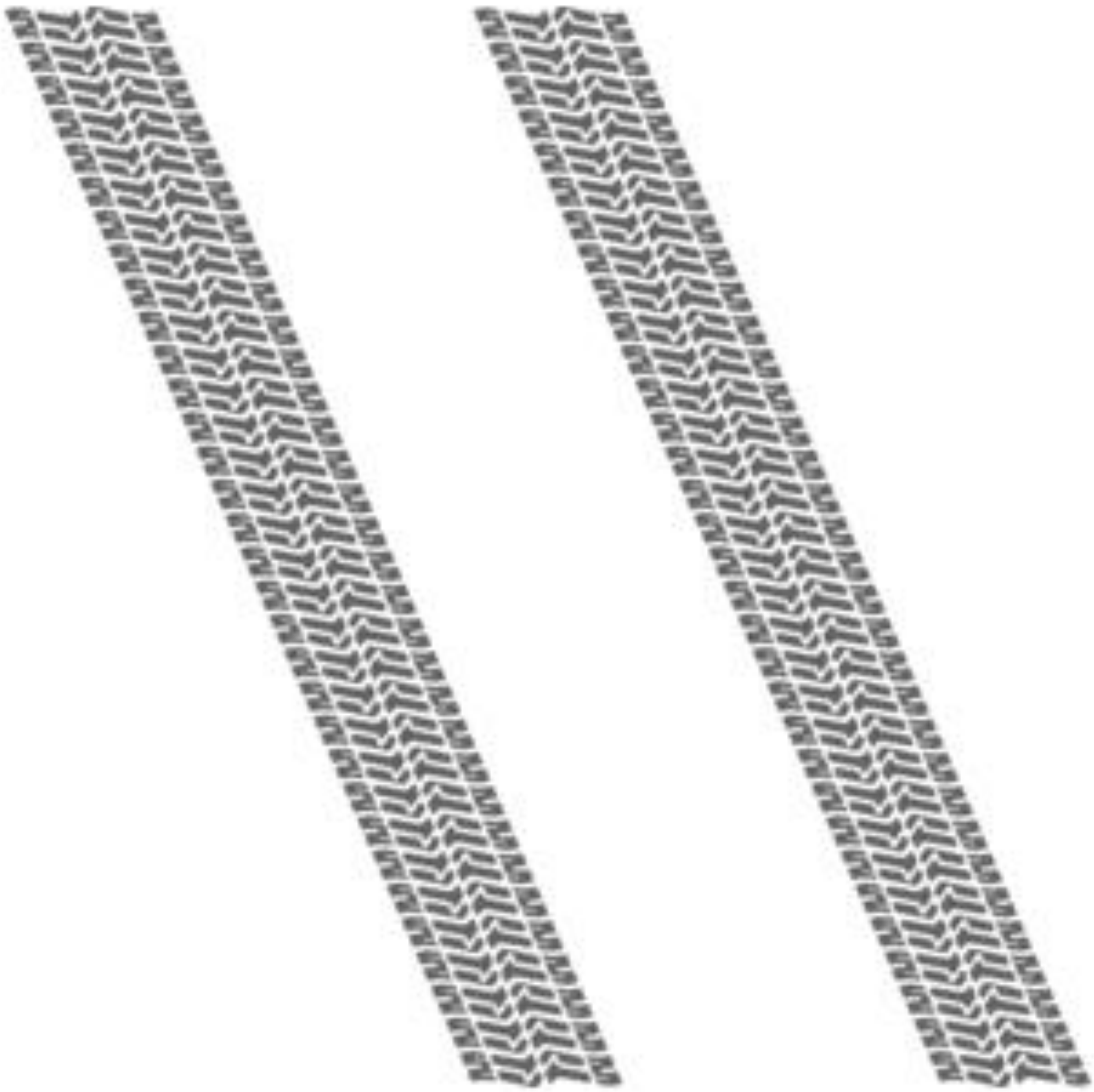
Earthmover Tyre Damage Information Booklet



Produced by LC Tyres

LC Tyres
22 Ballymount Rd
Dublin
01 4050 135

FOREWORD

The Health and Safety Authority encourages and welcomes industry guidance such as this produced by LC Tyres.

Tyre failure either during the operation of mobile equipment or during maintenance activities such as inflation or replacement of tyres has resulted in a number of serious and fatal accidents.

If systems are in place to examine tyres at regular intervals and maintenance is planned and where necessary carried out by competent operatives, using equipment that is suitable then accidents can be prevented.

I am pleased to acknowledge the work of the LC Tyres and particularly Tony Davenport in preparing this guidance. It brings together best practice in the inspection and maintenance of tyres on heavy mobile plant and has the interest of those involved in the operation or maintenance of these vehicles at heart.

