Recommended Practice - RP-02-17
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SECTION REPAIR OF RADIAL PLY TRUCK TIRES IN A FULL SERVICE REPAIR FACILITY

Tread Rubber and Tire Repair Materials Manufacturers' Group

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I. PURPOSE

The purpose of this Recommended Practice (RP) is to provide step-by-step procedures for repairing radial ply truck tires that are to be returned for continued service. These industry-approved guidelines have been prepared for use by Full Service Tire Repair Facilities. This RP covers: Inspection, Permissible Repairs, Section Repair Injury Chart, Injury Preparation and Repair Unit Selection, Repair Methods, and Finishing.

WARNING

Serious bodily injury may result from not wearing adequate **personal protective equipment (PPE)** including eye protection (i.e., goggles or face shields), ear protection, respiratory protection, and gloves while repairing tires. Always wear appropriate PPE for your safety.

II. INSPECTION

A. Careful inspection of tires is of utmost importance.

B. Tires must be inspected on a spreader (e.g., a full circle spreader recommended for truck tires) to allow for exploration of all cuts, breaks, and punctures. Adequate lighting (i.e., 200 footcandles (fc)/2153 lux (lx) minimum, 300 fc/3229 lx recommended) must be provided to the surface being inspected. Radial ply tires should never be inverted. During inspection, radial ply tires can be deflected up to 1 ½" (40 mm) from a relaxed position.

C. Tires with multiple tread cuts, damage due to underinflation or being run flat, separation between belt plies, separated or damaged beads, or ply turn-ups must be rejected. Tires with evidence of moisture in the injured areas must be thoroughly dried.

D. No section repairs may be made in the bead areas where casing penetration or steel cord damage has occurred. Refer to recommended non-repairable dimensions for the appropriate tire bead area (see Area "A", Figure 1).

REPAIRABLE AREAS

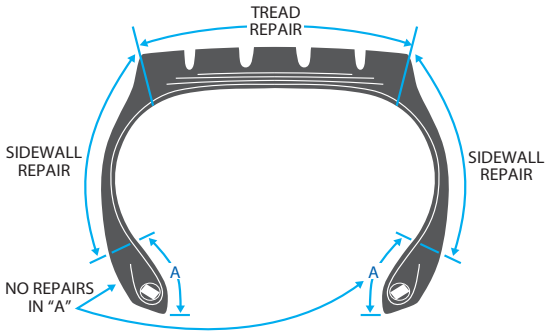


Figure 1

III. PERMISSIBLE REPAIRS

A. The extent of repairable areas, where satisfactory "through-the-tire" repairs may be made, are shown above in Figure 1.

Satisfactory repairs cannot be made in the bead area "A". To determine the non-repairable bead area, measure with a flexible rule and follow the contour inside the tire from the bead toe. (See chart on the following page.)

Tire Size	Dimension "A"
7.5 - 16.00	3" (75 mm)
215 - 385	3" (75 mm)

B. Only radial ply repair materials may be used in radial ply tires.

C. The recommended limits for injury repair are as follows:

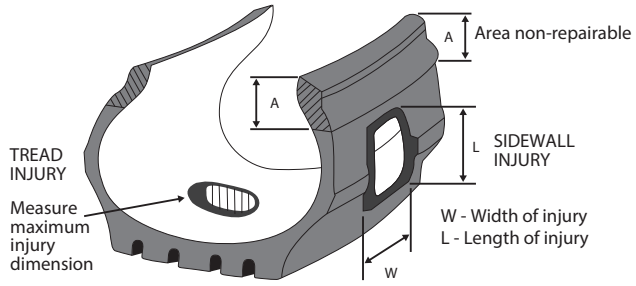
1. Repair of nail hole punctures up to 3/8" (10 mm) in diameter in truck tires can be made in the repairable tread area using an appropriate repair unit and filler material.

2. Repair of nail hole punctures up to 5/16" (8 mm) in diameter can be made in the outside rib of radial medium truck (RMT) tires using the Reinforced Shoulder Repair (RSR) guidelines.

3. Nail holes in the sidewall area must be treated as a full section repair.

4. Section repairs – refer to Section Repair Injury Chart below for section repair limits, and Figure 2 for proper measurement of injury areas.

MEASUREMENT OF INJURED AREAS



Note: size of injury exaggerated for clarity

Figure 2

SECTION REPAIR INJURY CHART - RADIAL TRUCK TIRES

MAXIMUM SECTION REPAIR LIMITS FOR RADIAL TRUCK TIRES

NOTE: DIMENSIONS SHOWN ARE FOR GENERAL GUIDANCE. REPAIR MATERIAL MANUFACTURER'S AND NEW TIRE MANUFACTURER'S RECOMMENDATIONS MAY DIFFER. SPECIFIC LIMITS SHOULD BE BASED ON RECOMMENDATIONS OF THE TIRE MANUFACTURER, REPAIR MATERIAL MANUFACTURER, AND TYPE OF TIRE SERVICE.

