



Overview

Flat tires are costly, time-consuming nuisances that can be repaired easily. The most common injury is a puncture. This type of injury is usually found in the tread or shoulder of the tire, but can also be found in the sidewall.

Abrasion is another cause of flat tires. An object continuously rubbing the same area on a tire can cause a wear spot. Over time this spot can burst, creating a blowout. This is commonly found on the sidewall of a tire.

Two Types of Tire Repairs

On-the-Wheel Repairs

- Plugs or repair strips are used
- Tire can stay on the vehicle
- Gets the vehicle back on the road quickly
- Designed for small tire punctures
- Temporary repair

Off-the-Wheel Repairs

- Patches, or plugs and patches are used
- Tire must be removed from the vehicle and the rim
- More time-consuming
- Can repair various size injuries to the tread, sidewall and shoulder
- Permanent repair

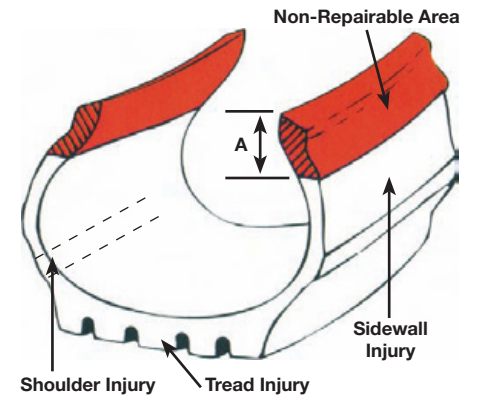
Repairable and Non-Repairable Areas

Radial Tire Non-Repairable Area

Vehicle Type	Width (Inches)	A
Passenger		2-1/2" (63mm)
Light Truck		2-1/4" (57mm)
Truck	7.50	3-1/2" (89mm)
	8.50	3-1/4" (83mm)
	9.00 – 12.00	4" (102mm)

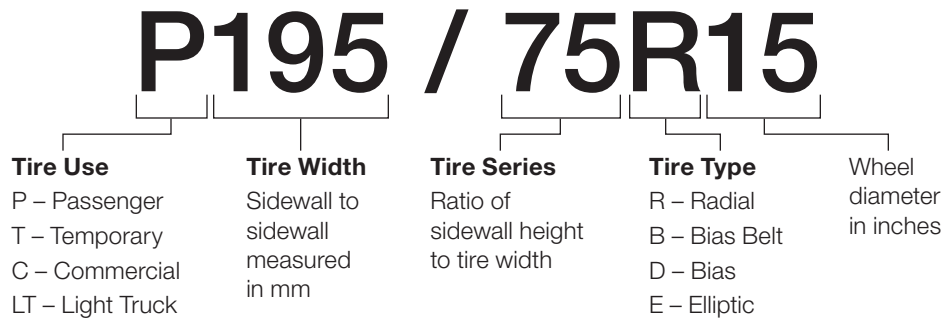
Bias-Ply Tire Non-Repairable Area

Tire Width (Inches)	A
7.00 – 8.75	3-1/4" (80mm)
9.00 – 14.00	4" (100mm)
16.00 – 18.00	5" (125mm)
21.00 – 29.50	6" (150mm)

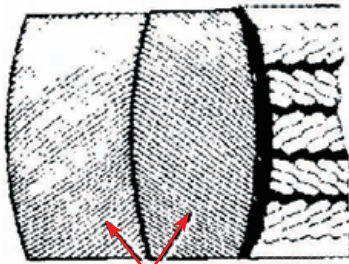


Tire Construction

Tire construction plays an important part in determining what type of tire repair product to use. To determine what type of tire is on a vehicle, just read the information on the sidewall of the tire.



