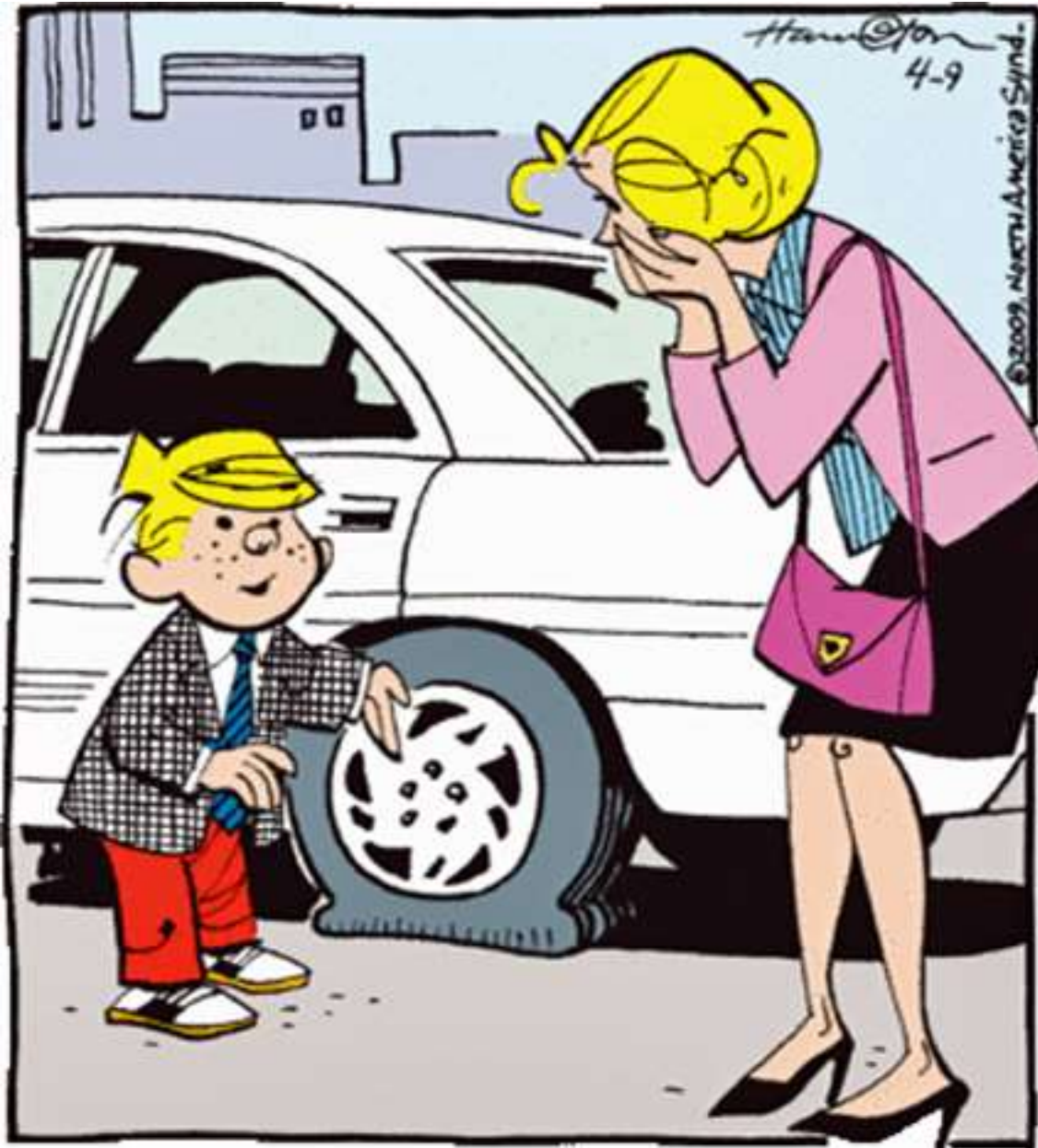


It's Only Flat on the Bottom!



Who Says Tires are Repairable?

