

# RETREADING RADIAL PLY OFF-THE-ROAD TIRES

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## I. IDENTIFICATION OF RADIAL PLY OTR TIRES

Radial ply off-the-road (OTR) tire sizes are designated with an “R” rather than the hyphen used for bias ply OTR tires (see Figure 1). For example, an 18.00R25 tire is radial ply, while the 18.00-25 is bias ply. Radial ply OTR tires are identified with the word “Radial” on the sidewall. Tires may also show the generic name of the cord material.

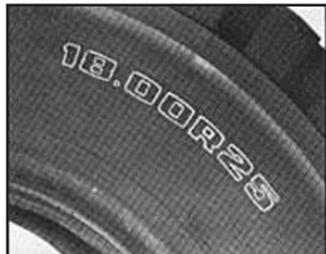


Figure 1

## II. BASIC CONSTRUCTION OF RADIAL PLY OTR TIRES

While one manufacturer’s radial ply OTR tire may differ in individual features from another manufacturer’s tire, certain basic features remain constant (refer to Figure 2). These include:

### A. Body Ply (Plies)

A major difference between the construction of a radial ply OTR tire and a bias ply OTR tire is the direction in which the cord plies are

built into the tire. In a radial ply OTR tire, the cords are placed perpendicularly across the tire from bead to bead. In a bias ply OTR tire, the cords are placed at an angle from bead to bead.

### B. Belt Plies

Radial ply OTR tires have belt plies, which run circumferentially around the tire, under the tread. They constrict the radial ply cords and give rigidity to the tread.

### C. Body Ply and Belt Materials

Radial ply OTR tire body plies and belts generally are steel cord, but can be made of other materials.



Figure 2

## III. RADIAL RETREADING – GENERAL

The construction features of radial ply OTR tires present different challenges when they are being retreaded. Special handling and care is necessary in order to successfully retread these tires. The most significant difference encountered by the retreader in radial ply OTR tire retreading is the limited ability (due to the belts) to decrease or expand the diameter of the tire to fit the normal retreading matrices.

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Two basic methods of curing retreaded radial ply OTR tires are autoclave-type curing and matrix-type curing. In autoclave-type curing, exact diameter fitting is not required. In matrix-type curing, the diameter of the buffed and built-up tire must match the diameter within a fitting tolerance.

In addition, the sidewalls cannot be restricted or the beads spread to increase the outside diameter of the tires to fit a matrix that is too large. The virtually non-expandable belt or band formed by the belts, prevents the tire from expanding to meet a large diameter matrix, resulting in insufficient curing pressure.

Also, radial ply OTR tires cannot be properly cured in matrices that are too small. The belt or band cords prevent the diameter from being reduced. Any matrix too small for the built-up tires will prevent proper curing.



### WARNING

Matrices used for bias ply OTR tires may not be suitable for the same nominal size radial tire for the following reasons:

- differences in the flatness of treads
- different tread widths
- different tread designs
- different aspect ratio
- difference in normal tire growth

## IV. RETREAD PROCESSING OF RADIAL PLY OTR TIRES

### A. Inspection

Carefully inspect tires under adequate lighting (i.e., 200 footcandles (fc) / 2153 lux (lx) minimum, 300 fc / 3229 lx recommended at the work surface). Reject and do not retread tires with the following defects:

1. Ply separation present in the crown, shoulder or bead areas.
2. Damaged beads including excessively bent or broken bead wires or damaged beads which expose the body cords.

3. Badly worn tires with large areas of exposed rusted belt wire which cannot be repaired.
4. Injury to the steel cords beyond repairable limitations.
5. Multiple deep cuts with rusted wires which cannot be repaired.
6. Sidewall cracks which cannot be repaired.
7. Sidewall breaks which cannot be repaired.

Examine all tires thoroughly for minor internal bulges or irregularities. These occasionally occur in newly manufactured tires, but do not impact the service qualities of the tires. It is suggested that any tires with these irregularities be identified in some manner so that after cure and at final inspection it will be recognized as an original condition of the casing and not one induced in the retreading process.



### 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 buffing tires. Always wear appropriate PPE for your safety.

### B. Buffing

Radial ply OTR tires can be buffed on any conventional buffing equipment. Some buffers require special templates and techniques.

