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# NAIL HOLE REPAIR PROCEDURES For Passenger, Light Truck and Truck Tires

## IMPORTANT!

### WARNING!

ALWAYS demount the tire from the wheel and complete a thorough tire and wheel inspection prior to returning the components to service.

### PRECAUTIONS

- Repair products and materials used should be from the same manufacturer to ensure compatibility in the curing process. NEVER mix products from different repair manufacturers.
- Repairs are limited to the crown area only. DO NOT repair sidewall or shoulder injuries.
- Regardless of the type of repair used, the repair must fill the injury and seal the innerliner. This is achieved with either a two piece repair (stem and patch) or a one piece repair (patch/stem combination repair unit).
- NEVER use only a rubber stem or plug; or NEVER USE only a patch. Both materials must be used for a proper tire repair.
- Specific repair limits should be based on recommendations or repair policy of the tire manufacturer and/or the type of tire service.
- Some "run-flat technology" tires cannot be repaired. Consult tire manufacturer for their repair policy and, if applicable, for their recommended repair procedures.
- Speed Ratings – Tire Manufacturer should be consulted for its individual repair policy.
- Never use any rim that is bent, corroded, cracked or worn.
- For speed rated tires, the tire manufacturer must be contacted for its individual repair policy – some manufacturers will void the tire speed rating if the tire has been repaired. Check whether the speed rating is retained after repair.

### GENERAL SAFETY INSTRUCTIONS

- Always read the operating and application instructions enclosed with the corresponding products, tools and machines and follow the Safety, Handling and Disposal guidelines.
- Always observe the safety instructions and symbols on the product packaging and refer to the manufacturer's Material Safety Data Sheet (MSDS).
- When working with solutions, rotary tools, sharp-edged tools, hot devices and hot materials, always take the necessary precautions and wear appropriate gloves, adequate eye protection (safety glasses or face shields), ear protection and observe maximum RPM while repairing tires.
- Always keep dangerous tools, solutions etc. out of the reach of children and unauthorized persons.



**WARNING: TIRES MUST ALWAYS BE PROPERLY REPAIRED AS DESCRIBED IN THIS CHART.** Improperly repaired tires can fail while in service, such as by tread-belt separation and/or detachment, which may result in an accident causing serious personal injury or death.

**ONLY PROPERLY TRAINED TIRE REPAIR TECHNICIANS SHOULD PERFORM THESE REPAIRS**

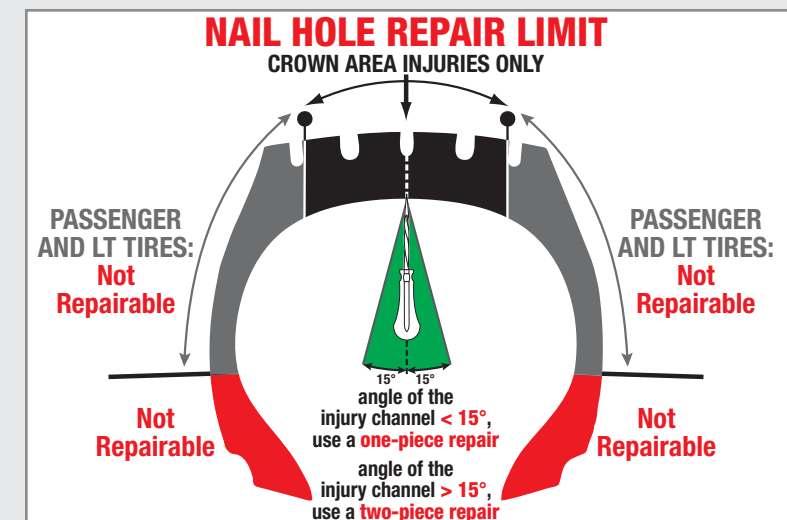
### MAXIMUM ALLOWABLE INJURY SIZE:

**Passenger & Light Truck Tires** maximum injury size  $\downarrow$  1/4" (6mm)  
**Medium & Heavy Truck Tires** maximum injury size  $\downarrow$  3/8" (10mm)  
 Any injury exceeding the Maximum Allowable Injury Size, as stated above, will require a section repair to be performed at a Full Service Repair Facility.