TIRE CROSS SECTION SIZE	SIDEWALL MAX. INJURY DIMENSIONS		TREAD MAX. INJURY DIMENSIONS
	WIDTH	LENGTH	
6.50 - 12.50	⅜" (10 mm) ¾" (20 mm) 1" (25 mm)	3 ¼" (80 mm) 2 ½" (65 mm) 2" (50 mm)	1" (25 mm) 1" (25 mm) 1" (25 mm)
215 - 285	⅜" (10 mm) ¾" (20 mm) 1" (25 mm)	3 ¼" (80 mm) 2 ½" (65 mm) 2" (50 mm)	1" (25 mm) 1" (25 mm) 1" (25 mm)
7.50 - 14.00	⅜" (10 mm) ¾" (20 mm) 1 ⅝" (40 mm)	5" (125 mm) 5" (125 mm) 3 ¼" (80 mm)	1 ½" (40 mm) 1 ½" (40 mm) 1 ½" (40 mm)
8 - 16.5	⅜" (10 mm) ¾" (20 mm) 1 ⅝" (40 mm)	5" (125 mm) 5" (125 mm) 3 ¼" (80 mm)	1 ½" (40 mm) 1 ½" (40 mm) 1 ½" (40 mm)
235 - 315/80 225 - 305/75	⅜" (10 mm) ¾" (20 mm) 1 ⅝" (40 mm)	5" (125 mm) 5" (125 mm) 3 ¼" (80 mm)	1 ½" (40 mm) 1 ½" (40 mm) 1 ½" (40 mm)
315 - 445/65	⅜" (10 mm) ¾" (20 mm) 1 ⅝" (40 mm)	5" (125 mm) 5" (125 mm) 3 ¼" (80 mm)	1 ½" (40 mm) 1 ½" (40 mm) 1 ½" (40 mm)

IV. INJURY PREPARATION AND REPAIR UNIT SELECTION

WARNING

Serious bodily injury may result from not wearing adequate **personal protective equipment (PPE)** including eye protection (i.e., goggles or face shields), ear protection, respiratory protection, and gloves while repairing tires. Always wear appropriate PPE for your safety.

A. Injury Preparation

1. Tire preparation – Tires must be thoroughly cleaned using a pre-buff cleaner available from a repair material supplier, and dried both inside and outside before proceeding with any repairs. Mark or outline the area around the repair unit for cleaning and buffing. Clean an area slightly larger than the repair unit to remove contaminating lubricants from the inner liner surface. Note: Some cleaners, such as those containing carbontetra-chloride, are subject to OSHA regulations.

2. Injury inspection – Probe the injury to remove any foreign materials and determine the extent of the injury. While probing, be careful not to damage any of the steel cords.

3. Preparation of skive – Using a tapered knife in the tread area, skive the damaged rubber to approximately a 45° angle (see Figure 3).

PREPARATION: TREAD AREA

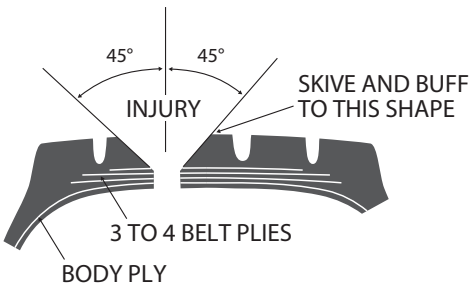


Figure 3

In the sidewall area, skive the rubber to approximately a 60° angle following the shape of the injury (see Figure 4).

PREPARATION: SIDEWALL AREA

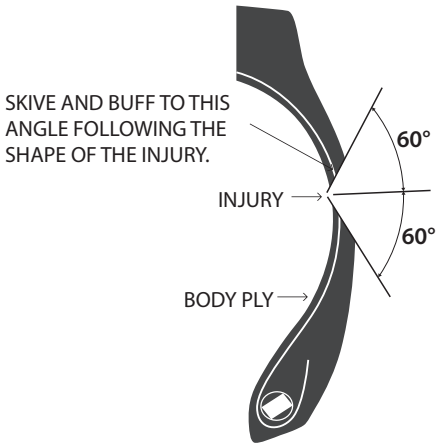


Figure 4

Skiving allows for less buffing of the rubber, therefore lessening the chance of rubber scorch. Use a low-speed (i.e., 5,000 rpm maximum) air tool, and buff the skived area to a TRMG BT2 or BT3 buffed texture (see RP 01/02-23 "BTS6 - Standard Buffing Textures for Tire Retreading and Repairing") using a medium grit rasp.