- National Highway Transportation Safety Administration (NHTSA)
 - www.nhtsa.gov
 - The Pneumatic Tire
 - (DOT HS 810 561)
 - Tire Aging Test Development Project
 - (DOT HS 811 201)
- U.S. Tire Manufacturers (USTM)
 - www.USTires.org
 - Puncture Repair Procedures for Passenger and Light Truck Tires
 - Wall Chart PRPPLTT-1004
- Goodyear
 - www.goodyear.com
 - Proper Puncture Repair Procedures for Passenger & Light Truck Tires
 - (PSB #2017-11)
- Michelin Tire
 - www.michelinman.com
 - “Can my tire be repaired?” (Web Page)
- Pirelli Tire LLC
 - www.Pirelli.com
 - Document Control Nos.
 - C90.CD.QA.018.F
 - PWRT0011
- Yokohama Tire
 - www.yokohamatire.com
 - When is a Tire Repairable?
 - youtu.be/JT7Au67c6Uw (Video)
- Continental Tires
 - www.continental-tires.com
 - Tire Repair (Web Page)
- BF Goodrich
 - www.bfgoodrichtires.com
 - Tire Repair (Web Page)

Tire Repair Rules

- Tire Repairs are limited to the Tread area only.
- A Tire Puncture greater than 1/4 inch (6.4mm) can not be safely repaired
- A Tire Repair must include a Patch and a Plug.
 - A Tire Patch alone is not acceptable.
 - A Tire Plug alone is not acceptable.
- A Tire Repair may reduce its Speed Rating.
- Aerosols, Liquids, Gels, etc. that are injected into a tire through the valve stem are not considered proper repairs.
- The Tire has not been driven on when Flat.
- One Tire Repair can never overlap another.

Repair Only the Tread Area







How Big is the Hole?