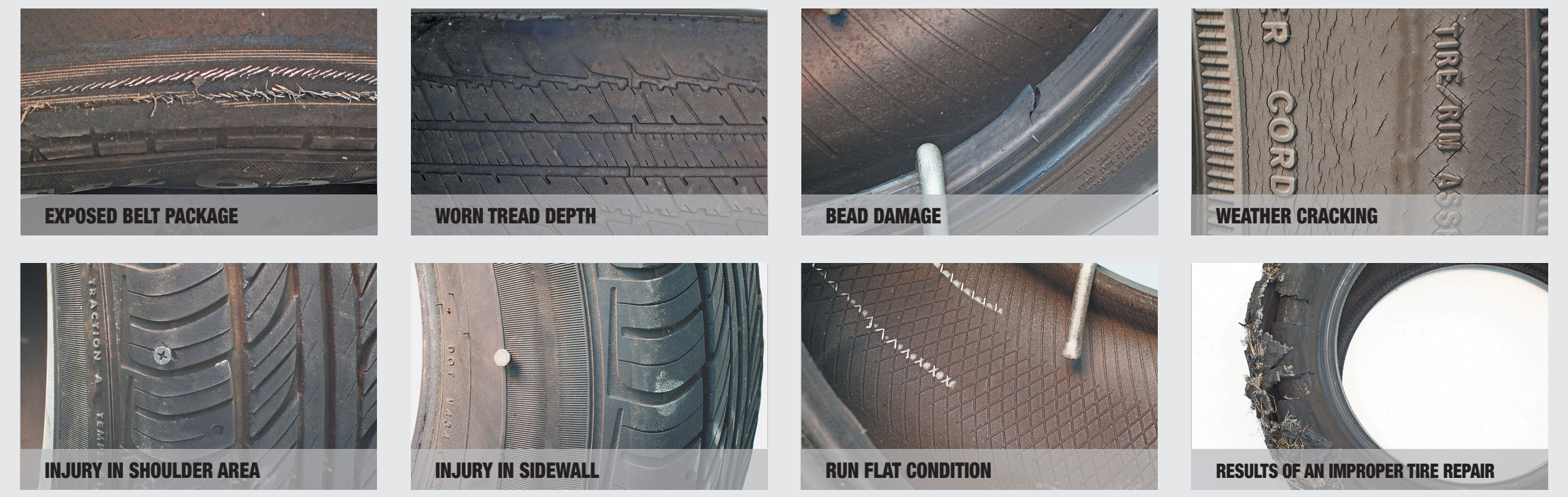
### DO NOT REPAIR A TIRE WITH:

- DO NOT REPAIR A TIRE WITH THESE TIRE INJURIES:**
- Greater than 1/4-inch (6mm) in diameter for passenger and LT, 3/8-inch (10mm) for medium truck
  - In the shoulder or sidewall areas
  - In a position that would overlap an existing repair
- DO NOT REPAIR A TIRE WITH THESE TIRE CONDITIONS:**
- Any conditions shown in the Non-Repairable Tire Conditions box
  - 2/32-inch (3mm) or less remaining in tread depth
  - Bead rubber torn down to steel
  - Run flat conditions
  - Broken or kinked beads
  - Loose or broken radial body cables on inside shoulder
  - Weather checking beyond 2/32-inch (3mm) deep
  - Soft, mushy rubber on inside shoulder
  - Broken or separated belts or tire with exposed fabric
  - Liner separations too large for repair
- DO NOT REPAIR A TIRE WITH THESE PREVIOUS REPAIRS:**
- An existing improper repair
  - Repairs that are outside of the repairable areas
  - Where 3 previous repairs already exist
  - An existing Non-Industry Standard Repair such as an "On the Wheel Repair / Outside In"
  - Repair where a "Tire Sealant" has been used.

