

PUNCTURE REPAIR PROCEDURES FOR PASSENGER AND LIGHT TRUCK TIRES

TIRE SIZES FOR LIGHT VEHICLES INCLUDE ALL PASSENGER CAR TIRES AND SOME LIGHT TRUCK TIRE SIZES (THROUGH LOAD RANGE E).
LIGHT VEHICLES ARE MOTOR VEHICLES WITH A GROSS VEHICLE WEIGHT RATING (GVWR) OF 10,000 LBS. OR LESS.

RECOMMENDED PROCEDURES FOR ALL TIRE REPAIR TECHNICIANS AND FACILITIES.

BEFORE PERFORMING A PUNCTURE REPAIR, READ THIS SECTION!

This publication covers puncture repair procedures for passenger and light truck tires (through load range “E”) in the tread area as described by the graphic below. **WARNING!:** Tire 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. Also see “**IMPORTANT**” box below.

PUNCTURE INJURY LIMIT* 1/4” (6mm)

For Passenger and Light Truck tires (through load range E)

This graphic indicates that puncture repairs are limited to the tread area as generally depicted in the graphic. **DO NOT** make repairs where the injury damage extends into the shoulder/belt edge area OR where the injury extends at an angle into the shoulder area. If there is any question that the injury extends into the shoulder/belt edge area, then the tire must be scrapped.



For speed rated tires, the tire manufacturer must be contacted for its individual repair policy and whether the speed rating is retained after repair. Speed rated passenger car tires may be identified by the use of a speed symbol (for example: Q, S, T, U, H, V, W, Y, (Y), or ZR) that may appear in the tire service description, which can be found near or in the tire size designation on the tire sidewall or on the vehicle tire placard. Although a tire may be speed rated, we do not endorse the operation of any vehicle in an unsafe or unlawful manner. A properly repaired speed rated tire (per the tire manufacturer’s recommendations) can be used for legal highway service, just as a properly repaired non-speed rated tire.

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* IMPORTANT!

- **Not all tires can be repaired.** Specific repair limits should be based on recommendations or repair policy of the tire manufacturer and/or type of tire service (e.g. service description, run-flat technology, commercial service applications, etc.).
- **For all tires, repair units cannot overlap.** The number of repairs should be limited first by the tire manufacturer's recommendations and repair policy and then by application and the individual tire's condition as determined by the inspection process detailed in Steps 1 and 2.
- **Some run-flat technology tires cannot be repaired.** Consult tire manufacturer for their repair policy and, if applicable, for their recommended repair procedures.
- **Industry recommended repair methods include:** (1) Two-piece stem and patch repair components, and (2) one-piece patch/stem combination repair units. For punctures angled greater than 25°, two-piece stem and patch repair components are recommended (see Step 2). **NEVER** use only a plug (stem) or **NEVER** use only a patch to repair a puncture.



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ONLY SPECIALLY TRAINED PERSONNEL USING THE PROPER TOOLS AND PROCEDURES SHOULD REPAIR TIRES.

NEVER repair tires with a tread puncture larger than 1/4" (6mm).

NEVER repair tires worn to the tire's treadwear indicators or to 2/32" remaining tread depth in any area of the tread.

NEVER perform a tire repair without removing the tire from the rim/wheel assembly for internal inspection. (Do not perform an outside-in tire repair or on-the-wheel repair). It is essential that only a specially 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**.

NEVER use only a plug (stem) or never use only a patch to repair a puncture. The injury must be completely filled with a suitable vulcanizing material or rubber stem and a patch must be applied to the inner liner to prevent air loss.

NEVER repair a tire that has an existing, improper repair (non-RMA repair); the tire must be scrapped.

NEVER substitute an inner tube for a proper repair or to remedy an improper repair.

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

NEVER buff the tire inner liner too deep, exposing the tire casing body (ply) cords. If this type of damage occurs during buffing, the tire must be scrapped.