Radial Ply Construction

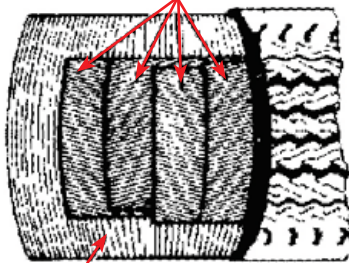


Bias Plies

Bias-ply tires have the cords criss-crossed across the tire from one bead to the other. The cords make an angle between 32° and 40° with the centerline of the tread. Bias-ply tires will typically have stiff sidewalls and flexible tread face.

Radial Ply Construction

4-Ply Belt

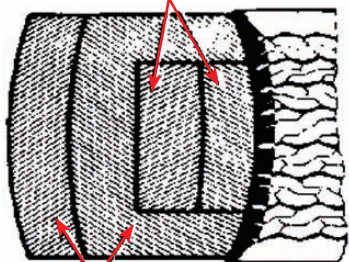


Radial Plies

A radial tire uses a cord angle of 90°. In other words, the cords run from one bead to the other directly across the tread. Radial tires also have a belt overwrap under the tread surface which can be made of various materials including fiberglass and steel mesh. This belt overwrap causes less tread distortion under load and more sidewall distortion.

Belted Bias Construction

2-Ply Belt

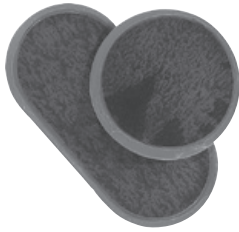


Bias Plies

Belted bias tires are a hybrid combining bias plies with the radial belt overwrap under the tread surface. This type of tire has the excellent feedback of the bias and the reduced tread distortion of the radial. Most racing radial tires are very close to this design.

Patches

Chemical Tire Patches



Chemical Tire Patches vulcanize chemically. These patches have feathered edges designed to prevent chaffing. They can be used on tube and tubeless radial or bias-ply tires on passenger cars and light-duty trucks. They are available in round and oval shapes to cover a wide variety of repairs. On tube repairs, round out or "buttonhole" the ends of the hole using a paper hole punch or scissors to prevent future tearing and rubbing damage to the tube.

Item No.	Patch Size (Inches)	Max. Injury Size (Inches)
82532	1-5/8	13/16
82533	2-1/4	1-1/8
82534	3-1/8	1-9/16
82535	1-3/8 x 2-3/8	11/16 x 1-3/16
82536	1-7/8 x 3-3/4	15/16 x 1-7/8
94911	2-1/2 x 5-3/4	1-1/4 x 2-7/8

Chemical-Cure Reinforced Truck Tire Patches

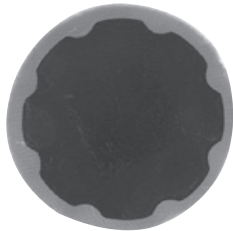


Chemical-Cure Reinforced Truck Tire Patches vulcanize chemically on tube and tubeless bias-ply tires. They can be used on passenger, truck and agricultural tires.

Ply Rating	Injury Size					
	6mm 1/4"	10mm 3/8"	15mm 1/2"	20mm 3/4"	25mm 1"	40mm 1-1/2"
8 – 12	–	89180	89180	89191	89182	89182
14 – 16	89180	89191	89191	89182	–	–
20 – 24	89180	89191	89182	–	–	–

Item No.	Size (Inches)	Description
89180	3-1/2	2-Ply
89181	4-1/2	2-Ply
89182	5-1/2	2-Ply

Reinforced Tire Patches



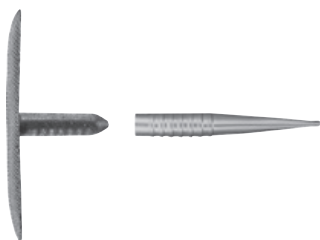
Lawson's Reinforced Tire Patches are designed for use on tube or tubeless bias-ply tires. They are reinforced with strong, flexible polyester cords. The patches will vulcanize chemically or at low temperatures.