These Repair Charts reflect International Repair Standards, determined on the basis of practical experience, bench checks, and laboratory tests. THEY NEITHER INCORPORATE NOR ARE INTENDED AS A REFERENCE TO LOCAL, STATE, OR NATIONAL STANDARDS THAT MAY EXIST IN YOUR COMMUNITY. Stay within the limitation for repairable injuries indicated by the charts. When repairing a tire, it is imperative that a complete inspection be conducted to ensure that the tire is fit to be repaired and safely returned to service. Always follow proper repair procedures as illustrated in the appropriate REMA TIP TOP Repair Manual(s). No tire can be safely repaired without demounting it from the rim, giving it a complete inspection, and properly repairing the injury with the appropriate inside repair unit and filler material. Always consult the tire manufacturer for the repair limits.



## NON-REPAIRABLE TIRE CONDITIONS



## NAIL HOLE REPAIR CHART

NAIL HOLE REPAIR CHART Crown Area Only		1-PIECE REPAIR INJURY ANGLE < 15°		2-PIECE REPAIR INJURY ANGLE > 15°				
SPEED INDEX	INJURY SIZE (INCH) (MM)	CARBIDE CUTTER	RADIAL OR BIAS		STEM		RADIAL OR BIAS	
			MINICOMBI	REMASTEM	UP	FRU	RAD	PN SERIES
PASSENGER & LIGHT TRUCK	1/8 (3)	CC-3	A-3	-	-	-	-	-
	3/16 (4.5)	CC-4.5	A-4.5	-	-	-	-	-
	1/4 (6)	CC-6	A-6	193-WL	UP-6	FRU-1	RAD-110	-
	5/16 (8)	CC-8	B-8	RS-8	UP-8	FRU-1	RAD-116	PN-3
	(ZR - W)	1/8 (3)	CC-3	A-3	-	-	-	-
MEDIUM DUTY TRUCK TIRES	1/8 (3)	CC-3	A-3	-	-	-	-	-
	3/16 (4.5)	CC-4.5	A-4.5	-	-	-	-	-
	1/4 (6)	CC-6	A-6	193-WL	UP-6	FRU-1	RAD-115	PN-3
	5/16 (8)	CC-8	B-8	RS-8	UP-8	FRU-1	RAD-115	PN-3
WIDE BASE SUPER SINGLE	3/8 (10)	CC-10	B-10	RS-10	-	-	RAD-115	PN-3
	1/4 (6)	CC-6	A-6	193-WL	UP-6	FRU-1	RAD-115	PN-3
	5/16 (8)	CC-8	B-8	RS-8	UP-8	FRU-2	RAD-120	PN-3
	3/8 (10)	CC-10	B-10	RS-10	-	FRU-2	RAD-120	PN-4

\*\* Light Truck Tires Only - 6 or 8 Ply Rating (Load Range C & D)

## PRODUCTS USED

- TWO PIECE REPAIR:**  
 Universal Repair Units ..... UP-6 (1/4"), UP-8 (5/16")  
 Radial Repair Units ..... RAD-110 (1/4"), RAD-115\* (1/4"), RAD-116 (5/16"), RAD-120\* (5/16")  
 REMASTEM ..... RS-8 (5/16"), RS-8 (5/16"), RS-10\* (3/8")  
 Bias-Ply Tire Repair Units .. PN-3, PN-4\*
- ONE PIECE REPAIR:**  
 MINICOMBI ..... A-3 (1/8"), A4.5 (3/16"), A-6 (1/4"), B8\* (5/16"), B10\* (3/8")
- CHEMICALS:**  
 Pre-Buffer Cleaner ..... 70F  
 Special Blue Cement ... BL-8F  
 Innerliner Repair Sealant. 76F
- \* Use on Truck Tire Injuries only.
- ACCESSORIES:**  
 Low Speed Air Buffer (RTT-SSB) Ball Bearing Stitcher (30)  
 Air Vacuum w/Bag (795) Brass Bristle Cleaning Brush (6014)  
 Carbide Cutter, 1/8" (CC-3) Innerliner Scraper (932)  
 Carbide Cutter, 3/16" (CC-4.5) Pulling Wires (626)  
 Carbide Cutter, 1/4" (CC-6) Marking Crayon (62W, 62Y)  
 Carbide Cutter, 5/16" (CC-8) Skiving Knife (929)  
 Carbide Cutter, 3/8" (CC-10) Pair of Pliers  
 Buffing Rasp, 2" (TCW-210-80) Rep Boy Tire Spreader (3050-RB)  
 QR Adapter (6068-125; CC-3) GREASE BULLY Nitrile gloves  
 QR Adapter (6068; CC-6) StrongHold Gloves  
 QR Arbor (6067) Safety Glasses  
 Awl/Injury Probe (190) A good light source

