



Examination & Recommend Action

BRIDGESTONE
AIRCRAFT TIRES

TIRE SPECIFICATION &
MAINTENANCE MANUAL

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NORMAL TREAD WEAR

PHENOMENON

Rubber is worn out evenly across the tire tread.

Even tread wear indicates that tire pressure has been maintained at the correct inflation level during service.



RECOMMENDATION

Tire should be removed at the following condition whichever comes first across the tread;

- i) When the wear level reaches the bottom of any groove at one point up to 1/8 of the circumference.
- ii) The reinforcing fabric (bias) or aramid cord protector (radial) is exposed.

If it is necessary to continue the tire in service beyond the limit i), the tire should be removed either at the next maintenance base or the limit ii) happens, whichever occurs first.

Important Notice:

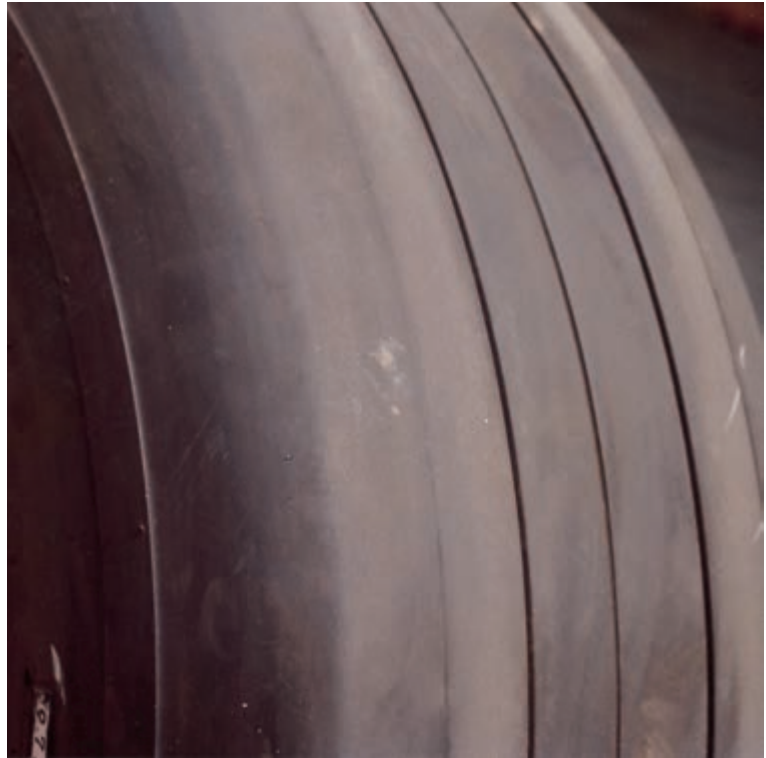
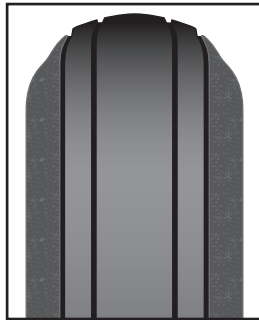
As written in "General" on 1st page of this manual, specific removal criteria shall be defined by instruction of airframe manufacturers, such as AMM.

Such document takes precedence over this manual.

UNEVEN TREAD WEAR (SHOULDER)

PHENOMENON

Rubber wearing is much progressed at “shoulder area” of tread.



POSSIBLE CAUSES

Underinflation will lead to excessive tread shoulder wear. It will also lead to high tire deflection and subsequent heat build-up which may result in tire damage.

RECOMMENDATION

If the tire wear limit has been or soon will be reached, remove the tire.

If the wear limit has not been reached, check the pressure and adjust it to the recommended value.

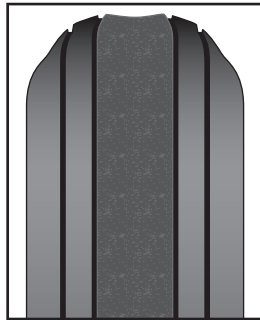
If shoulder wear is more pronounced on one side, this type of wear could result from axle flexing.