It is only by taking ownership of the management of risk that improvements will be made, and I commend the use of this guidance to all concerned.

Pat Griffin

Senior Inspector Agriculture, Mines and Quarries
Health and Safety Authority

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Bead Failure Guide

Bead Blisters

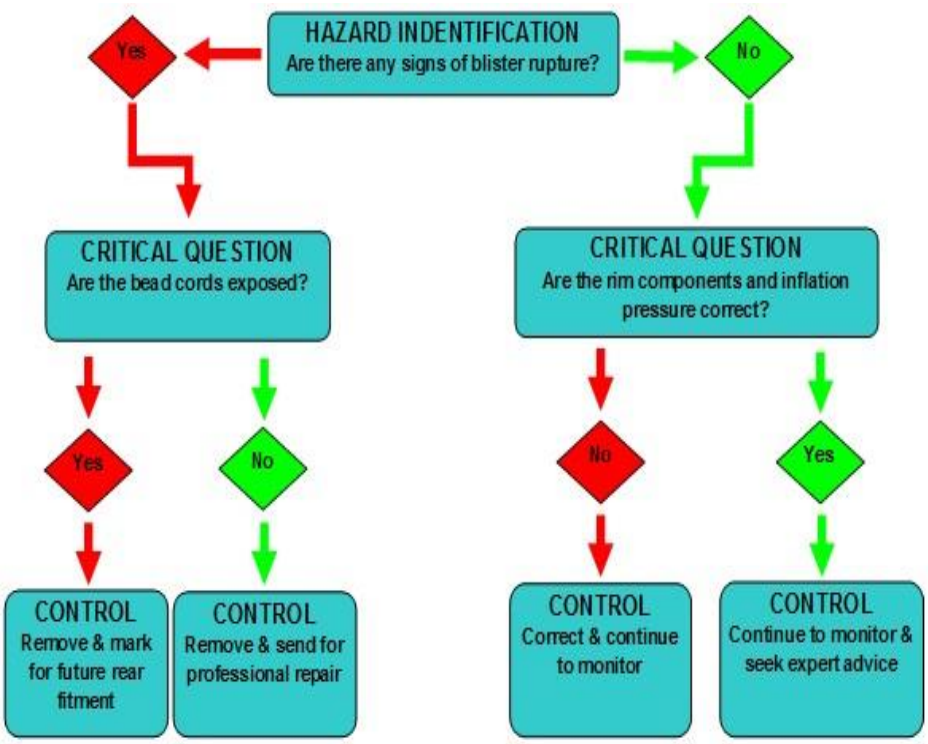
Definition:

Swelling or bulging in the flange contact area caused by friction.

Contributing Factors:

1. Poor underfoot conditions, undulations.
2. Incorrect or defective rim components.
3. Improper inflation or overloading.
4. Excessive torque, cornering or rim spin.

Process Map



Important Notes:

1. **Bead blisters are usually the first warning signs of incorrect/defective rim components; this should be rectified before further damage is incurred.**
2. **Bead damage with exposed cords is irreparable.**