## STEP 1 INSPECT

### 1.1 INSPECT THE TIRE ON THE OUTSIDE



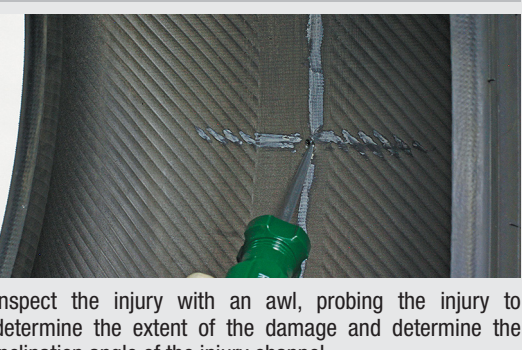
Check tire surface and the valve for the source of the leak(s) by using a leak detector. Mark the injury with a tire crayon.

### 1.4 LOCATE AND REMOVE THE PENETRATING OBJECT



Locate and remove the penetrating object from the tire, noting the direction of penetration.

### 1.6 INSPECT THE INJURY



Inspect the injury with an awl, probing the injury to determine the extent of the damage and determine the inclination angle of the injury channel.

### 1.7 REPAIR UNIT SELECTION

If the angle of the injury channel is greater than 15 degrees, a two-piece repair system must be used.  
 If the angle of the injury channel is less than 15 degrees, a one-piece repair system should be used.  
 Determine the injury size and refer to the NAIL HOLE REPAIR CHART above to select the appropriate repair unit.  
 The selection of the proper repair unit is dependent on several factors including injury size and angle, type of tire construction (radial or bias) and size of the tire to be repaired.

**PASSENGER AND LIGHT TRUCK TIRES**  
 For passenger and light truck tires, the maximum injury size that can be repaired is 1/4 inch (6mm) in diameter. Shoulder and sidewall repairs in passenger tires are not recommended by the tire industry. Injuries exceeding 1/4 inch must be referred to an authorized full service repair facility.

**TRUCK TIRES**  
 For truck tires, the maximum injury size that can be repaired is 3/8 inch (10mm) in diameter. Injuries should be in the crown area only. Injuries exceeding 3/8 inch or any injury in the shoulder, or sidewall must be referred to an authorized full service repair facility.

Check the warnings above in the section marked "IMPORTANT!" for reparability of the tire.

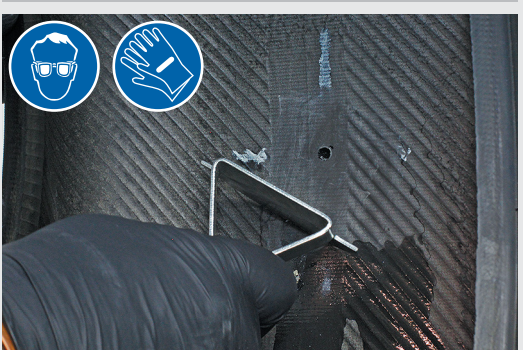
## STEP 2 PRE-CLEAN

### 2.1 APPLY PRE-BUFF CLEANER



Apply 70F Per-Buffer Cleaner around the injury area. Using an innerliner scraper, scrape the area to be buffed removing the contaminants such as dirt, tire tubes, and mold release lubricants. The area cleaned should be slightly larger than the selected repair unit. Scrape the innerliner while the Pre-Buffer cleaner is still wet. Repeat 2-3 times until the surface is clean.