Tire can be kept in service until normal wear removal criteria is reached.

UNEVEN TREAD WEAR (CENTER)

PHENOMENON

Rubber wearing is much progressed at “center area” of tread.



POSSIBLE CAUSES

Overinflation accelerates center tread wear, reduces tire traction and makes the tread more susceptible to cutting by foreign objects.

RECOMMENDATION

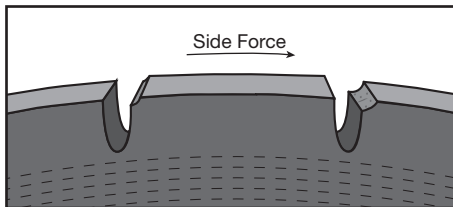
If the tire wear limit has been reached or soon will be reached, remove the tire.

If the wear limit has not been reached, check tire pressure and adjust in accordance with maintenance manual standards.

IRREGULAR WEAR: ABRASION

PHENOMENON

Tread surface becomes quite rough, or slightly melted.



POSSIBLE CAUSES

Refers to abrasive wearing of the tread caused by sudden, strong side forces.

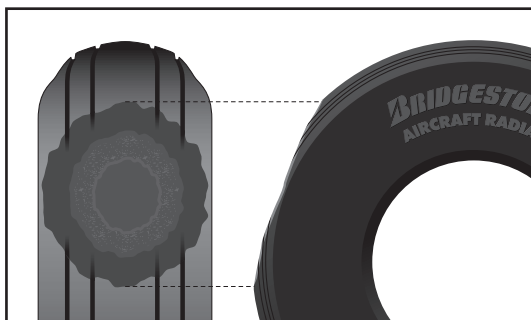
RECOMMENDATION

If the reinforcing fabric (bias) or aramid cord protector (radial) is exposed, remove the tire.

SPOT WEAR

PHENOMENON

Quite deep rubber wearing happens at singular location of tire.



POSSIBLE CAUSES

Skid burns result from brake malfunctions or locking of the wheel, most often during landing.

RECOMMENDATION

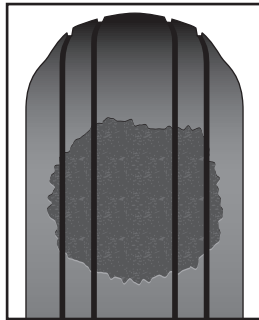
If the spot wear reaches the reinforcing fabric (bias) or aramid cord protector (radial), remove the tire from the aircraft.

If the spot wear does not reach the reinforcing fabric (bias) or aramid cord protector (radial), if there is sufficient groove depth in the whole spot wear area, if there is not incipient separation and if vibration is not detected while rolling, leave the tire on the aircraft.

TREAD RUBBER REVERSION

PHENOMENON

A patch of tread rubber is melted or scorched.



POSSIBLE CAUSES

An oval shaped burn on the tread most often is caused by hydroplaning on wet or frozen runways during landing.

RECOMMENDATION

If the tread rubber reversion reaches the reinforcing fabric (bias) or aramid cord protector (radial), remove the tire from the aircraft.

If the tread rubber reversion does not reach the reinforcing fabric (bias) or aramid cord protector (radial), if there is sufficient groove depth in the whole tread rubber reversion area, if there is not incipient separation and if vibration is not detected while rolling, leave the tire on the aircraft.

TREAD SEPARATION

PHENOMENON

Internal separation happens between tire components at tread area. Part of tread rubber and / or fabrics are lost and internal construction is exposed.



POSSIBLE CAUSES

Separation of the tread or fabric is caused by overloading, cuts, abnormal heat built-up, etc.

