the shoulder area can be trimmed.
- Align the patch correctly inside the tire with the auxiliary lines. (fig. 3.1.5.1)



3.1.5.1

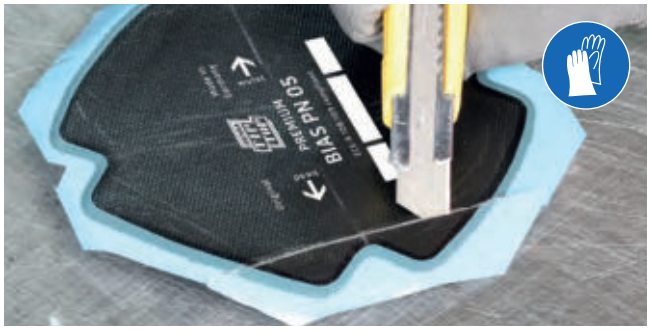
- Draw an auxiliary line where the bead toe runs. (fig. 3.1.5.2)

3.1.5.2

- Draw another auxiliary line **10–20 mm** next to this line in the direction towards the centre of the patch unit. (fig. 3.1.5.3)

3.1.5.3

- Cut the patch along the second line with an angle of **45°** using a knife. Patches may be trimmed up to the point where the first cord plies cross each other. (fig. 3.1.5.4)



3.1.5.4

↗ **Note:** Make sure that no splits extend from the trimmed cut. Apply INNERLINER SEALER to the trimmed area in order to avoid penetration of moisture.

3.2 Two-way system

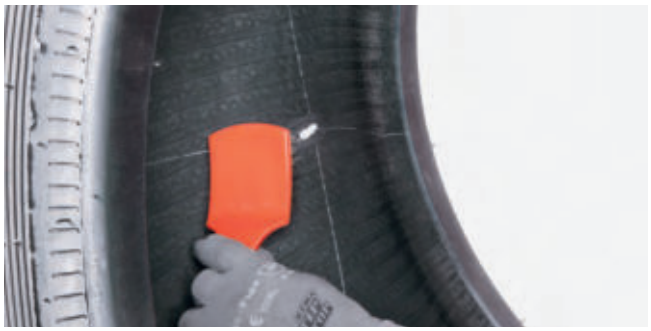
In the two-way system the curing of the rubber fill is carried out prior to the application of the patch unit.
The patch repair unit is cured chemically at a minimum room temperature of (+18°C / 65°F) for 24 hours.

3.2.1. Preparation of the injury

- Buff an **approx. 5 mm**-wide area around the injury, on the inside of the tire. **(fig. 3.2.1.1)**

3.2.1.1

- Clean the repair area with the brass brush. **(fig. 3.2.1.2)**
- Remove all debris by vacuum.
- Check the outside skive to make sure it is clean, if not, buff it lightly with the polywire brush and the brass brush, and then vacuum.



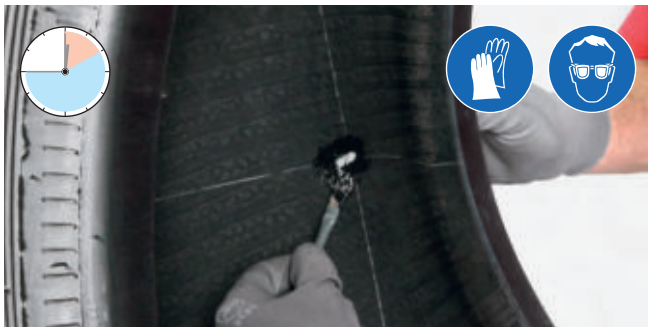
3.2.1.2

↗ **Note:** Coat repair area immediately after buffing.

- Coat the repair area with SOLUTION MTR-2, first on the tire outside, then on a smaller spot inside the tire. **(fig. 3.2.1.3)**
- Turn the tire so that the repair area is in the **3 or 9 o'clock position** for better evaporation.
- Allow the first coat of SOLUTION MTR-2 to completely **dry (minimum 60 minutes).**

3.2.1.3

- Apply another even coat of SOLUTION MTR-2 to the tire outside first, then to a smaller inside area. **(fig. 3.2.1.4)**
- Turn the tire so that the repair area is in the **3 or 9 o'clock position** for better evaporation.