**1/4" 6.4mm
Maximum**

**9/32" 7.25mm
Diameter**



**A #2 Pencil
Should NOT Fit**

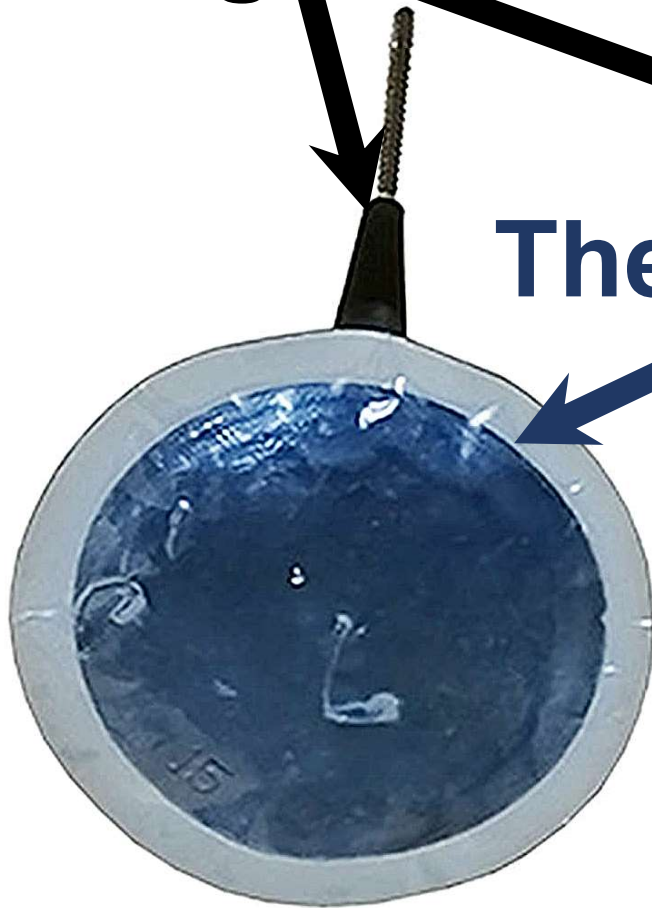


2 Pencil

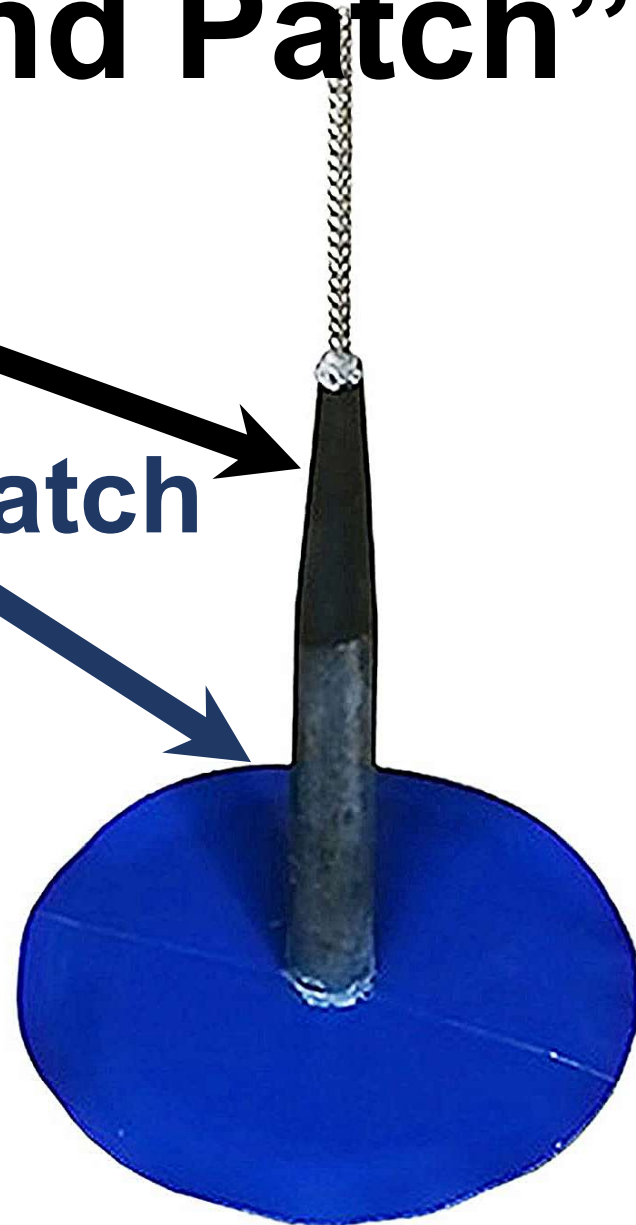
1/4" Hole

A Plug and Patch is called a “Compound Patch”!

The Plug



The Patch



Tire Patch Tools:

Inner Liner
Scraper



Rubber
Cement



Carbide
Reamer



70 Grit
Buffing
Wheel



Pliers



Patch
Roller



Locate, Mark and Remove the Item that Damaged the Tire.



**Mark the Tire Wall where
the Patch will be Placed.**



**Scrape the Tire Wall where
the Patch will be Placed.**



Use a 70 Grit Buffing Wheel to prepare the Tire Wall.



Use a Carbide Reamer to Size and Remove any Steel Belt material from the Hole.