RECOMMENDATION

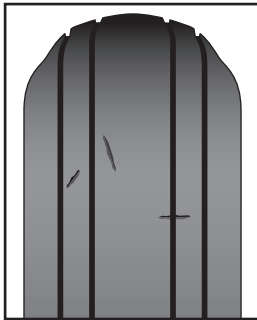
A tire with tread or fabric separation must be removed immediately and be checked by the tire manufacturer. If tread separation is serious, part of most of the tread (often including the reinforcing fabric in bias tires) may peel off, which in turn may lead to damage to the aircraft. Therefore, remove the tire immediately.

Early signs of tread separation can manifest themselves in the form of a tread bulge, local uneven wear (depression) or a local tread/sidewall rubber split. Remove the tire immediately.

If the tire is still inflated after aircraft is at parking position, record the pressure after it has cooled down (allow 3 hours). Then deflate the tire before removing the wheel assembly.



CUTS



POSSIBLE CAUSES

Cuts are most often caused by foreign objects present on runways or taxiways.

RECOMMENDATION

If cuts reach the carcass ply or belt cut limits, the tire must be removed from the aircraft.

If the Cut Depth Limit (CL) has not been reached, but the cut length exceeds the Length Limit (LL), remove the tire from the aircraft.

* Tires with cuts reaching more than 40% of the actual number of plies, or 40% of the belts for radial tires, must be scrapped.

⚠ WARNING

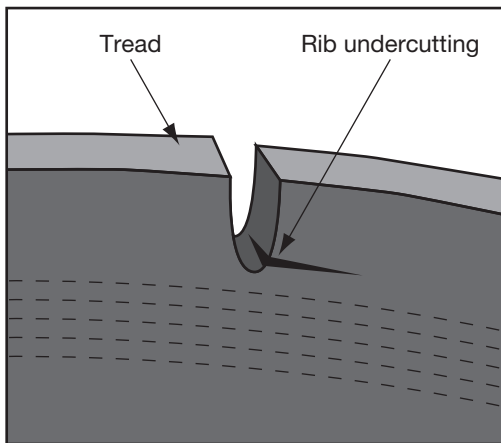
DO NOT PROBE CUTS OR EMBEDDED FOREIGN OBJECTS WHILE TIRE IS INFLATED.

Note: CL designates the depth from the groove bottom to the outer carcass ply (bias) or outer belt (radial). Neither the reinforcing fabric (bias) nor aramid cord protector (radial) shall be confused with the belt or carcass plies. Refer to the CL and LL limits table p86.

RIB UNDERCUTTING

PHENOMENON

Rubber cracks happen at the “wall” of the “tread-rib” in tread grooves. The cracks spread underneath the ribs.



POSSIBLE CAUSES

An extension of groove cracking progressing under a tread rib which can lead to tread chunking, peeled rib or thrown tread.

RECOMMENDATION

The tire shall be removed from aircraft as soon as the crack extends under the rib.

TREAD

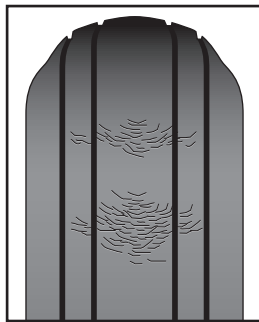
SIDE

BEAD

CHEVRON CUTTING

PHENOMENON

Superficial rubber cuts happen on the tread. The cuts are shaped as “v” and extend across the tread.

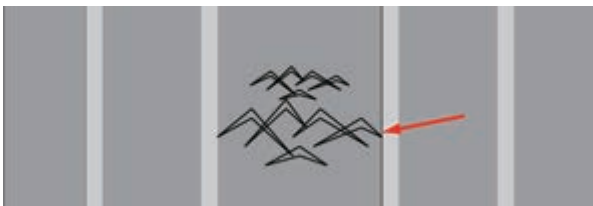


POSSIBLE CAUSES

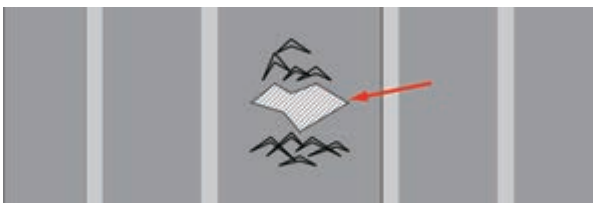
This phenomenon usually occurs on grooved runways at aircraft touches down, the tires are rotated rapidly and damaged by the runway groove edges.