3.2.1.4

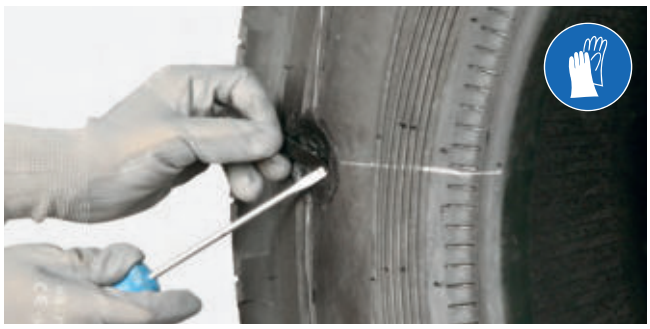
3.2.2. Filling

- Observe the drying time before applying RUBBER MTR-UNI. **Drying time knuckle test (10-45 minutes).**

↗ **Notes:** Do not speed up the drying of the solution using any artificial means. Make sure that before rotating the tire back into its initial position after the drying process is complete, no remaining dust falls into the tire contaminating the dried solution.

3.2.2.1

- Cut RUBBER MTR-UNI.
- Pre-heat RUBBER MTR-UNI up to **80°C [176 °F].** **(fig. 3.2.2.1)**



3.2.2.2

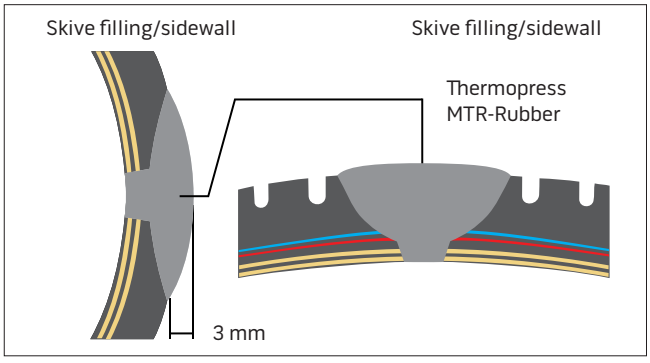
- Stitch 2 pieces RUBBER MTR-UNI in the repair area inside the tire. Stitch RUBBER MTR-UNI layer by layer on the tire outside, to avoid air traps. **(fig. 3.2.2.2 and 3.2.2.3)**

Alternatively:
Apply RUBBER MTR-EXT with an extruder and stitch at regular intervals in order to avoid air traps.

3.2.2.3

- Overfill slightly to prevent shrinkage during curing. **Overfill by 2 to 3 mm. (fig. 3.2.2.4)**

↗ **Note:** Seal open grooves near the filling in the tread area with adequate material in order to avoid running of the rubber.



3.2.2.4

3.2.3. Cure the fill rubber

- Apply SOLUTION MTR-2 to both the inside and outside filling. (fig. 3.2.3.1)

3.2.3.1

- After 2-3 minutes cover with heating foil to avoid dirt or machine parts sticking to the rubber fill. (fig. 3.2.3.2)

3.2.3.2

- Cure using a vulcanizing press or another system. Always follow the manufacturer's instructions for use of the particular curing equipment. The curing temperature for warm/hot curing starts from +100°C/212°F.
- Use specially shaped plates and bags to maintain the best normal tire contours during the cure. (fig. 3.2.3.3)

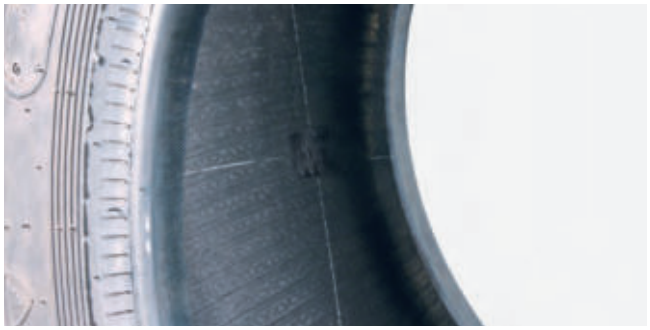
3.2.3.3

- Check the skive filling immediately after removing the tire from the vulcanizing device. In order to do so, press the tire probe into the skive filling. If it leaves a durable mark (rubber not fully vulcanized), the whole curing process will have to be repeated. If gas bubbles are found upon inspection, the repair has to be repeated. (fig. 3.2.3.4)
- When satisfied with the curing allow the tire to cool to ambient room temperature.