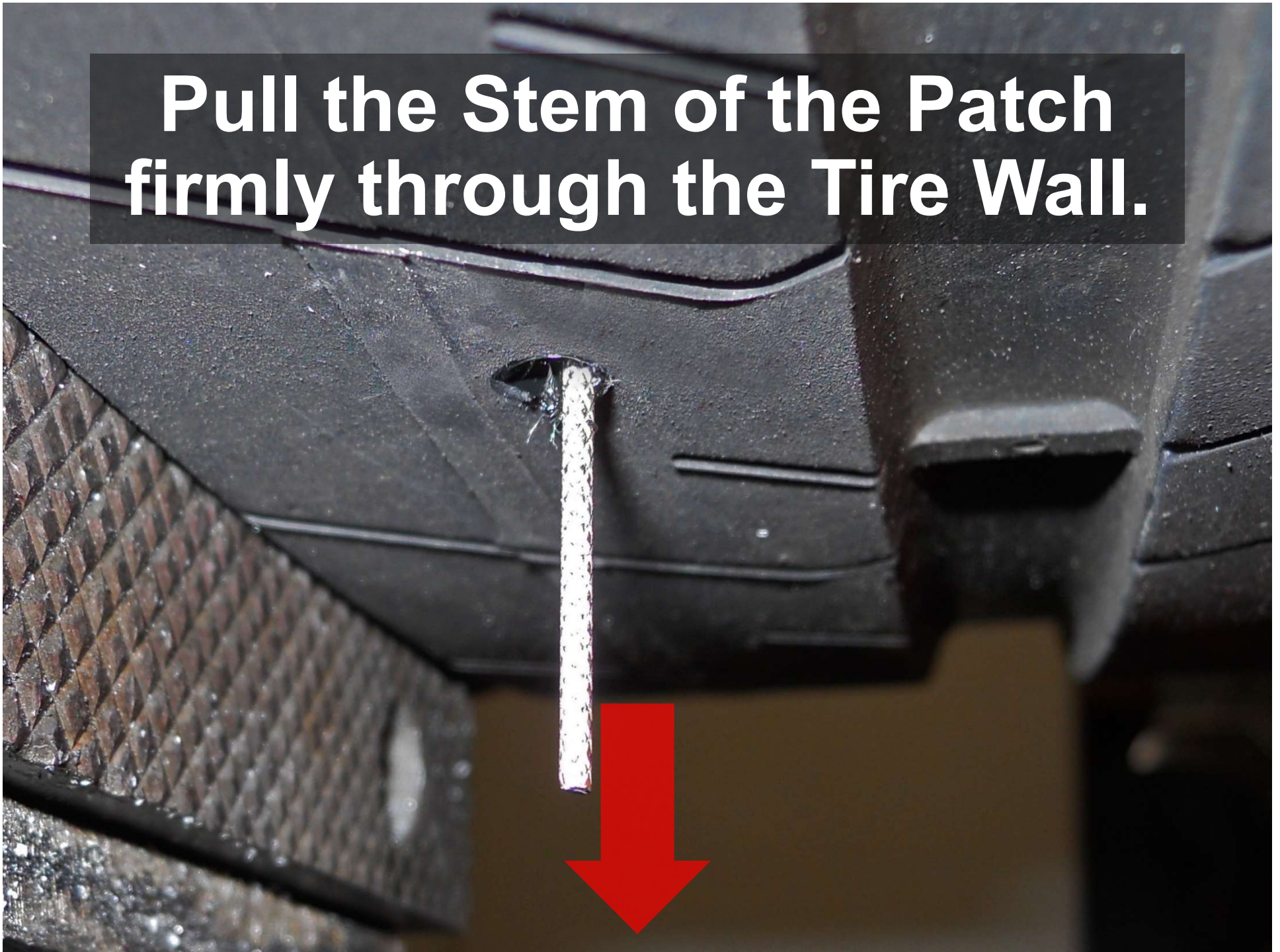




**Apply Rubber Cement to
the: Tire, Hole & Patch Stem.**

**Then, Insert the Stem of the
Patch into the Hole.**

**Pull the Stem of the Patch
firmly through the Tire Wall.**



**Use a Roller to firmly press
the Patch to the Tire Wall.**



Use a Razor Blade or Sharp Knife to cut the Patch Stem.



**Leave a small portion of the
Patch Stem exposed.**



***Note: Following Tire inflation and installation, the
Patch Stem may retract slightly, DO NOT Trim.***

Repairs & Speed Ratings

Preserved at 1 Repair

- BF Goodrich
- Continental
- Dunlop
- General
- Goodyear
- Michelin
- Pirelli (“H” and below)
- Toyo (Reduced to “H”)
- Uniroyal

Voided ANY Repair

- Bridgestone
- Cooper
- Falken
- Firestone
- Hankook
- Kuhmo
- Pirelli (“V” and above)
- Sumitomo
- Yokohama

Speed Ratings?



Tire Speed Ratings

Rating	Maximum Speed mph	Maximum Speed km/h
T	118 mph	190 km/h
U	124 mph	200 km/h
H	130 mph	210 km/h
V	149 mph	240 km/h
Z	149+ mph	240+ km/h
W	168 mph	270 km/h
Y	186 mph	300 km/h
(Y)	186+ mph	300+ km/h

USTMA™ Wall Chart (PRPLTT-1004)



PUNCTURE REPAIR PROCEDURES FOR PASSENGER AND LIGHT TRUCK TIRES

RECOMMENDED PROCEDURES

BEFORE PERFORMING A PUNCTURE REPAIR, READ THIS SECTION

This publication covers puncture repair procedures for passenger and light truck tires (including European commercial, C-Type tires) in the tread area as described by the graphic below. The 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.

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 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. 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.

PUNCTURE INJURY SIZE LIMIT 1/4" (6mm) For Passenger and Light Truck Tires (Including C-Type Tires)



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.

OTHER REPAIR LIMITATIONS

- 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, runflat 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) and NEVER use only a patch to repair a puncture.

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.

NEVER use only a plug (stem) and 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-USTMA 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 innerliner too deep, exposing the tire casing body ply cords. If this type of damage occurs during buffing, the tire must be scrapped.

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 reparability.^{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 USTMA Demounting and Mounting Procedures for Passenger and Light Truck Tires wall chart.¹

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.

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 will 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.

WARNING

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

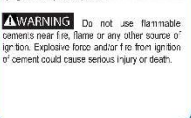
4 PREPARE INJURY CHANNEL

All damage must be removed. Use an electric air powered drill (1/200" pin max) with an appropriate size carbide outer or other suitable tool. Beginning from the inside, ream the puncture channel a minimum of three times--rotate from the outside. Use a probe to check for any spots in the radial ply surrounding the injury. Remove any additional damage found.