RECOMMENDATION

If the reinforcing fabric (bias) or aramid cord protector (radial) is exposed and damaged, remove the tire from the aircraft.



If the chevron cuts extend across a rib from groove to groove, or locate in tightly linked distance each other, remove such tire from the aircraft. If this kind of chevron cut occurs at the end of wear level, there is concern of tire tread tearing.

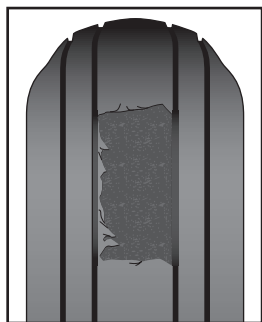


If the cut protector is exposed over 5 cm² due to tread chunking, remove such tire from the aircraft.



If more than one chevron cut reaches to the cut protector, remove such tire from the aircraft.

PEELED RIB



POSSIBLE CAUSES

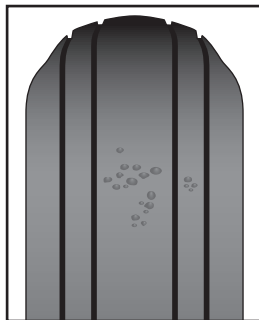
This condition occurs when a tread rib partially or totally peels off in a circumferential direction. Usually beginning with a cut in the tread, it results in a circumferential delamination of a tread rib away from the tire carcass.

RECOMMENDATION

Remove the tire from the aircraft.

In the case of transverse cuts on the tread, remove the tire if the cut is deeper than the tread groove or extends across a rib from groove to groove.

BULGE ON THE CROWN SURFACE (DEFLATED TIRE)



POSSIBLE CAUSES

Severe operating conditions may cause local reinforcing fabric nylon cord to rupture. When such tires are deflated, small bulges (i.e. surface swelling) may appear on the tread surface. This phenomenon is due to the stretching of rubber around the ruptures in the reinforcing fabric and does not pose any problems once the tire is retreaded as the reinforcing fabric is replaced.

However, bulges and blisters appearing while the tire is inflated and in service indicate a separation or damaged tire.

RECOMMENDATION

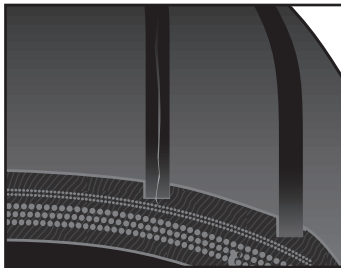
Mark the area and remove the tire immediately.

⚠ WARNING

THE CONTINUOUS TIRE USAGE UNDER BULGE/BLISTER OCCURRENCE ON TIRE SHOULDER/CROWN AREAS LEADS TO SERIOUS QUALITY ISSUE.

STRONGLY RECOMMEND TO REMOVE THE TIRE IMMEDIATELY AFTER THE FINDING OF BULGE/BLISTER ON TIRE SHOULDER/CROWN AREAS.

GROOVE CRACKING



POSSIBLE CAUSES

Groove cracking may result from environmental aggression of the rubber (ozone attack for example) or from an excessive mechanical solicitation, insufficient inflation of the tire. These cracks occur at the bottom of the tread groove pattern.

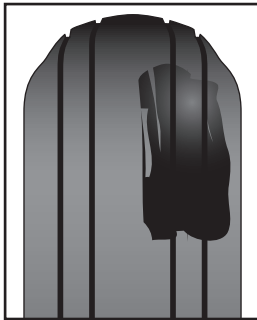
RECOMMENDATION

The tire shall be removed from the aircraft if:

- the groove cracking exposes the reinforcing fabric (bias) or aramid cord protector (radial).
- the groove cracking is under cutting the adjacent rib.