4. Wire preparation – Using a high-speed (i.e., 20,000 rpm minimum) air tool and an appropriate high-speed stone or burr, remove any damaged steel cord.

NOTE:
Steel cord should not turn blue, but should be polished when grinding is finished, and should be ground flush with the opening of the injury. Be careful not to apply too much pressure, as the tool will scorch or burn the rubber. Using a wire brush and a low-speed (i.e., 5,000 rpm maximum) air tool, remove any burnt rubber.

5. Inspecting the skive – Probe to make sure all damage and rust have been removed from the injury.

6. Cement all exposed steel cords with black vulcanizing cement.

B. Repair Unit Selection

1. Measure sidewall injuries across the width and length of the removed steel cord. Measure tread injuries across the maximum injury dimension of the removed steel cord (see Figure 2). This will be the "injury" size for repair unit selection. Refer to repair material manufacturer's recommendations for the appropriate repair unit to be used. Sizing templates may be available from the repair supplier.

2. There are two methods followed for repair unit selection and placement for section repairing of radial ply tires. One method requires one anchor point in the crown area and another anchor point out of the flex zone, near the bead area of the tire (see Figures 5 and 6).

REPAIR PLACEMENT
NON-FLEX TO NON-FLEX

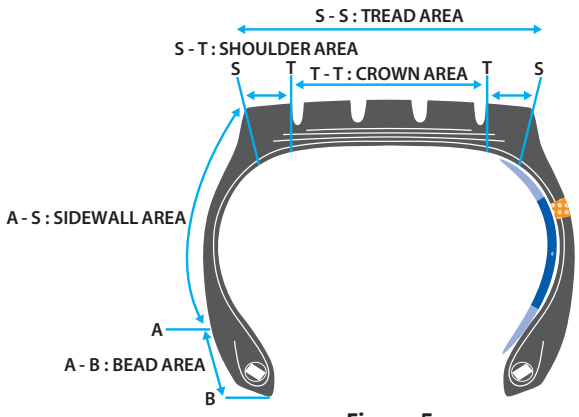
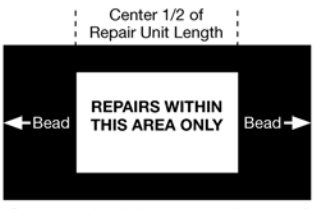


Figure 5

Radial Tire Crown Repair Unit
(NOT CENTERED over injury)



Center repair unit in tire crown. No part of the injury should extend beyond center 1/2 of repair unit length. If it does, use a sidewall type repair unit.

Figure 6

This procedure may require an up-sizing of the repair unit in an effort to gain additional length, so as to accomplish proper repair placement (i.e., non-flex to non-flex position).

The other method involves using a repair unit designed to be centered-over-injury, but within the belt area of the tire (see Figure 7, S-S area). These are most often crown area repairs (see Figures 6 and 7).

CENTER OVER INJURY
WITHIN NON-FLEX PLACEMENT

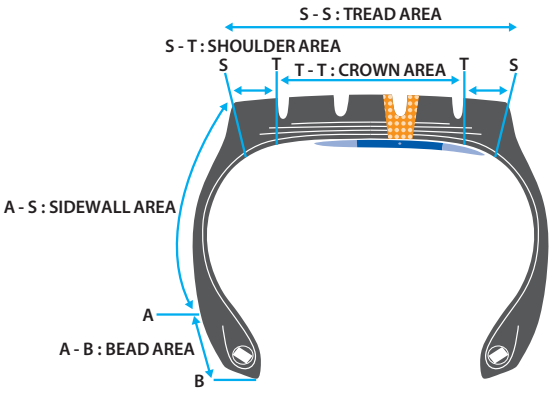


Figure 7

V. REPAIR METHODS

A. Using the Spotter Method and a Chemical Repair Unit

1. Injury preparation – After the injury has been prepared (as outlined in steps IV.A.), buff an area 1" (25 mm) larger than the injury on the inside of the tire using a low-speed (i.e., 5,000 rpm maximum) air tool, and buff to a TRMG BT2 texture. Buff deep enough to remove all the curing bladder lines.

2. Vacuuming – After buffing, use a vacuum to remove all the buffing dust from the inside and outside of the tire.

NOTE:
Do not use an air hose to blow dust from the buffed area because air lines may contain contaminates such as oil, moisture, and lubricants which reduce adhesion.

3. Cementing – Apply cement according to repair material manufacturer's procedures. Allow the cement to dry thoroughly. For chemical-type repairs, be sure to use a compatible cement.

4. Filling the skive – Apply a piece of cushion gum large enough to cover the buffed and cemented area on the innerliner of the tire. Stitch into place and remove protective polyfilm from the back of the cushion gum.