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 an auxiliary heat source to reduce drying time. In cold and/or humid climates, additional drying time may be required.



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.

U.S. TIRE MANUFACTURERS ASSOCIATION
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WASHINGTON, DC 20005

All USTMA tire publications may be ordered online at www.USTMA.org or call +1 202.682.4800

1 EXTERNAL INSPECTION

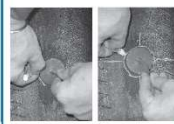
Prior to demounting, check the tire, wheel and valve for the source of the leakage by using water or a soap solution. Mark the injured area and visually deflate the tire. Then remove the tire from the wheel being careful to avoid further damage to the tire, particularly to the bead area. Place on a well-lighted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

Always inspect tires internally and externally prior to installation of any repair. Bright ambient lighting and a hand-held inspection light are necessary to perform this inspection. Consult your equipment's supplier for appropriate lighting.

WARNING Permanent tire damage due to under inflation and/or over loading can always be avoided. Any tire shown, or suspected to have been run flat, that has the placard near the wheel showing that it is pressure sensitive should be repaired with a permanent plug and damage card always, particularly a sensitive tire. Ply cords weakened by under inflation and/or over loading may break one after another until a rupture commonly referred to as a "blow-out" occurs in the center sidewall with accompanying instant loss of tire and excessive force. This can result in serious injury or death. These tires should be inflated using a restraining device (or safety cage) that complies with OSHA regulations and an air line with a clip-on air chock.²

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 2" (13mm) larger than the repair unit, so buffing will not remove the crown marks.



9 REPAIR UNIT APPLICATION

Do not mix products from different repair material manufacturers. Follow repair material manufacturer's 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 on the underside of the patch being careful not to touch the bonding material on the repair unit.



Using a two-piece, directionally marked unit, install the unit so that the alignment is correct and centered over the injury. Next, stretch down thoroughly with a stretching tool, working from the center out. If 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 droops, then stretch down thoroughly with a stretching 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.

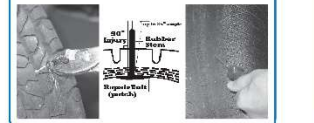
REFERENCES

- 1 Refer to USTMA "Demounting and Mounting Procedures for Passenger and Light Truck Tires" wall chart
- 2 Refer to USTMA TSB # 21 "Inspection Procedures to Identify Potential Safety" (Zipped Repairs) in "Beard Club Radial Truck, Bus and Light Truck Tires" with accompanying wall chart.
- 3 Refer to information on the product or manufacturer National Safety Data Sheet and follow guidelines for handling and disposal.
- 4 Refer to USTMA TSB # 47 "The Road Builders' Warning About Sealants: OEM Mobility Kits, the Sealants, Retaining Substances and Flammable Substances"

2 INTERNAL INSPECTION

Spread the beads and mark the injury with a fine crayon. Remove the puncturing object using the angle of penetration. Probe the injury with a blunt tool 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 or over loading, and/or tires with an existing improper (non-USTMA) repair must be scrapped. If sealant is found inside the tire, see NOTE at bottom right corner.



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. Follow repair material manufacturer application recommendations. Cement the puncture channel per recommendations (see graphic, 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 as shown in the graphic (see graphic, bottom right). It is necessary to completely fill the injury to provide a backup for the patch repair unit and to prevent nesting of the steel wires or deterioration of fabric.



10 FINAL INSPECTION

Inspect the repair inside and out. The patch should be well adhered and the plug should completely fill the injury. No body ply cords should be exposed on the innerliner. If any body ply cords were exposed during the buffing process in step 7, the tire must be scrapped.

Mount and inflate the tire. Inspect the tire/wheel assembly for damage and leakage. Pay particular attention to the repair area, the beads and the valve. If the tire continues to lose air at the repair location, it must be removed from the wheel for complete re-inspection and reworking of the repair, if possible.

WARNING A plug (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.

NOTE FOR STEP 2: Tire Sealants and OEM Mobility Kits⁴

- 1 Vehicle Origin 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 reach a service location for professional inspection and possible repair. Such sealants are not considered proper repairs. Consult the manufacturer's recommendations regarding reparability or continued use of such tires.
- 2 Tires with damage initially treated with any type of pump, sealant or mist have been damaged as a result of being run under inflated and/or over loaded and also, if inspected accordingly before repairing tire.
- 3 Tires that are run flat with puncture sealant require specialized repair techniques. The tire and sealant manufacturer(s) should be contacted for recommendations.