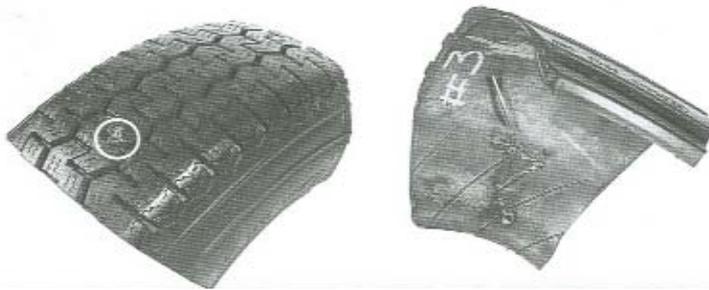
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WARNING

Never perform a tire repair without removing the tire from the rim/wheel assembly for internal inspection.

(DO NOT perform an outside-in tire repair or on-the-wheel repair.)



Driving on 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^{1, 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 warnings contained in owner's manuals, on the equipment, listed on websites and molded onto tire sidewalls.

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 Passenger and Light Truck Tires wall chart.¹

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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.

WARNING

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

As explicitly illustrated in the following ten steps, the basic principles for puncture repairing are: to remove the tire from the wheel for inspection and repair; to prepare the injured area; to fill the injury with a suitable, vulcanizing material or rubber stem that must fill the injury and keep moisture out; to seal the inner liner with a patch repair unit to prevent air loss; and, to re-inspect the finished repair.



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1 EXTERNAL INSPECTION

Prior to demounting¹, check tire surface and the valve for the source of the leak(s) by using water or a soap solution. Mark the injured area and totally deflate the tire. Then remove the tire from the wheel being careful to avoid further damage to the tire, particularly to the bead area. Place on a well-lighted spreader. (Avoid excessive spreading of the tire or tire beads.)

Always inspect tires internally and externally prior to installation of any repair. 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.

WARNING!

Permanent tire damage due to under inflation and/or overloading cannot always be detected. Any tire known, or suspected to have been run at less than the placard recommended operating inflation pressure and/or overloaded, could possibly have permanent structural damage (cord fatigue, particularly steel cords or belt material). Ply cords weakened by under inflation 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. These tires should be inflated by using a restraining device (or safety cage) that complies with OSHA regulations and an air line with a clip-on air chuck.²

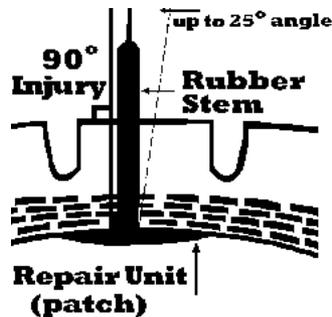
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2 INTERNAL INSPECTION

Spread the beads and 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 remove any loose foreign material. If the angle of the injury exceeds 25° , use a two-piece repair system (see graphic at center). Do not repair if injury extends into the shoulder/belt edge area and never repair in the sidewall area.

For all tires, repair units cannot overlap. Inspect for any other internal damage. Tires with damage due to under inflation, overloading, and/or tires with an existing improper (non-RMA) repair must be rejected.^{1,2} (See “IMPORTANT” box on left side.) (See “NOTE” box at lower right corner.)



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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 repair material manufacturer's recommendations. Consult your local repair materials supplier for an appropriate cleaner³. This step serves to remove dirt and mold lubricants that can reduce repair unit adhesion and contaminate buffing tools.



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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.



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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.



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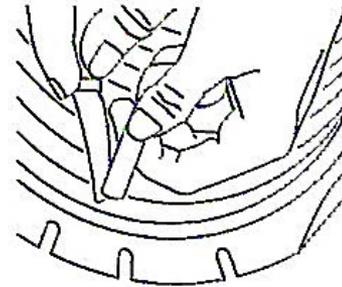
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6 FILL INJURY

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

Do not mix products from different repair material manufacturers.³ Follow repair material manufacturer application recommendations.

Cement the puncture channel per recommendations (see photo, bottom left). Completely fill the injury from the inside of the tire with a suitable vulcanizing material or rubber stem. Without stretching the stem, cut the material off just above the inside tire surface (see graphic, bottom right). It is necessary to completely fill the injury to provide a backup for the patch repair unit and to prevent rusting of the steel wires or deterioration of fabric.



