RUBBER manufacturers association

# PUNCTURE REPAIR PROCEDURES
## FOR TRUCK/BUS TIRES
### FOR ALL TRUCK/BUS TIRES LOAD RANGE "F" AND HIGHER

## RECOMMENDED PROCEDURES FOR ALL TRUCK TIRE REPAIR TECHNICIANS AND FACILITIES.

### IMPORTANT GENERAL INFORMATION

**It is essential that only a trained person remove any tire from the wheel when it has been damaged or is losing air. A thorough inspection for any internal damage can then be made. This publication covers puncture repair procedures for truck/bus tires in the tread area only!**


**PUNCTURE REPAIR INJURY LIMITS***
(IN THE TREAD AREA ONLY):

**Truck/Bus Tires = 3/8"** (10mm)

**REPLACE** or **RETREAD** tires having a tread depth of 2/32" or less remaining in any tread groove.

**NEVER** substitute an inner tube for a permissible or non-permissible repair.

**NEVER** invert radial tires. (Avoid excessive spreading of the tire or tire beads.)

It is essential that only a trained person remove any tire from the wheel when it has been damaged or is losing air. A thorough inspection for any internal damage can then be made. See WARNINGS.



**WARNING**

**NEVER PERFORM A TIRE REPAIR WITHOUT REMOVING THE TIRE FROM THE RIM/WHEEL ASSEMBLY FOR INTERNAL INSPECTION** (no outside-in tire repair/on-the-wheel repair).

Driving the tire a short distance while it was severely under-inflated caused this dangerous, non-repairable condition shown above. The damage was not visible from the outside. Every tire must be removed from the wheel for inspection and to assess repairability.

**NEVER** PERFORM A TIRE REPAIR WITHOUT REMOVING THE TIRE FROM THE RIM/WHEEL ASSEMBLY FOR INTERNAL INSPECTION (no outside-in tire repair/on-the-wheel repair). See WARNINGS.

**NEVER** INSTALL A REPAIR UNIT TO SEAL THE INNER LINER WITHOUT FILLING THE INJURY. The injury must be completely filled with a suitable vulcanizing material or rubber stem, which must fill the injury and keep moisture out. Also the repair unit must seal the inner liner to prevent air loss. The finished repair must seal the inner liner and fill the injury.

Industry recommended repair methods include a combination of a separate stem and repair unit, chemical or heat curing repair units, and one-piece repair/stem units. Use of a separate stem and repair unit is recommended for repair of angled injuries (see Step 2).

**WARNING**

**TIRE CHANGING CAN BE DANGEROUS AND SHOULD BE DONE BY TRAINED PERSONNEL USING PROPER TOOLS AND PROCEDURES. ALWAYS READ AND UNDERSTAND ANY MANUFACTURER'S WARNING CONTAINED IN THEIR CUSTOMERS' LITERATURE OR MOLDED INTO THE TIRE SIDEWALL.** Failure to comply with these procedures may result in faulty positioning of the tire and/or rim parts and cause the assembly to burst with explosive force, sufficient to cause serious physical injury or death. Never mount or use damaged tires or rims.

**FOR MORE ON TIRE MOUNTING SAFETY AND PROCEDURES** refer to the RMA *Demounting and Mounting Procedures for Truck/Bus Tires* wall chart.

***NOTE:**

**Repair material manufacturers and new tire manufacturers recommendations may differ. Specific limits should be based on recommendations of tire manufacturer, repair material manufacturer, and type of tire service.** Injuries larger than the above injury limits or injuries with exposed fabric or wire must be referred to a full-service repair facility (see below). Injuries larger than these limits should be considered for a section repair. Tire and repair materials manufacturers' recommendations may differ and may affect warranty and service description (load index and speed symbol). Contact tire manufacturer and repair material manufacturer for further information. **For all tires, repair units cannot overlap. Multiple injuries to the same radial cable should be considered for a section repair. The number of repairs may be limited by application, economics, and/or manufacturers' recommendations.**

A "full-service repair facility" is a facility with proper equipment, repair materials, and trained personnel to perform a full range of tire repairs – such as, puncture, spot, reinforcement, and section – off the rim.