3.2.3.4

3.2.4. Buff the liner

- Draw auxiliary lines running through the middle of the injury, slightly beyond the edge of the patch placement area. (fig. 3.2.4.1)



3.2.4.1

- Use a tire marking pen (or a piece of chalk) and a template to mark the liner area to be buffed. (fig. 3.2.4.2 and fig. 3.2.4.3)

  The use of templates is a must in order to locate the patch unit accurately. The patch templates are printed on the packaging of the patches. Just cut out the templates in the marked areas in order to be able to use them.

3.2.4.2

↗ **Note:** If any problem is noted with the inner liner such as looseness or soft smearing, remove the inner liner completely from the patch placement area (chapter 3.4.1) and laminate the patch unit (chapter 3.4.2). If there is no inner liner at all or if cord ends are visible, the patch unit also needs to be laminated (3.4.2).

3.2.4.3

- If any additional silicone scrape is required it should be completed now. Then, mark the contours of the repair patch again (see section "Clean the liner").

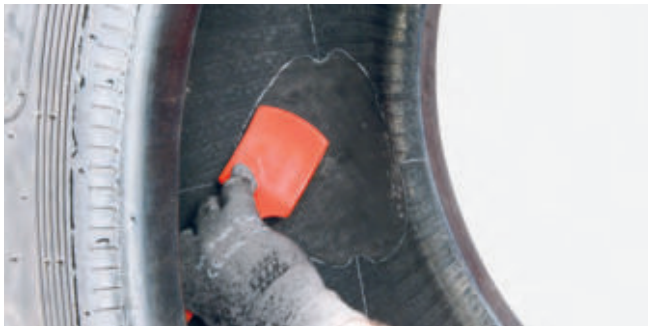
- Buff the liner using a polywire brush embedded in PVC or a limestone. (fig. 3.2.4.4) When buffing the liner all vent lines or vent patterns must be removed. Use only light pressure while buffing and do not allow the tool to remain stationary in one spot.

3.2.4.4

↗ **Note:** A nice and even buffing texture according to RMA 3 texture is recommended for patch unit applications. Coat the repair area immediately after buffing.

3.2.5. Cement application

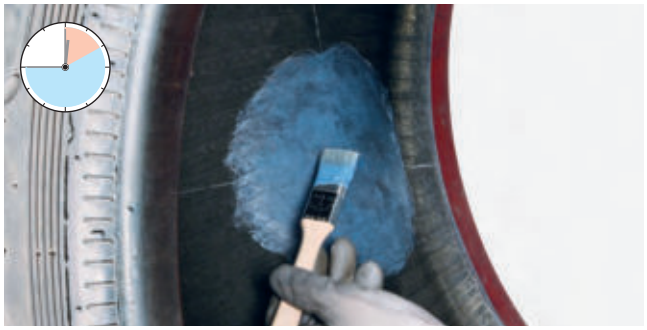
- Clean with a brass bristled brush and remove all dust by vacuum. Never use compressed air to remove buffing dust, always use a vacuum together with a brass cleaning brush. **(fig. 3.2.5.1 und 3.2.5.2)**



3.2.5.1

3.2.5.2

- Apply an even coat of CEMENT SC-BL to the buffed liner inside. **(fig. 3.2.5.3)**
- Turn the tire so that the repair area is in the **3 or 9 o'clock position.**



3.2.5.3

- Observe drying time prior to patch application. **Drying time knuckle test (10 - 45 minutes).** **(fig. 2.2.5.4)**

↗**Note:** Do not speed up the drying of the solution using any artificial means. Make sure that before rotating the tire into its initial position after the drying process, no remaining dust falls inside the tire contaminating the dried solution. When renewing the coat, respect the drying time of **at least 60 minutes** for the first coat. Apply the patch after the regular **Drying time knuckle test (10 - 45 minutes) after the second coat**.