Item No.	Size (Inches)	Description
94912	2-1/4	1-Ply
82544	3	1-Ply
94913	3-5/8	2-Ply

Ply Rating	Injury Size			
	3mm 1/8"	6mm 1/4"	10mm 3/8"	15mm 1/2"
Passenger, Truck and Earthmover				
4	94912	94912	82544	94913
6	94912	94912	82544	94913
8	94912	94913	94913	–
10	94912	82544	94913	–
12	94912	82544	94913	–
14	94912	82544	–	–
16	94912	82544	–	–
18	94912	82544	–	–
20	94912	82544	–	–
22	94912	82544	–	–
24	94912	82544	–	–

Ply Rating	Injury Size			
	3mm 1/8"	6mm 1/4"	10mm 3/8"	15mm 1/2"
Farm, Tractor, Skidder				
4	94912	94912	82544	94913
6	94912	94912	82544	94913
8	94912	82544	94913	94913
10	94912	82544	94913	–
12	94912	82544	94913	–
14	94912	82544	–	–
16	94912	82544	–	–
18	94912	82544	–	–
Reinforcement Repairs				
8 – 12	94912	94912	82544	94913
14 – 18	94912	94912	82544	94913
20 – 24	94912	94912	94913	–

Combination Radial Patch/Plug Repair



Patch/Plug Repair is designed for radial tire tread repairs only. It is reinforced with polyester cords for greater strength. The metal quill aids in insertion of the plug portion into the injury. Once inserted, pull the metal quill off to expose the rubber plug portion. These will chemically vulcanize to the repair area.

Item No.	Patch Size (Inches)	Stem Dia. (Inches)	Max. Puncture Size (Inches)
83783	1-3/4 x 3	5/16	3/16
83784	2-1/4 x 4	3/8	1/4
83785	2-5/8 x 5	7/16	5/16

Patches (cont.)

Center-Over-Injury Tire Patches



COI (Center-Over-Injury) Radial Patches cover a wide range of injury areas and sizes. Item Nos. 94914, 94915 and 94916 are for tread injuries only and their repair limitations are shown in the table at the right. Item Nos. 94917 and 94918 can be used for sidewall, tread and shoulder injuries. Their repair limitations are shown in the table below. All of these patches vulcanize chemically to the repair area.

Item No.	Patch Size (Inches)	Vehicle Type	Max. Injury Size (Inches)
94914	1-3/4 x 3	Small Passenger	1/8
94915	2-1/4 x 4	Medium Passenger	1/4
94916	2-3/4 x 5-1/2	Large Passenger	3/8
94917	3 x 5	Small Light Truck 2-Ply	–
94918	3 x 6	Medium Light Truck 2-Ply	–

Sidewall Injury (Inches)		Tread Injury (Inches)	Passenger		Light Truck	Heavy Truck	
Max. Width	Max. Length (Inches)	Max. Dia. (Inches)					
			125 – 195	205 – 255	6.50 – 12.50	7.50 – 10.00	11.00 – 14.00
					7 – 10 215/85 – 255/85 215/75 – 265/75	8 – 11 235/80 – 275/80 245/75 – 295/75	12 – 16.5 295/80 – 315/80 315/75 – 425/65
1/4"	1/2	3/8	–	–	94917	–	–
	2		–	–	94918	–	–
1 Cable	1-1/2		–	–	94917	94917	94917
	3-1/8		–	–	94918	94918	94918
2 Cables	3/4		–	–	94917	94917	94918
	1-1/2		–	–	94917	94918	–
	2-3/8		–	–	94918	–	–
3/8"	3/8		–	–	94917	94917	94917
	1-1/2		–	–	94917	–	–
	2		–	–	94918	–	–
	2-3/8		–	–	94918	–	–
1/2"	1-1/2		–	–	94918	–	–
	2	–	–	94918	–	–	
	2-3/4	–	–	94918	–	–	
3/4"	3/4	–	–	94918	–	–	
	1	–	–	94918	–	–	
1"	2	–	94918	–	–	–	
Shoulder Injury	1/4	–	–	–	94917	94917	
	3/8	–	–	94917	94917	94918	
	1/2	–	–	94917	94918	–	
	3/4	–	–	94918	94918	–	

Plugs

Posi-Grip Jiffy Gun and Plugs



Posi-Grip Plugs are designed for temporary on-the-wheel repairs on radial or bias-ply passenger car and truck tires. The plugs seal the injury by compression only. Use Silicone Nipple Lubricant, Item No. 83005, for easy installation of Posi-Grip Plugs.