Tires with minor groove cracking may continue in service.

CONTAMINATION



POSSIBLE CAUSES

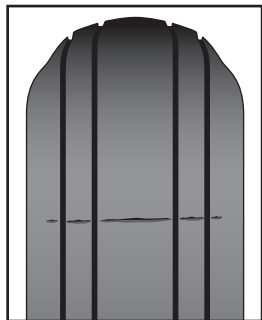
Hydraulic fluid, fuel, tar oil, solvent, chemicals and hydrocarbons deteriorate tire rubber.

RECOMMENDATION

Clean the tire quickly with commercially available denatured alcohol to remove such substances, then wash with soap and water.

If the permanent deformation remains still after inflation pressure or washing procedure, the tire should be removed.

OPEN TREAD-SPLICE



POSSIBLE CAUSES

Denotes a tire defect where the tread joint or splice separates in a radial direction during operation.

RECOMMENDATION

Tires having this defect must be removed from the aircraft.

CHIPPING AND CHUNKING

PHENOMENON

Relatively smaller “gouges” occur on tread surface. Small amount of tread rubber is missing.



POSSIBLE CAUSES

Quite strong Lateral-Force is applied on the tread surface during operation. Typical maneuver result in this phenomenon is: cross-wind landing, high speed cornering, and tight-turning.

RECOMMENDATION

Remove tire when cords are exposed in the spot.

RIB TEARING



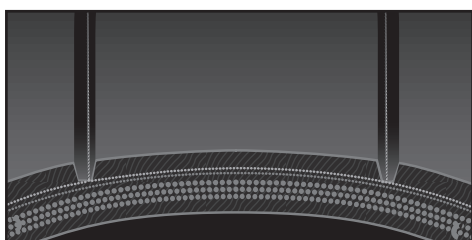
POSSIBLE CAUSES

Rib tearing occurs when a tire is subjected to an extraordinary side force during cross-wind landing, high speed cornering, and sharp-turning.

RECOMMENDATION

If cords are exposed, remove the tire from the aircraft.

CORD EXPOSURE IN TREAD GROOVE



POSSIBLE CAUSES

When rubber gauge in the tread groove is thin, the reinforcing fabric pattern may become visible at the base of the groove. Tires with this condition are airworthy.

RECOMMENDATION

However, should the reinforcing fabric (bias) or aramid cord protector (radial) become exposed or frayed during service as a result of cracking or cuts, the tire must be removed.

IMPACT BREAK



POSSIBLE CAUSES

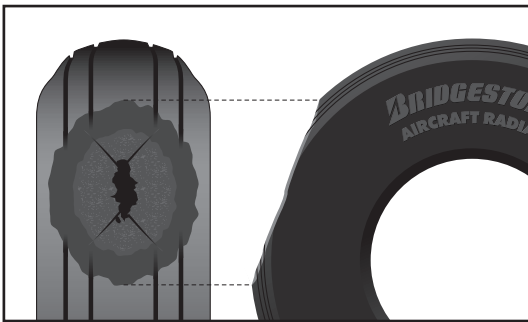
For bias tires, FOD and shock bursts are typically identified by diamond or X-shaped ruptures of the tread and carcass sustained by rolling over foreign objects. The photograph shows a damaged tire restored to its original shape and the cause of the failure being investigated.

RECOMMENDATION

Remove the tire from the aircraft.

Should FOD burst occur, completely collect scattered fragments of the tire to allow for a thorough investigation.

SKID BURST



POSSIBLE CAUSES

Skid bursts result from brake malfunctions or locking of the wheel, most often during landing. Without tire rotation, the rubber and carcass plies are quickly worn through leading to the bursting of the tire.

BULGE/BLISTER



POSSIBLE CAUSES

Bulges and blisters indicate a separation or damaged tire.