**The four basic principles for puncture repairing are: (a) remove the tire from the wheel for inspection and repair, (b) prepare the injured area (c) fill the injury with a suitable vulcanizing material or rubber stem to keep moisture out, and (d) seal the inner liner with a repair unit to prevent air loss. The finished repair must seal the inner liner and fill the injury.**

**WARNING**

Serious eye or ear injuries may result from not wearing adequate eye goggles (or face shields) and ear protection while repairing tires.

### 1 EXTERNAL INSPECTION

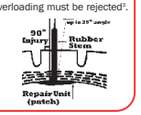
**ALWAYS** inspect tires internally and externally prior to installation of any repair[1]. A minimum of 200 foot candles of lighting is required – 300 foot candles is recommended – at the surface being inspected. A hand-held inspection light can help ensure that these conditions are met both inside and outside the tire. Consult your equipment supplier for appropriate lighting.

For demounted tubeless tires, mount tire and inflate to 30 psi max. (15 psi max. for a light truck tire) using a restraining device (or safety cage) that complies with OSHA regulations and an air line with a clip-on air chuck[2]. **If the tire is tubeless** and still inflated on the rim, continue with the next steps. Locate the injury visually, or use a water and soap solution, or immersion tank. Mark injuries with a tire crayon. **If the tire is a tube type**, mark external injuries on the tire by using the damaged tube as an injury locator. Demount the tire and place on a well-lighted spreader.

**WARNING! Permanent tire damage due to underinflation and/or overloading cannot always be detected. Any tire known or suspected to have been run at 80% or less of normal operating inflation pressure and/or overloaded, could possibly have permanent structural damage (cord fatigue, particularly steel cord). Ply cords weakened by underinflation and/or overloading may break one after another, until a rupture, commonly referred to as a "zipper", occurs in the upper sidewall with accompanying instantaneous air loss and explosive force. This can result in serious injury or death.**[3]

### 2 INTERNAL INSPECTION

Inspect the tire on the spreader. DO NOT INVERT RADIAL TIRES (avoid excessive spreading of the tire or tire beads.) Mark the injury with a tire crayon. Remove the puncturing object noting the angle of penetration. Probe the injury with a blunt awl to determine the extent and direction of the injury and to remove any loose foreign material. If the angle of the injury exceeds 25°, use a two-piece repair system. For all tires, repair units cannot overlap (see "NOTE" at left). Injuries exceeding the injury limit of 3/8" (10 mm) must only be repaired in a full-service repair facility. Tires with damage due to significant under inflation and/or overloading must be rejected[3].

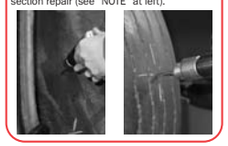



### 3 PREPARE INNER LINER SURFACE

Clean the area around the puncture thoroughly with an appropriate (pre-buff) inner liner cleaner. Use a clean cloth and/or scraper, according to the repair material manufacturer's recommendations. Consult your local repair materials supplier for a proper cleaner[4]. This step serves to remove dirt and mold lubricants that can reduce repair unit adhesion and contaminate buffing tools.

### 4 PREPARE INJURY CHANNEL

All damage must be removed. Use an electric/air powered drill (1,200 rpm max.) with an appropriate size carbide cutter or other suitable tool. Beginning from the inside, ream the puncture channel a minimum of three times – repeat from the outside. Use a probe to check for any splits in the radial plies surrounding the injury. Remove any additional damage found. If the damage exceeds puncture repair limits, a section repair is required. Multiple injuries to the same cable should be considered for a section repair (see "NOTE" at left).



### 5 REPAIR UNIT SELECTION

Select the appropriate size repair unit, based on repair material manufacturer's recommendations.

Center the unit over the injury and outline an area 1/2" (13mm) larger than the repair unit, so buffing will not remove the crayon marks.

### 6 FILL INJURY

***For a two-piece repair unit, follow the instructions below. For a one-piece (combination) repair unit, skip this step.***

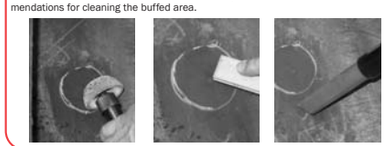
**NOTE**: Follow repair material manufacturer recommendations. DO NOT mix products from different manufacturers[4].