Item No.	Dia. (Inches)	Max. Injury Dia. (Inches)
82542	5/16	3/16
82543	3/8	1/4

Pli-Seal Plugs



Pli-Seal Plugs are designed to fill the injury so they can be used in section repairs. They vulcanize chemically or with a heat-curing system.

Item No.	Plug Size (Inches)	Description	Max. Injury Size (Inches)
98092	2-1/4 x 3/8	5-Ply	1/4
98093	3-1/8 x 5/8	5-Ply	3/8

On-The-Wheel Repair Strips and Strings



Repair Strips are designed to fill the injury. They vulcanize chemically or with a heat-curing system to create a temporary repair. Repair Strings can be used on radial or bias-ply passenger or truck tires. They seal by compression to form a temporary repair. Repair Strips and Strings are designed to fill the injury so they can be used in section repairs.

Item No.	Size (Inches)	Description	Max. Injury Size (Inches)
82546	2-3/8 x 1/4	3-Ply Strip	1/8
82547	2-3/8 x 1/2	3-Ply Strip	3/8
94919	4	Fat Brown String	1/4
94920	7-1/4	Thin Black String	1/4

Chemicals



Heavy-Duty Vulcanizing Cement is a fast-drying cement with accelerators. The vulcanizing process begins when the face gum of the patch comes in contact with the cement. Blue.



Bead Sealer is a thick, black sealer designed to fill gaps and form a bond between the tire and the rim.



All-Purpose Chemical Vulcanizing Cement is a fast-drying cement with accelerators. The vulcanizing process begins when the face gum of the patch comes in contact with the cement. Clear.



Rubber Prep Buffing Solution thoroughly cleans the tire or tube inner liner of dust, dirt, grease, oil, silicone and soapstone.



Tire Bead Lube Concentrate is a lubricant designed to aid in fitting the tire onto the rim. It is applied to the tire bead.

Types of Repairs and Repair Limits

Puncture Repair

An injury in the tread (crown) area only. Caused by a small, sharp object penetrating the inner liner of the tire. The injury can be a maximum of 1/4" (6mm) in passenger tires and 3/8" (10mm) in light and medium truck tires.

Spot Repair

A rubber-only repair that penetrates less than 25% of the body plies. An area to be spot-repaired must not exhibit any cord damage except in the case of bias-ply tires, which may have up to 25% of the cord plies injured.

Reinforcement Repair

An injury which penetrates from 25% to 75% of the body plies. A cord-reinforced repair unit is required on the inner liner of the tire.

Section Repair

An injury that penetrates 75% or more of the body plies and exceeds the puncture repair limits.

Section Repair Limits for Radial Tires

Tire Size	Crown Limits	Sidewall Limits
Passenger P195R and smaller	1/2" (13mm)	3/8" x 2" (9mm x 50mm) or 3/4" x 1-1/2" (19mm x 38mm)
Passenger P250R and larger	3/4" (19mm)	3/8" x 2-3/4" (9mm x 70mm) or 3/4" x 2" (19mm x 50mm)
Light Truck	1" (25mm)	3/8" x 3-1/8" (9mm x 80mm) or 1" x 2" (25mm x 50mm)
Truck: 8.25R – 14.00R	1-1/2" (38mm)	3/4" x 5-1/8" (19mm x 130mm) or 1-1/4" x 4" (32mm x 102mm) or 1-1/2" x 3-1/8" (38mm x 80mm)