### 2.2 SCRAPE AWAY CONTAMINANTS



Using an innerliner scraper, scrape the area to be buffed removing the contaminants such as dirt, tire tubes, and mold release lubricants. The area cleaned should be slightly larger than the selected repair unit. Scrape the innerliner while the Pre-Buffer cleaner is still wet. Repeat 2-3 times until the surface is clean.

## STEP 3 DRILL

### 3.1 DRILL THE INJURY CHANNEL



Determine the correct size Carbide Cutter from the NAIL HOLE REPAIR CHART above. Use a low speed tool (not to exceed 1200 rpm) to drill the injury from the inside out two or three times first and then from the outside in once or twice. Use full strokes with the carbide cutter, completely removing the cutter from the tire with each stroke.

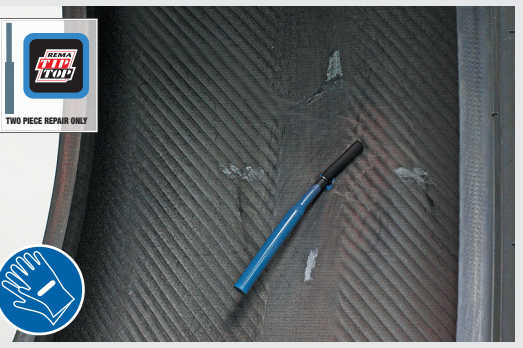
## STEP 4 FILL THE INJURY CHANNEL

### 4.1 CEMENT THE INJURY CHANNEL



**TWO PIECE REPAIR ONLY**  
 Apply BL-8F Special Blue Cement to the injury channel using a #626 pull-wire or a #190 awl.

### 4.2 INSERT THE STEM



**TWO PIECE REPAIR ONLY**  
 Remove the REMASTEM from the plastic packaging and place it in the pull wires (avoid touching the blue bonding layer when handling the REMASTEM). Fully coat the REMASTEM with cement and insert it into the eyelet of the pull wire. Insert the pull wire through the injury channel and quickly pull the pull wire through the tire. Pull until there is approximately 1/4" (6 mm) of the stem remaining on the inside of the tire.

### 4.3 CUT THE STEM



**TWO PIECE REPAIR ONLY**  
 Cut the stem off leaving approximately 1/8" (3 mm) remaining on the inside of the tire. The remainder of the stem will be removed during the buffing process to provide a smooth surface.

## STEP 5 BUFF

### 5.1 MARK AROUND THE REPAIR UNIT



Center the repair unit over the injury and outline an area larger than the unit, so buffing will not remove the crayon marks.  
 If the repair unit has bead arrows, make sure the arrows are pointing to the bead.

### 5.2 BUFF THE REPAIR AREA

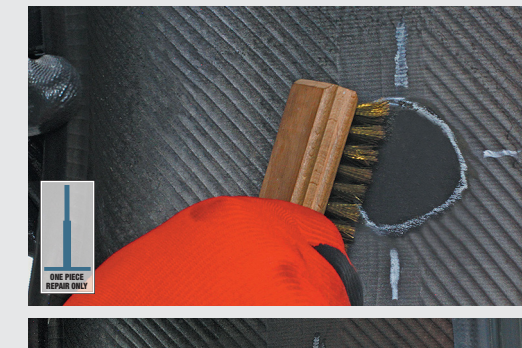


Lightly buff the repair area using a low speed (< 5,000 RPM) air or electric buffing tool with a clean buffing rasp, 36 to 60 grit (Z30-170 SDS) and remove all vent lines until you get a completely smooth surface. Continue lightly buffing the repair area to a smooth velvety finish (Buff Texture 1 or 2) by putting slight pressure on the buffing tool and keeping it in constant movement.