Cement the puncture channel and fill the injury from the inside of the tire with a suitable vulcanizing material or the appropriate size rubber stem. Without stretching the stem cut the material off just above the inside of the surface. It is necessary to fill the injury to provide a backup for the repair unit and to prevent rusting of the steel wires or deterioration of fabric.

### 7 BUFFING

To prevent contamination and preserve the outline, buff within the marked area thoroughly and evenly with a low speed buffer (5,000 rpm max.) with a fine wire brush or gritted rasp. **For tubeless tires**, buff to a velvet surface; RMA No. 1 or No. 2 texture[5]. **For tube-type tires**, buff the area inside the outline with a fine wire brush to achieve an RMA No. 1 texture[5]. Take care not to expose or damage tire casing body cords.

Remove all rubber dust from the buffed area by using a fine wire brush and vacuum, being careful to avoid touching and contaminating the area. **NOTE**: DO NOT use compressed air to clean bonding surfaces; air lines contain contaminants such as oil and moisture, which reduce adhesion. Follow repair material manufacturer's recommendations for cleaning the buffed area.



### 8 CEMENTING

**NOTE**: DO NOT mix products from different repair material manufacturers[4].

Apply chemical cement and allow to dry according to repair material manufacturer's procedures[4]. DO NOT use forced air or outside heat source to accelerate drying time. (In cold and/or humid climate conditions, adjust drying time.)

**WARNING!** Do not use flammable cements near fire, flame or any other source of ignition. Explosive force and/or fire from ignition of cement could cause serious injury or death.

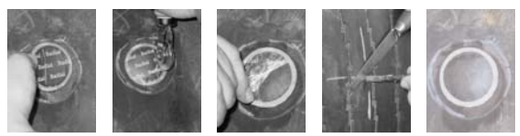
### 9 REPAIR UNIT APPLICATION

**NOTE**: DO NOT mix products from different repair material manufacturers[4].

The tire must be in a relaxed position when the repair unit is installed. (Do not spread the beads excessively.) Remove and discard protective covering being careful not to touch the bonding material on the repair unit[4].

**If using a two-piece, directionally marked unit**, install the unit so that the alignment is correct and centered over the injury. Next, stitch down thoroughly with a stitching tool, working from the center out. **If using a combination repair/stem unit (one-piece)**, DO NOT cement the stem, rather cement the injury channel. Next, pull the stem through the injury until the unit slightly dimples, then stitch down thoroughly with a stitching tool, working from the center out.

Remove and discard the top protective covering. Cut the fill material flush with the outer tread surface while being careful not to stretch the stem. **NOTE**: Follow manufacturer's recommendations for installation instructions.



### 10 FINAL INSPECTION

Inspect all repairs; rework if necessary. After remounting and inflating the tire/wheel assembly[2] using a restraining device (or safety cage) that complies with OSHA regulations and an air line with a clip-on air chuck, check for leaks and inspect the tire, beads, the repair, and the valve for other leaks or tire damage. If the tire continues to lose air, it must again be removed from the wheel for complete re-inspection. (For tube-type tires be sure to use a properly repaired or new tube to replace a damaged tube.)

**CAUTION:**

**REGARDLESS OF THE TYPE OF REPAIR USED, THE REPAIR MUST SEAL THE INSIDE SURFACE AND FILL THE INJURY.**



### REFERENCES

1 Refer to the RMA Shop Bulletin No. 37 *Inspection Standards for Radial and Bias Truck and Bus Tire Casings.*
2 Refer to the RMA *Demounting and Mounting Procedures for Truck/Bus Tires* wall chart.
3 Refer to the RMA TISB No. 33 and wall chart *Inspection Procedures for Identification of Potential "Zipper Ruptures" in Steel Cord Radial Medium and Light Truck Tires.*
4 Refer to information on the product or manufacturer's Material Safety Data Sheet and follow guidelines for handling and disposal.
5 Refer to the RMA Shop Bulletin No. 29 *RMA Standard Buffing Textures for Retreading and Repairing* rubber texture sheet.

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