3.2.5.4

3.2.6. Patch application

- Observe drying time prior to patch application. **Drying time knuckle test (10 - 45 minutes).**
- Relax the tire beads before applying the patch (do not spread them). Position the injury at the **6 o´clock position.**
- Align the patch correctly inside the tire with the help of the auxiliary lines.
- Test the dryness of the cement **(knuckle test).**
- Loosen the patch backing paper but place it back to protect the bonding layer. **(fig. 3.2.6.1)**
- Use the cross line to center the patch above the injury.
- Start removing the patch backing paper on the first half of the patch from the centre first and stitch from the centre working outwards. **(fig. 3.2.6.2)**
- Then also remove the patch backing paper on the second half of the patch from the centre first and stitch from the centre working outwards. **(fig. 3.2.6.3)**
- Finally stitch the patch border area.
- Remove the protective foil.
- Record any required data on the patch unit using the marking pen. **(fig. 3.2.6.4)**

Vulcanization: The self-vulcanizing of the applied patch requires an ambient temperature of at least 18°C (65 °F) and a curing time of 24 hours.

3.2.6.1

3.2.6.2

3.2.6.3

3.2.6.4

3.2.7. Final inspection

- Check whether the patch has been applied correctly with no air or gas entrapment under it. (fig. 3.2.7.1)

↗ **Note:** A laminated patch unit will need a **minimum curing time of 48 hours at a temperature of at least 18°C / 65°F.**

3.2.7.1

- Inspect the complete tire including the inside and the patch repair unit.
- Apply INNERLINER SEALER to the patch border area and over any buffed area. (fig. 3.2.7.2)

As an alternative, apply RCF SEALER-PLUS.

3.2.7.2

- Buff the skive filling with max. 1 bar filling pressure when the tire is mounted in order to adapt it to the tire contour. Initially the 65 mm dome rasp can be used to remove the overfill However, it is recommended to finally improve the appearance by using a fine grit buffer ES45. (fig. 3.2.7.3)
- Regroove the tread pattern to match the original.

↗ **Note:** Inspect the complete tire (including the inside and the patch repair unit) before returning the tire to normal service.

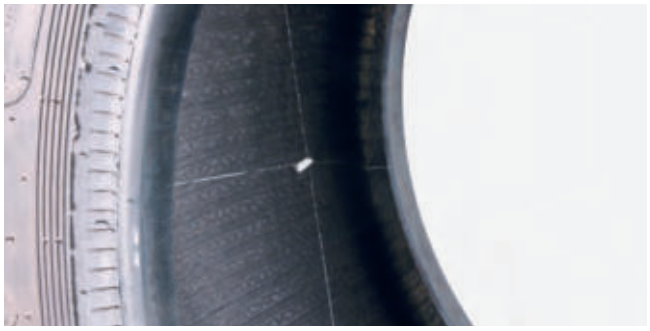
3.2.7.3

3.3.1. One-way system

In the one-way system, the curing of the rubber fill and patch repair unit is carried out simultaneously.

3.3.1. Buff the liner

- Draw auxiliary lines which will help to centre the patch unit. These lines must run through the middle of the injury, slightly beyond the edge of the patch placement area.(fig. 3.3.1.1)



3.3.1.1

- Use a tire marking pen (or a piece of chalk) and a template to mark the liner area to be buffed. (fig. 3.3.1.2)

  The use of templates is a must to locate the patch unit accurately. REMA TIP TOP offers patch templates made of plastic. Additionally, the patch templates are printed on the packaging of the patches. Just cut out the templates out in the marked areas in order to be able to use them.

3.3.1.2

↗ **Note:** If any problem is noted with the inner liner such as looseness or soft smearing, remove the inner liner completely from the patch placement area (chapter 3.4.1) and laminate the patch unit (chapter 3.4.2). If there is no inner liner at all or if cord ends are visible, the patch unit also needs to be laminated (3.4.2).