Section Repair Limits for Bias-Ply Tires

Ply Rating	Crown	Sidewall
Highway Service Drive or Trailer Applications		
Up to 8	1" (25mm)	1" (25mm)
10 – 14	2" (51mm)	1" (25mm)
16 – 20	2-1/2" (64mm)	1-1/4" (32mm)
Local Service Trailer or P&D Applications		
Up to 8	2" (51mm)	1-1/2" (38mm)
10 – 14	3" (76mm)	1-1/2" (38mm)
16 – 20	3-1/2" (89mm)	1-3/4" (45mm)

Industry Standard Section Repair Procedures

I. Initial Tire Inspection

- A. An Injury that penetrates 75% or more of the body plies and exceeds puncture repair limits requires a section repair. DO NOT attempt to repair this type of damage with nail hole repair units. Demount the tire from the wheel and locate the injury.
- B. Remove any injuring object and make a careful visual inspection to determine the size, angle and extent of the injury. Use a probing awl to probe for unseen internal damage. Determine whether the injury is within repairable limits.

II. Filling the Area

- A. Preparing the Outside of the Tire
 1. Using a low-speed buffer and a carbide cutter, begin removing all damaged rubber from the inside and outside of the tire and steel cord in the injury area. All broken cords and loose strands of cable must be removed, leaving only solid, undamaged rubber at the sides of the opening. In the tread area, use an appropriate buffing wheel to buff at a 45° angle down to the cord and 90° through the cord.
 2. Using a high-speed buffer with a pencil stone, polish the exposed cord ends, being careful not to scorch the rubber. Clean away any rubber or steel dust left behind from the inside and outside of the tire. Using a low-speed buffer and an appropriate buffing wheel, round over the edges of the prepared area.
- B. Preparing the Inside of the Tire
 1. Clean the inner liner around the injury area with a pre-buff chemical rubber cleaner. Using an inner liner scraper, remove dirt, mold lubricants and other contaminants.
 2. Using a low-speed buffer with an appropriate buffing wheel, buff an area about 1" larger than the injury area to an RMA #1 texture. Round over the edges of the prepared area. Use a vacuum cleaner to remove buffing dust.
 3. Measure the thickness of the tire at the injury area and note this measurement for future reference. Measure and record the dimensions of the repair area.
 4. Spread a generous coating of vulcanizing cement over the prepared injury area on both the inside and outside of the tire.

C. Filling the Injury

1. Secure a backing plate on the inner liner. Fill the injury area with an appropriate filling material. Stitch and pack material to avoid creating any gaps or air pockets. Work from the center outward, making sure to stitch runner over the edges. Filling material should be about 1/8" above the outside of the tire when finished packing. Remove the backing plate and cure the filling material following manufacturer's cure time recommendations.

III. Repair Unit Application

- A. Select the proper size reinforced repair unit and center it over the injury on the inner liner. Mark an area about 1/2" larger than the selected repair unit. Clean the selected area completely with a chemical pre-buff. Using an inner liner scraper, remove all dirt, mold lubricants and other contaminants.
- B. Using a low-speed buffer and an appropriate buffing wheel, buff the area to an RMA #1 texture. Remove all buffing dust with a vacuum.
- C. Using a chemical vulcanizing cement recommended by the repair manufacturer, apply a thin, even coating to the prepared and buffed surface. **Allow cement to dry thoroughly.**
- D. While beads are in a relaxed position, remove backing from repair unit and center the repair over the injury. Stitch repair down thoroughly with a stitching tool, working from the center out, making sure to stitch the edges.
- E. Once the repair unit has been stitched down, apply a generous coating of inner liner sealer to the edges of the repair unit.

IV. Finishing the Repair

Using a low-speed buffer and an appropriate buffing wheel, lightly buff the outside of the repaired area until the rubber is flush with the surrounding area, presenting a smooth, finished appearance. For tread area repairs, use a regroover to replace the original tread design. For sidewall repairs, mark the repaired area for future reference.