Buffing is very important in the actual processing of radial ply OTR tires to attain proper end results, particularly for matrix curing. Like any buffing operation, it has three major objectives:

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1. Size the tire if required, to fit a matrix.

Since the built tire must fall within close circumferential measurements to fit a matrix, sizing starts on the buffer. Tires should be measured before buffing is started and the operating chart consulted to determine the amount of tread to be removed to prepare the tire for the matrix.

All measurements must be circumferential around the tire at the center of the tread for maximum accuracy. The circumference after final buffing should be recorded on the tire tag or marked on the tire for use by the builder.

2. Shape the tire to the proper contour and width for the curing system used.

Crown radius and width should be as specified on the operating charts. These show the proper shape for the buffed tire. Make certain shoulders are the same height on both sides.

In addition, proper buffing will allow those tires which are to be used in a matrix to enter the matrix without interference, but will still provide sufficient contact with the matrix skirt to seal the rubber in the tread area.

3. Prepare the surface for the application of the new rubber to attain proper adhesion.

The best possible adhesion is obtained by bonding new rubber to original rubber. Good adhesion is not obtained when bare cords are exposed. Therefore, every effort should be made to avoid exposing wire or cord during buffing unless belt damage exists.

Buff to a TRMG BT3, BT4, or BT5 texture (see RP 01/02-23 "BTS6 - Standard Buffing Textures for Tire Retreading and Repairing"). This can be controlled and regulated by the buffer through use of the proper rasp, regulation of the speed

of rotation, and pressure of the rasp on the tire. Exposed wire can rust quickly from moisture in the atmosphere. Therefore, any exposed wire should be cleared of frayed or shredded ends, buffed, and cemented at the completion of the buffing operation to prevent oxidation. (See instructions under "Cementing and Repairing".)

Tread cuts should be cleaned out removing as much rubber as needed to ensure that all of the existing injury and rust is removed.

Special high speed (i.e., 20,000+ rpm) abrasive wheels designed for steel cord are required for exposed wire removal. Be sure to remove all frayed wire. Scorched rubber must be removed with a 5,000 rpm or lower speed buffer with wire brush attached.

Inspect the tire during the buffing operation for any possible injuries or defects that might require special attention or make the tire unsuitable for retreading.

Care should be taken to avoid obliterating any identification labeling.

### C. Cementing and Repairing

It is extremely important to cement any exposed wire immediately at completion of the buffing operation. Cement must be allowed to dry thoroughly before proceeding with further processing of the tire.

Fill cavities after cement has dried with repair gum and stitch firmly.

**BE SURE TO ADD CURING TIME FOR FILLED CAVITIES IF REQUIRED.** Mark any additional cure time on the side of the tire before it goes to curing.

Cement the buffed and repaired tire in preparation for the application of tread rubber.

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### D. Tread Rubber Application

#### 1. Matrix Cure - Strip Application:

Build to tread rubber die size specified on the operation chart to correspond with the buffed diameter.

Check the tread rubber for accuracy of gauge. If it is necessary to adjust the gauge of the tread rubber to obtain the desired built-up dimensions, an increase of 2/32" represents about 3/8" increase in the circumference and approximately 1/8" in the diameter of the tire.

#### 2. Autoclave Cure:

Radial ply OTR tires processed in autoclaves do not usually have a restricted diameter tolerance.

Close independent movement section segmented molds until the tire begins to distort. Partially inflate the tire and continue to close the mold very slowly, allowing the tread rubber to warm up and move without distorting the tire. Fully inflate the tire after the mold is closed.

### B. Two-Piece Center Split Matrices

Center the tire on the bottom half of the matrix. Bring the top half into contact with the tire, keeping it parallel to the bottom half. Slowly close the mold allowing the tread rubber to warm up and displace as the mold is being closed.

### C. Autoclave

Radial ply OTR tires can be cured in an autoclave in the same manner as bias ply OTR tires.

## V. LOADING AND CURING

### A. Segmented Matrices (Three-Piece Type)

Back jack the tire uninflated into the back section of the hinged mold. Slowly close the mold until the tire begins to distort. Partially inflate the tire and continue to close the mold very slowly. Fully inflate the tire after the mold is closed.

## VI. FINAL INSPECTION

Inspect all tires for nonfills, porosity, and buckles. Correct the procedures contributing to these conditions.

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