- If any additional silicone scrape is required it should be completed now. Then, mark the contours of the repair patch again (see section "Clean the liner").

3.3.1.3

- Buff the liner using a polywire brush embedded in PVC or a limestone. (fig. 3.3.1.3) When buffing the liner all vent lines or vent patterns must be removed. Use only light pressure while buffing and do not allow the tool to remain stationary in one spot.

- Clean with a brass bristled brush and remove all dust by vacuum. (fig. 3.3.1.4) Never use compressed air to remove buffing dust, always use a vacuum together with a brass cleaning brush.

3.3.1.4

↗ **Note:** A nice and even buffing texture according to RMA 3 texture is recommended for patch unit applications. Coat the repair area immediately after buffing.

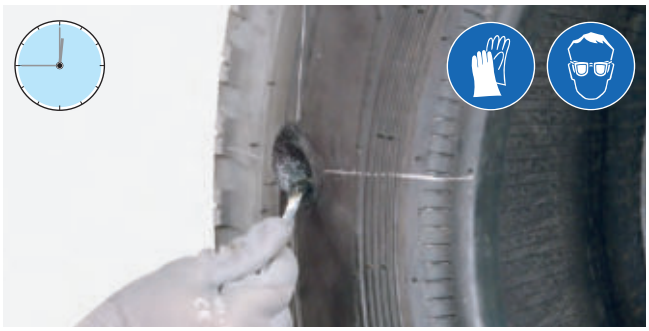
3.3.2. Cement application

- Apply SOLUTION MTR-2 to the outside skive area evenly.
- Turn the tire so that the repair area is in the **3 or 9 o'clock position.**
- Allow the first coat to completely dry. **Minimum 60 minutes.**
- Apply SOLUTION MTR-2 to the outside skive area. **(fig. 3.3.2.1)**
- Apply CEMENT SC-BL to the buffed liner inside evenly. **(fig. 3.3.2.2)**
- Turn the tire so that the repair area is in the **3 or 9 o'clock position.**
- Observe the drying time prior to the patch application. **Drying time knuckle test (10-45 minutes).**

↗ **Note:** Do not speed up the drying of the solution using any artificial means. Make sure that the drying process is complete before rotating the tire back into its initial position and make sure no remaining dust falls into the tire contaminating the dried solution. When renewing the coat, respect the drying time of **at least 60 minutes for the first coat. Apply the patch after the regular drying time knuckle test (15 - 180 minutes) after the second coat. Waiting time before vulcanization: 12 hours.**

If interruptions of the curing process are anticipated, use SOLUTION HR **drying time knuckle test (15 - 180 minutes)** instead of CEMENT SC-BL, **provided that the one-way system is used in a hot/warm curing process (starting from +85°C / 185°F) and the waiting time before vulcanization is max. 14 days.**

Shorter drying times can be achieved using CEMENT FD-BL **drying time knuckle test (5 - 15 minutes),** provided that the one-way system is used in a **hot/warm** curing process **(starting from +100°C / 212°F) and the waiting time before vulcanization is max. 4 hours.**