RECOMMENDATION

Mark the area and remove the tire immediately from the aircraft.
Small bulge shall be also checked carefully.

⚠ WARNING

THE CONTINUOUS TIRE USAGE UNDER BULGE/BLISTER OCCURRENCE ON TIRE SHOULDER/CROWN AREAS LEADS TO SERIOUS QUALITY ISSUE.
STRONGLY RECOMMEND TO REMOVE THE TIRE IMMEDIATELY AFTER THE FINDING OF BULGE/BLISTER ON TIRE SHOULDER/CROWN AREAS.

SIDEWALL CUTS



POSSIBLE CAUSES

Sidewall cuts are often caused by foreign objects.

RECOMMENDATION

If sidewall cords are exposed or damaged, remove the tire from the aircraft.

SIDEWALL CRACKING
 (Upper side and lower side)
 Circumferential cracks



POSSIBLE CAUSES

Circumferential cracks are caused by load shear and stress combined with low tire inflation pressure. Cracking in the area where the tire touches the rim flange can occur due to the mechanical interaction between the rim flange and the lower sidewall of the tire during deflection.

RECOMMENDATION

If fabric is exposed, remove the tire.

⚠ WARNING

DO NOT PROBE CUT TO MEASURE CUT DEPTH. JUDGE VISUALLY ONLY.

WEATHERING & RADIAL CRACKING



POSSIBLE CAUSES

Weathering and radial cracking occur when tires are exposed to ozone or to direct sunlight (ultraviolet rays) for extended periods of time, and are accelerated by insufficient tire inflation pressure.

RECOMMENDATION

If cords are exposed, remove the tire and scrap.

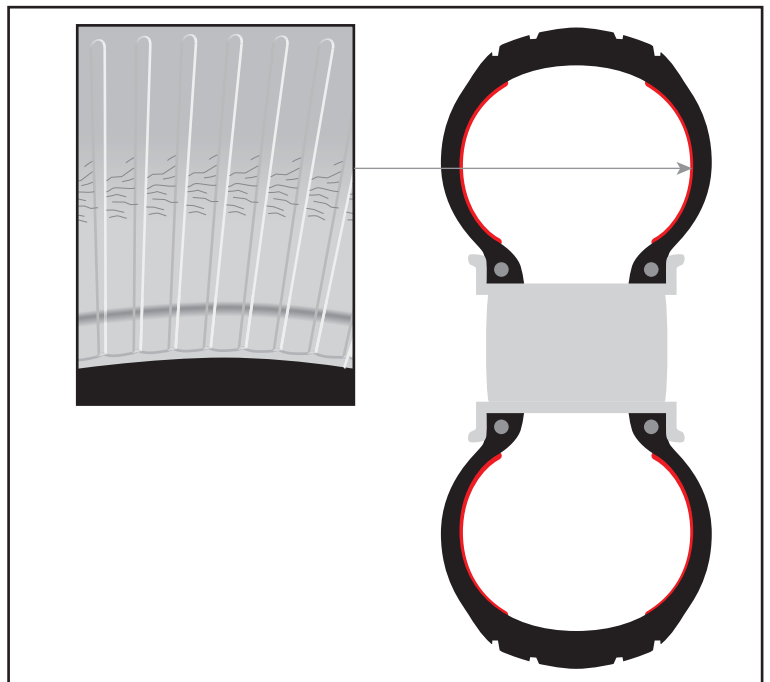
INNERLINER WRINKLING



POSSIBLE CAUSES

Wrinkling of the innerliner typically occurs due to over deflection of the tire. This type of damage can also indicate that the tire has experienced low inflation pressure conditions in service.

* Tires with innerliner wrinkling should be scrapped together with the axle mate tire, since both tires have been subjected to overloading.



⚠ WARNING

IF THE INFLATION PRESSURE LOSS IS MORE THAN 10%, REPLACE THE TIRE.

IF YOU RE-INFLATE AND KEEP USING THE TIRE, THERE IS A RISK OF TIRE BURSTING.