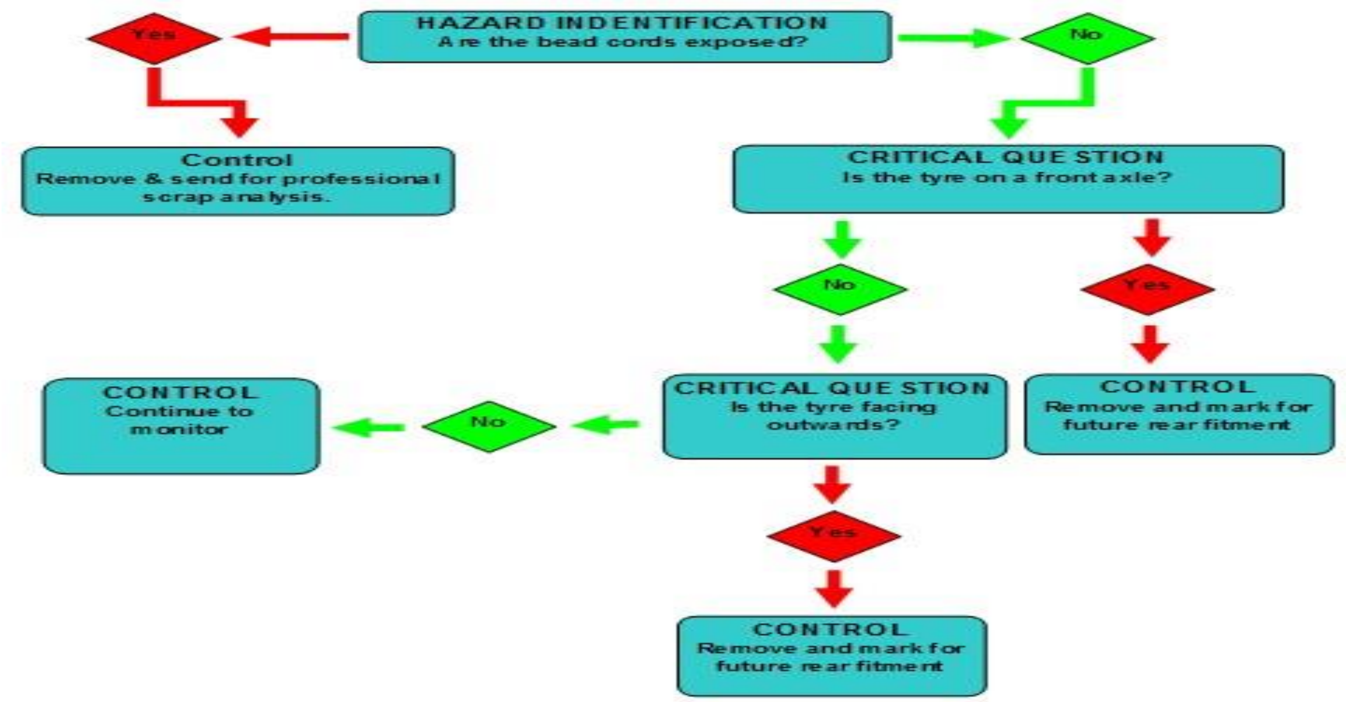
Bead Cuts

Definition:

Cut by a foreign object in the bead area.

Contributing Factors:
1. Defective flange.
2. Poor housekeeping, fitment/handling damage.
3. Foreign object embedded between the bead and flange.
4. Operational conditions.

Process Map



Important Notes:

1. **Cosmetic repair is advisable before the cords are exposed.**

Bead Rocking/Wear

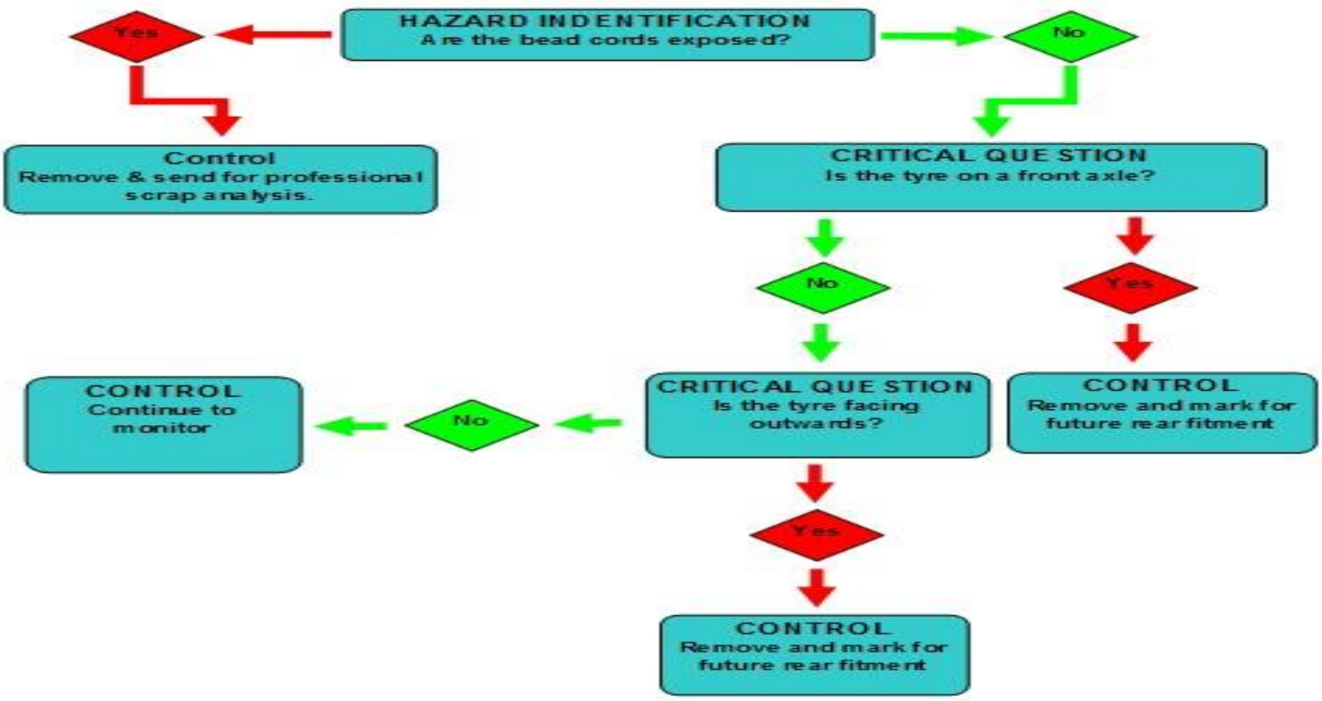
Definition:

Excessive wear on the bead base or bead support area caused by friction.