   Using repair gum or an extruder gun, fill the injury slightly higher than the surrounding surfaces of the inside and outside of the tire.

NOTE:
In the tread area it may be necessary to block the tread design to keep the uncured rubber from flowing into the design and causing improper cure due to loss of pressure.

5. Curing – Cure the plug using a spotter, following equipment manufacturer's directions.

6. Cleaning the cured plug – After curing, and when the plug area has cooled, reclean the inside of the tire using a pre-buff cleaner from a repair material supplier.

7. Innerliner buffing – Buff the innerliner to a large enough area to accommodate the chemical repair unit. Using a low-speed (i.e., 5,000 rpm maximum) air tool, buff the innerliner to a finely textured surface (i.e., TRMG BT1). Make sure all of the innerliner design in the repair area is removed.

8. Vacuuming – After buffing, use a vacuum to remove all the buffing dust from the inside of the tire.

NOTE:
Do not use an air hose to blow dust from the buffed area because air lines may contain contaminates such as oil, moisture, and lubricants which reduce adhesion.

9. Cementing – Remove the protective polyfilm from the bottom of the chemical repair unit. Using chemical vulcanizing cement, cement the entire buffed area of the tire and the bottom of the chemical repair unit, if required. Apply cement according to repair manufacturer's procedures. Allow the cement to dry thoroughly. For chemical-type repairs, be sure to use a compatible chemical cement with the repair materials.

10. Repair unit installation – With the beads relaxed to the normal rim width, place the repair unit, oriented properly to the beads and without bridging, over the cemented and buffed area of the tire. Stitch from the center of the repair unit out, being careful not to trap any air. After stitching, remove the protective polyfilm from the top side of the repair unit.

11. Buffing the cured plug – Using a low-speed (i.e., 5,000 rpm maximum) air tool and a fine grit rasp, remove any excess rubber on the outside of the plug.

NOTE:
In some cases the tread area plug may require the use of a grooving tool to restore tread design.

12. For finishing, refer to Section VI.

B. Using a Section Mold Type Repair System

1. Tire preparation – Follow procedures under IV.A.

2. Innerliner buffing – Buff the cleaned innerliner using a low-speed (i.e., 5,000 rpm maximum) air tool and a medium grit stone. Buff the innerliner to a TRMG BT2 buffed texture, making sure all the innerliner design has been removed.

NOTE:
Some tubeless innerliners may require removal for section repairs; consult the tire manufacturer for recommendations.

3. Vacuuming – After buffing, use a vacuum to remove all the buffing dust from the inside and the outside of the tire.

NOTE:
Do not use an air hose to blow dust from the buffed area because air lines may contain contaminates such as oil, moisture, and lubricants which reduce adhesion.

4. Cementing – Apply cement according to repair material manufacturer's procedures. Allow the cement to dry thoroughly. For an uncured repair unit, use black brush-type vulcanizing cement. For a chemical cure repair unit, use a chemical cure cement.

5. Repair unit installation – With the beads relaxed to the normal rim width, place the repair unit, oriented properly to the beads and without bridging, over the cemented and buffed area of the tire. Stitch from the center of the repair unit out, being careful not to trap any air. After stitching, remove the top protective polyfilm from the repair unit.

6. Filling the skive – Using repair gum or an extruder gun, fill the injury slightly higher than the surrounding surface of the outside of the tire.

NOTE:
In the tread area, it may be necessary to block the tread design to keep the uncured rubber from flowing into the design and causing improper cure due to loss of pressure.

7. Curing – Cure the repair in accordance with the section mold manufacturer's and repair material manufacturer's recommendations.

8. Buffing cured plug – After the tire is cured and cooled, inspect for proper cure. Use a low-speed (i.e.,5,000 rpm maximum) air tool and a fine grit rasp to remove any excess rubber on the outside of the plug.

NOTE:
In some cases the tread area may require the use of a grooving tool to restore the tread design.

9. For finishing, refer to Section VI.

C. Section Repair Curing While Retreading

Some types of retread curing systems allow for curing the section repair during the curing cycle. Contact equipment or repair material manufacturer for recommendations. For precured retreading, trim repair gum flush with the buffed surface using a cold, sharp knife.

VI. FINISHING

Inspect the repair for bulges, blows, sunken spots, or evidence of undercure. Finished sidewall section repairs should not bulge more than 3/8" (10 mm) above the surrounding surface of the inflated tire. Reprocess if possible, or reject those found unacceptable.

Remove tread blocking from tread groves and restore original tread design.

Buff off high spots so tire will run smoothly. Balancing the tires is recommended when mounted for service.

Some manufacturers recommend that a tire with chemical cure repair units be mounted and inflated after cure or the tire not be put into service until 24 hours after curing. Consult repair materials manufacturer for recommendations.

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