3.3.2.1

3.3.2.2

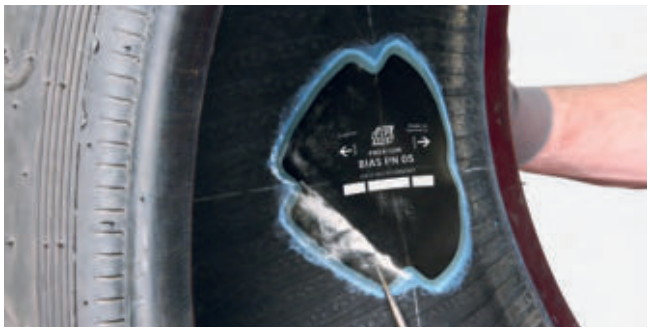
3.3.3. Patch application

- Relax the tire beads before applying the patch (do not spread them). **Position the injury at the 6 o´clock position.**
- Draw auxiliary lines on the patch unit.
- Test the dryness of the cement **(knuckle test).**
- Loosen the patch backing paper by **2/3** but place it back to protect the bonding layer. **(fig. 3.3.3.1)**
- Align the patch correctly inside the tire with the help of the auxiliary lines.
- Start removing the patch backing paper on the first half of the patch from the centre first and stitch from the centre working outwards. **(fig. 3.3.3.2)**
- Then also remove the patch backing paper on the second half of the patch from the centre first and stitch from the centre working outwards.
- Finally stitch the patch border area.
- Remove the protective foil. **(fig. 3.3.3.3)**
- Record any required data on the patch unit using the marking pen.
- Apply INNERLINER SEALER to the patch border area and any other buffed area. This operation can be carried out after curing, during final inspection.

↗ **Note:** For systems using inner and outer envelopes or curing tubes it is recommended to place talc over the INNERLINER SEALER coat in order to prevent sticking. **(fig. 3.3.4.4)**

3.3.3.1

3.3.3.2



3.3.3.3

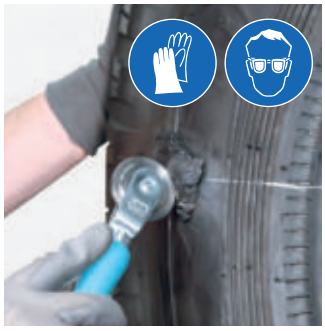
3.3.3.4

3.3.4. Filling

- Apply RUBBER MTR-EXT with an extruder. (fig. 3.3.4.1)
- To avoid air traps, stitch at regular intervals. (fig. 3.3.4.2)

Alternatively:
Cut RUBBER MTR-UNI, pre-heat it up to 80°C [176°F] and stitch it layer by layer on the tire outside.

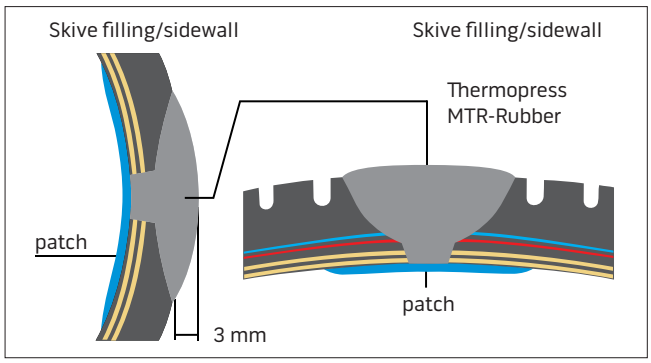
3.3.4.1



3.3.4.2

- Overfill slightly to prevent shrinkage during curing. Overfill by **2 to 3 mm**. (fig. 3.3.4.3)

↗ **Note:** Seal open grooves near the filling in the tread area with adequate material in order to avoid running of the rubber.



3.3.4.3

- Apply SOLUTION MTR-2 to the fill and cover with heating foil to avoid dirt or machine parts sticking to it. (fig. 3.3.4.4)

3.3.4.4

3.3.5. Curing

- Cure using a VULCSTAR, an autoclave or another curing system according to the one-way system. (fig. 3.3.5.1) Always follow the manufacturer's instructions for use of the particular curing equipment.

↗ **Note:** Complete the curing within a **12 hour period** when using the one-way system with CEMENT SC-BL.

3.3.5.1

3.3.6. Final inspection

- Check the skive filling immediately after removing the tire from the vulcanizing machine. In order to do so, press a tire probe into the skive filling. If it leaves a durable mark, the rubber has not fully been vulcanized and the whole curing process needs to be repeated. If gas bubbles are found upon inspection, the repair has to be repeated as well. (fig. 3.3.6.1)

3.3.6.1

- Check whether the patch has been applied correctly with no air or gas entrapment under it.
- Allow the tire to cool to ambient temperature.
- Inspect the complete tire including the inside and the patch repair unit.
- Apply INNERLINER SEALER to the patch border area and over any buffed area. (fig. 3.3.6.2)

3.3.6.2

As an alternative, apply RCF SEALER-PLUS.