IT IS STRONGLY RECOMMENDED FOR OPERATORS TO INFORM BRIDGESTONE OF ANY TIRE REMOVED FOR LOW PRESSURE USE, IN ORDER FOR US TO TAKE APPROPRIATE ACTIONS.

CASING BREAK UP (CBU)

POSSIBLE CAUSES

This phenomenon is caused by under inflation operation with high deflection during taxi.

Upper sidewall



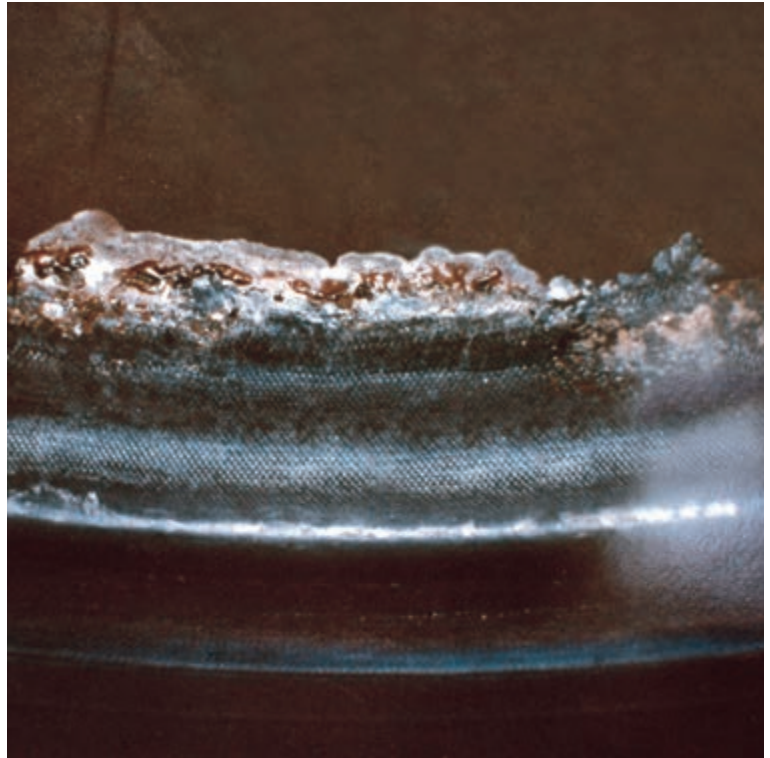
Whole appearance of the above tire

Outside appearance of this inner liner CBU tire.
Casing break up happens inside of tire shoulder area.
***Hard to detect from outside appearance.**

⚠ WARNING
IF THE INFLATION PRESSURE LOSS IS MORE THAN 10%, REPLACE THE TIRE.
IF YOU RE-INFLATE AND KEEP USING THE TIRE. THERE IS A RISK OF CASING BREAK UP.
* HARD TO DETECT FROM OUTSIDE APPEARANCE.