**NOTE: If during the buffing procedure the Radial Piles (or Body Piles) are damaged or exposed, the tire should be replaced.**

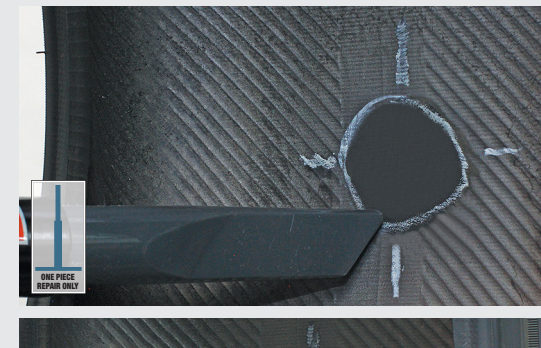
## STEP 6 POST-CLEAN

### 6.1 BRUSH



Clean the buffed area with a 6014 Brass Brush by brushing the area several times in one direction. Avoid brushing the non-buffed areas where there are contaminants that could be pulled onto the freshly buffed area. Use a brush that is designated only for tire repair and not used for anything else. This will help avoid contaminants in the buffed area.

### 6.2 VACUUM



Use a vacuum to remove all debris from the inside of the tire. Do not touch the buffed area with the tip of the vacuum cleaner to avoid contamination. Always remove buffing dust with the use of a brass brush and vacuum. Never use compressed air. Do not use a Pre-Buffer Cleaner on the buffed texture after you have buffed to avoid leaving residues which reduce adhesion.

## STEP 7 INSTALL

### 7.1 CEMENT THE INJURY CHANNEL



**ONE PIECE REPAIR ONLY**  
 Apply BL-8F Special Blue Cement to the injury channel using a #626 pull-wire or a #190 awl. Special Blue Cement provides the necessary lubrication for the insertion of the repair unit, and bonds it reliably to the tire.

### 7.2 CEMENT THE BUFFED AREA

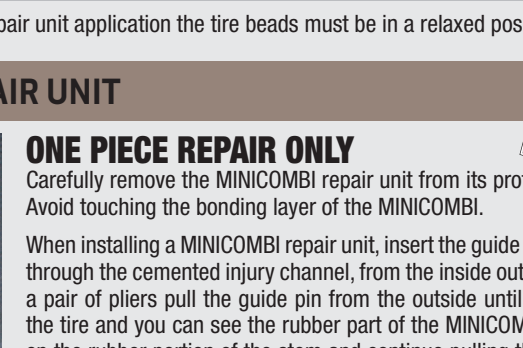


Apply a thin, even coat of BL-8F Special Blue Cement to the buffed area of the tire innerliner using a clean brush.  
 Use a swirling motion to apply the cement, as this will aid in the drying process as well as assure a thin, even coat. Completely cover the buffed area with cement to assure a good bond between the tire and the Repair Unit. Continue brushing and working the cement into the buffed area until the cement appears dry. Do not go outside the buffed area (Contaminates the brush).  
 Rotate the tire so that the cemented area is located between the 10 o'clock and 2 o'clock position. This will allow the solvent vapors, which are heavier than air, to "fall" away from the cemented innerliner.  
 Check the cement for dryness by touching the edge of the cemented area with the back of your finger. If the cement feels tacky, then it is dry. If it is not tacky, allow more drying time. Drying time depends on atmospheric conditions like heat and humidity. Hot temperature and high humidity require longer drying time of the cement. If the cement is not completely dry, the repair unit will lift off or blister and cause repair failure. Never use compressed air, hair dryers, heat guns, etc to aid in the drying of the cement.  
 Avoid any contamination on the bonding layer or the coat applied.

### 7.3 RELAX THE TIRE BEADS

Relax the beads of the tire from the spreader. During the repair unit application the tire beads must be in a relaxed position.