- Buff the skive filling with **max. 1 bar** filling pressure when the tire is mounted in order to adapt it to the tire contour. Initially the 65 mm dome rasp can be used to remove the overfill. However, it is recommended to finally improve the appearance by use of a fine grit buffer ES45. (fig. 3.3.6.3)

3.3.6.3

↗ **Note:** Before putting the tire back into operation, inspect the complete tire, including the inside and the patch repair unit.

3.4 Additional working procedures – if necessary

3.4.1 Inner liner removal

- Use a tire marking pen or a piece of chalk and a patch template in order to mark the contours of the repair patch unit accurately. (fig. 3.4.1.1)

3.4.1.1

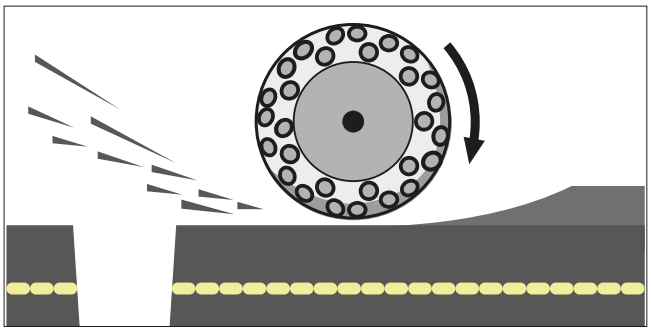
- Remove the patch unit and mark a second auxiliary line **approx. 20 mm** inside the patch markings.

- Carefully remove the liner from the inner marked area using a **65 mm** dome rasp buff. Make sure that the body ply is not damaged. The buffed surface area should have a fine and even buffing texture equivalent to RMA 3.

3.4.1.2

- Now buff the remaining **20 mm** outer edge. (fig. 3.4.1.2 and 3.4.1.3) Make sure to produce a transition or gradual ramp to the liner level. Focus on the correct direction of the rotation of the buffing tool and do not rotate the tool against the inner liner edge.

- Finally clean with a brass bristled brush and remove all dust by vacuum. Never use compressed air in order to remove buffing dust.



3.4.1.3

↗ **Note:** Coat repair area immediately after buffing.

- Apply a thick and even coat to the previously buffed area in the tire. Turn the tire so that the repair area is in the **3 or 9 o'clock position. Observe the drying time before applying the patch unit. (fig. 3.4.1.4). Drying time knuckle test (10 - 45 minutes).**

3.4.1.4

↗ **Note:** If textile should be detected, apply 2 coats. Leave the first coat to dry well (at least 60 minutes). After the drying time of the second coat, a suitable laminated repair patch has to be ready for application. If carcass rubber should be detected in between the inner liner and the patch unit, cover it up with a layer of rubber and vulcanize it with the patch.

3.4.2. Patch lamination

If the inner liner has been removed, the patch unit will have to be laminated.

↗ **Note:** Apply RUBBER SV-GUM when using the 2-way system. For repairs according to the 1-way system apply RUBBER MTR-CUS and SOLUTION MTR-2. As an alternative to RUBBER MTR-CUS, apply RUBBER SV-GUM and CEMENT SC-BL provided that no autoclave with open steam is used during vulcanization.

- Cut a piece of cushion gum larger than the patch unit and have it ready without soiling the bonding surface to the patch.
- Completely remove the patch protective foil without touching or soiling the bonding layer. Then put the patch with its top side on a clean surface.
- Apply an even and thick coat to the patch bonding layer. **Drying time knuckle test (10 - 45 minutes).** **(fig. 3.4.2.1)**
- Laminate the patch with the cushion gum and stitch on with a wide roller-stitcher in order to avoid air entrapment. **(fig. 3.4.2.2 and 3.4.2.3)**
- The cushion gum should be **approx. 5 mm** larger than the patch on all sides. **(fig. 3.4.2.4)**
- Cut in the centre of the protective foil without cutting through the cushion gum.

Waiting time between lamination and patch application: **2 hours.**

Vulcanization: the self-vulcanizing of the laminated patch requires an ambient temperature of at least 18°C (65 °F) and a curing time of 48 hours.

3.4.2.1

3.4.2.2

3.4.2.3

3.4.2.4

Your local contact

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