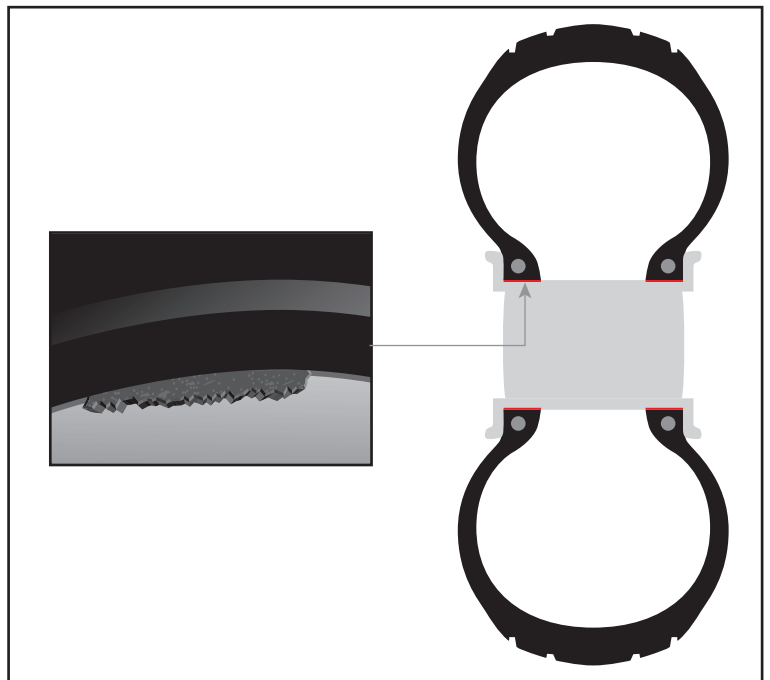


OVERHEATING FROM EXCESSIVE BRAKING



POSSIBLE CAUSES

Excessive braking or maladjusted brakes are liable to create high heat build-up, which may lead to melting of the rubber at the bead seat or toe/heel areas.



RECOMMENDATION

Remove the tire after it cools.

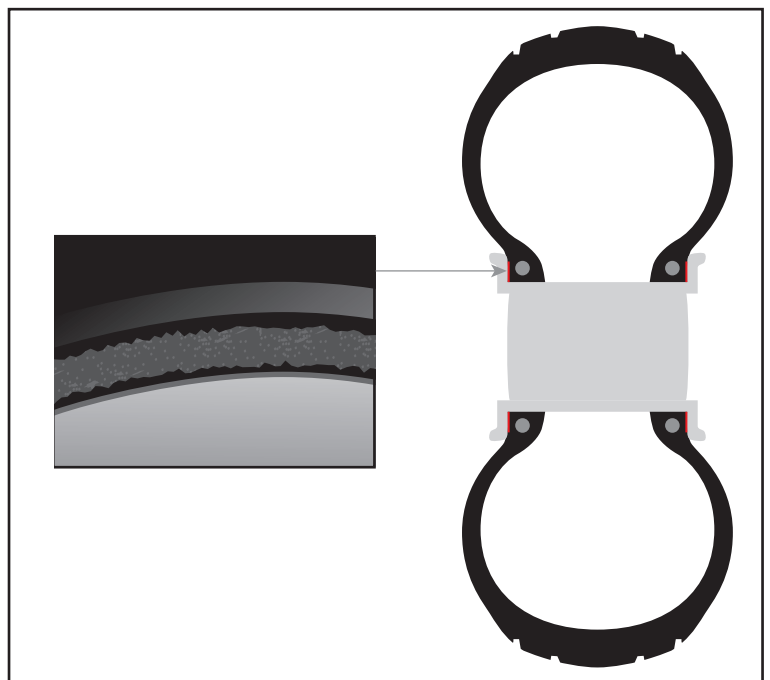
*Tires with signs of cord-melting due to overheating must be scrapped.

CHAFFER DAMAGE

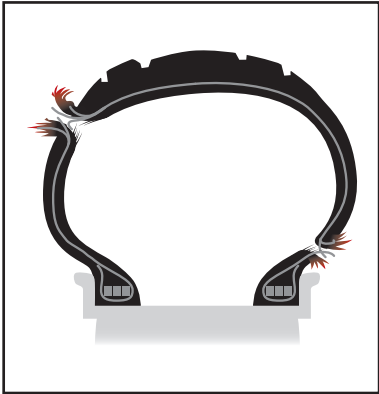


POSSIBLE CAUSES

If the tire is mounted incorrectly on the rim or is mounted using a wrong tool, the tire beads may be damaged. Improper inflation of the tire and oil seepage between the tire bead and wheel rim flange may also cause chaffer damage. The damage shown on the right was caused by slippage between the tire and the rim.



HEAT BURST



POSSIBLE CAUSES

Abnormal heat generation may occur at the bead and shoulder areas. In the worst case, bursting may result.