### 7.4 INSTALL THE MINICOMBI REPAIR UNIT



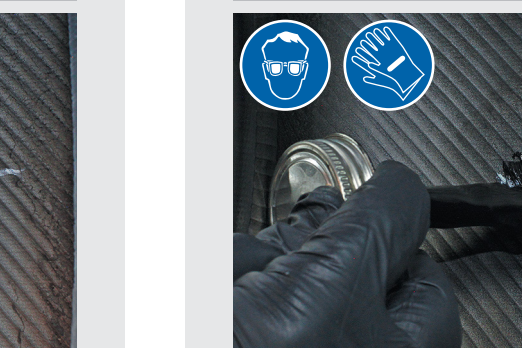
**ONE PIECE REPAIR ONLY**  
 Carefully remove the MINICOMBI repair unit from its protective cover. Avoid touching the bonding layer of the MINICOMBI.  
 When installing a MINICOMBI repair unit, insert the guide pin and stem through the cemented injury channel, from the inside outwards. Using a pair of pliers pull the guide pin from the outside until it is through the tire and you can see the rubber part of the MINICOMBI. Re-grasp on the rubber portion of the repair unit and continue pulling the stem until the MINICOMBI base, on the inside of the tire, is flush with the tire and slightly dimples.  
 The guide pin is only used to get the MINICOMBI through the tire. Once it is through the tire, re-grasp on the rubber portion of the MINICOMBI. If you pull on the guide pin only, it will pull out of the MINICOMBI.

### 7.5 INSTALL THE REPAIR UNIT



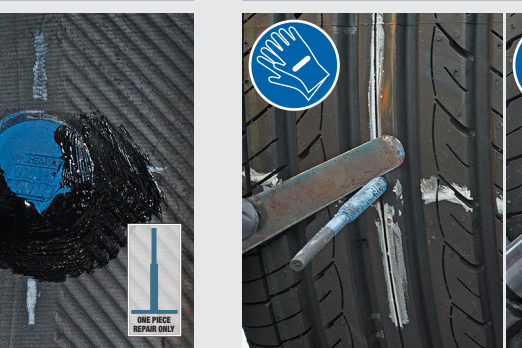
**TWO PIECE REPAIR ONLY**  
 Remove the poly or foil from the back of the repair unit. Without touching the bonding layer, center the repair unit over the injury and apply carefully pushing down on the repair unit with your thumb or fingers.  
 If using a directional repair unit, make sure to align the arrows in the correct direction.  
 If using a non-directional or Universal Repair Unit, it does not matter in which direction the repair unit is installed.

### 7.6 STITCH



After the repair unit is applied, stitch thoroughly from the center outwards. Always start stitching from the center outward to remove any trapped air that may be under the repair unit. Continue several times in different directions over the whole surface of the repair unit to make sure that it is completely stitched to the innerliner and that it adheres securely to the buffed surface area.

### 8.1 APPLY REPAIR SEALANT



Check the repair area for defects. The finished repair should show no peeling or lifting at the edges, and should neatly cover the repair area.  
 Apply a generous application of 76F Innerliner Repair Sealant to the entire over-buffed area and the edge of the repair unit. If a MINICOMBI has been used, apply the Repair Sealant to the base of the MINICOMBI and any still exposed buffed areas.

### 8.2 RE-MOUNT & INFLATE



Safely mount the tire on the rim and inflate to the recommended tire pressure.

## STEP 8 FINISH

### 8.3 CUT THE STEM & BUFF



Cut the excess stem off or buff flush with the tread of the tire. DO NOT PULL ON THE STEM WHEN CUTTING IT OFF.

### 8.4 CHECK FOR LEAKS



Check both beads, the repair and the valve with a leak detector. If the tire continues to leak, it must be demounted and re-inspected for other damage, and repaired correctly. If the damage is beyond repair limits, the tire should be scrapped.

### 8.5 BALANCE THE TIRE



Balance the tire. After the final inspection is done, the tire can immediately be put back into operation. The vulcanization between the repair unit and the tire is automatically completed under normal running conditions.