Industry Standard Puncture Repair Procedures



1. Inspection

Before repairing, determine if the injury is within repairable limits. Mark the injury, then remove puncture object from the tire. Before deflating, apply soap solution to the tire to determine if air loss is from one or more punctures. Unseat the beads and apply approved bead lubricant. Remove the tire from the wheel carefully to avoid further damage, especially to the beads, and place the tire on a spreader.



2. Probing

Probe the puncture with a blunt, smooth-surface awl or other probing tool to determine the size and direction of the injury, making sure no foreign material is left in the injury.



3. Internal Examination

Spread the beads, marking the puncture with a tire crayon. Inspect for evidence of other damage, e.g. damage to the bead area, run flat, etc. If, after a thorough internal examination, the tire is determined to be repairable and injury is within repairable limits, proceed to the next step.



4. Select Proper Repair Materials

Center the repair unit over the injury and outline an area slightly larger than the repair with crayon. Repair materials selected must be those which are recommended for the construction type (radial, belted bias, bias) of the tire to be repaired.



5. Cleaning

Clean inside the outlined area thoroughly with a pre-buff chemical cleaner **Do Not Use Gasoline!** This removes dirt, mold lubricants, etc. and keeps buffing tools clean. Do not substitute chemical cleaning for mechanical buffing. Make certain that no loose or frayed wire ends protrude through the inner liner.



6. Buffing

Buff the cleaned area thoroughly to a flat, smooth velvet surface (RMA #1 buffed texture for chemical vulcanizing repairs, or RMA #3 buffed texture for uncured repairs), taking care not to gouge the inner liner or expose casing fabric. Remove buffing dust from the inner liner with a vacuum cleaner.

7. Puncture Preparation

Ream the puncture channel with a fine reamer from the inside in a clockwise direction to prepare the injury. All exposed cables must be removed to prevent further damage to the tire or the repair.

8. After completing basic preparation, finish repair by selecting one of the following repair methods.



Chemical Vulcanizing Repairs

a. Fill Injury – Cement the puncture channel and fill the injury from the inside with contour conforming material. Cut or buff material flush with the inner liner. Follow repair material manufacturer's recommendations. It is very important to fill the injury to prevent rusting of steel cables or deterioration of fabric.



b. Cementing – Always use chemical vulcanizing cement recommended by the repair material manufacturer and apply a thin, even coating to the prepared and buffed surface. Cement must be allowed to dry thoroughly!



c. Repair Unit Application – Tire must be in a relaxed position when the repair unit is being installed. **Do not spread the beads excessively.** Remove backing from suitable repair unit and center over the injury. Stitch repair down thoroughly with stitching tool, working from the center out.



Combination Repair Units

a. Cementing – Always use the cement recommended by the repair material manufacturer. Apply a thin, even coating to the prepared, buffed surface and inside the injury channel. Cement must be allowed to dry thoroughly!



b. Repair Unit Insertion – Remove the backing from the stem and repair head. Pull through according to manufacturer's recommendations.

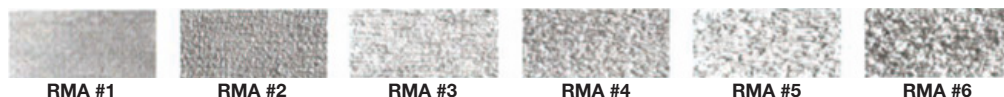


c. Stitching – Stitch repair head down firmly with stitching tool, working from the center out.

9. Finish Repair

Regardless of type of repair used, the finished repair should fill the injury and seal the inner liner. After inflating, check finished repair, both beads and the valve stem with soap and water solution to ensure a complete seal.

RMA Buffing Textures



Tools



Tire Probe

Tire Probes are necessary repair tools. They help clean out and prep the injury for repair.



Open-Eye Needle

Open-Eye Needle tools are used to install Pli-Seal Plugs and Repair Strips and Strings.



Roller Stitcher

A Roller Stitcher is used on tire patches, working from the center out, to aid in sealing the injury.



Tire Pressure Gauge

Once the repair is complete, reinflate the tire to the correct pressure.