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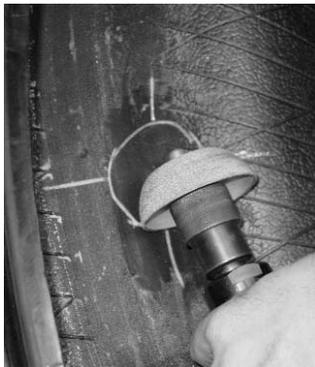
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7 BUFFING

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. Take care not to expose or damage tire casing body (ply) cords. Buff to a velvet surface; RMA No. 1 or No. 2 texture.⁴

Never buff the tire inner liner too deep exposing the tire casing body (ply) cords. If this type of damage occurs during buffing, the tire must be scrapped.

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. 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.



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8 CEMENTING

Do not mix products from different repair material manufacturers.³

Apply chemical cement and allow it to dry according to repair material manufacturer's procedures. 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.

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9 REPAIR UNIT APPLICATION



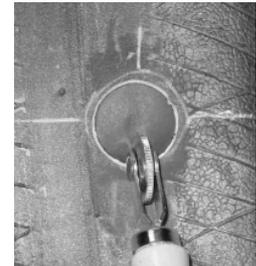
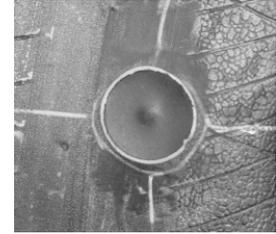
Do not mix products from different repair material manufacturers³. Follow repair material manufacturer's recommendations for installation instructions.



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.³ When 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. When using a one-piece, combination patch/stem repair unit, Do not cement the stem, instead 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.



Inspect patched area! If the buffed area extends beyond the patch, look for any signs of tire casing body (ply) cords. Do not continue the repair if the buffed area exposes the tire's casing body (ply) cords; the tire must be scrapped.



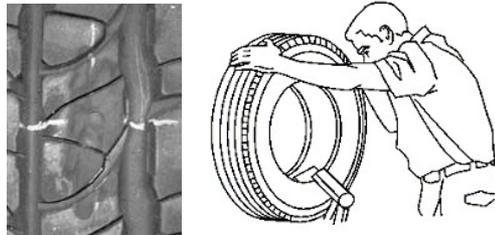
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10 FINAL INSPECTION

IMPORTANT! A proper repair must completely fill the injury with a suitable vulcanizing material or rubber stem and a patch must be applied to the inner liner to prevent air loss.

Inspect all repairs; rework if necessary. After remounting and inflating the tire/wheel assembly¹, inspect the assembly (tire/rim/valve) for damage or leakage. Pay particular attention to the location of the repair, the beads and the valve. 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 replace a damaged tube with a new tube.)



WARNING!

A patch only or a plug (stem) only is an improper repair. 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.

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REFERENCES

- ¹ Refer to RMA *Demounting and Mounting Procedures for Passenger and Light Truck Tires* wall chart.
- ² Refer to RMA TISB Vol. 33 *Inspection Procedures to Identify Potential Sidewall “Zipper Ruptures” in Steel Cord Radial Truck, Bus and Light Truck Tires* with accompanying wall chart.
- ³ Refer to information on the product or manufacturer Material Safety Data Sheet and follow guidelines for handling and disposal.
- ⁴ Refer to RMA Shop Bulletin No. 29 *RMA Standard Buffing Textures for Retreading and Repairing* rubber texture sheet.
- ⁵ Refer to RMA TISB Vol. 41 *Tire Bead Lubricants, Mounting Aids, Bead Sealers, OEM Mobility Kits, Tire Sealants, Balancing Substances and Flammable Substances*.

NOTE for STEP 2: Tire Sealants and OEM Mobility Kits⁵

- 1) Vehicle Original Equipment Temporary Tire Mobility Kits and aftermarket sealants such as aerosols, liquids, or gels injected into a tire through the valve provide only temporary mobility allowing the driver to promptly reach a service location for professional inspection and possible repair. Such sealants are not considered proper repairs. Consult tire manufacturers’ recommendations regarding repairability or continued use of such tires.
- 2) Tires with damage initially treated with any type of puncture sealant(s) may have been damaged as a result of being run under inflated and/or overloaded and should be inspected accordingly before repairing tire.
- 3) Tires that are manufactured with puncture sealant require specialized repairing techniques. The tire and/or sealant manufacturer(s) should be contacted for recommendations.

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RUBBER MANUFACTURERS ASSOCIATION
1400 K STREET, NW, SUITE 900
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