Contributing Factors:

1. Poor underfoot conditions or undulations.
2. Incorrect or defective rim components.
3. Improper inflation or overloading.
4. Excessive torque, cornering or rim spin.

Process Map



Important Notes:

1. **Rim inspection is critical before a tyre is refitted to the rim.**

Bead Rupture/Bursting

Definition:

Bead wires exposed from separation of the rubber around the bead bundle.

Contributing Factors:
1. Abnormal heat generated from the brake drums.
2. Incorrect or defective rim components.
3. Improper inflation or overloading.
4. Electrical discharge.

Process Map

There is no process other than to scrap the tyre

Control
Remove & send for professional scrap analysis.

Important Notes:

1. **Bead rupture is irreparable.**

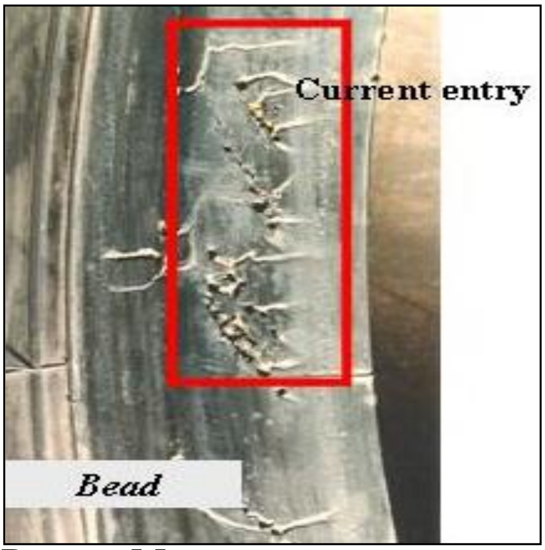
Electrical Contact Damage

Definition:

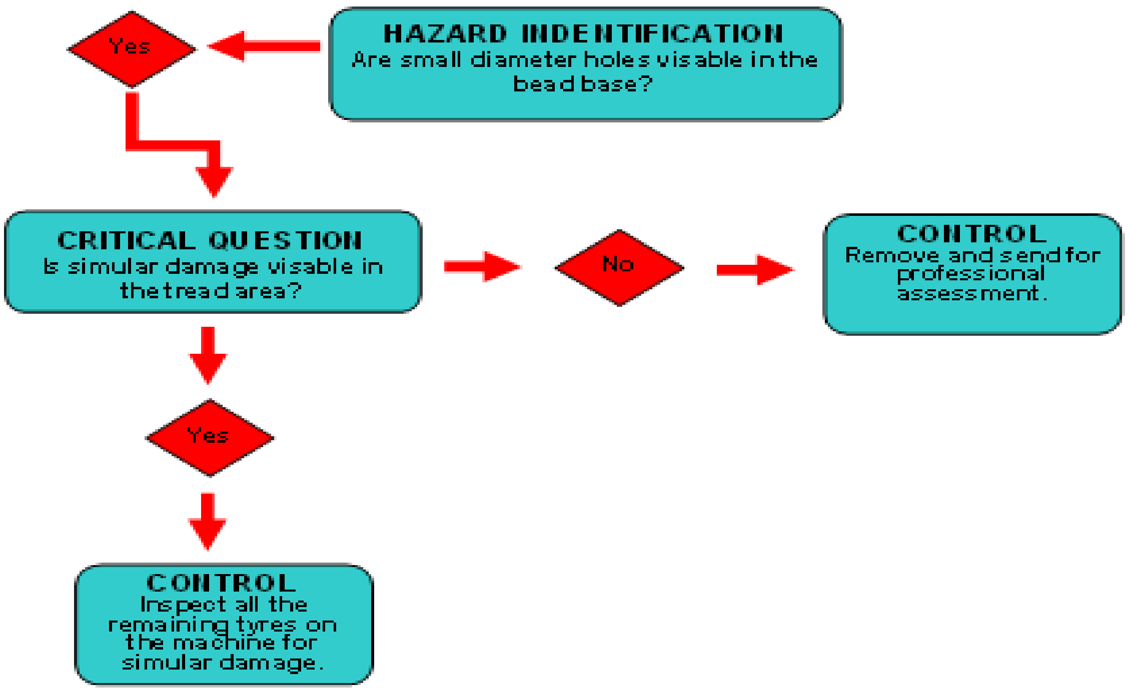
Small diameter holes in the rubber on the base of the bead.

Contributing Factors:

Electrical discharge from lightning, or contact with high tension wires.



Process Map



Important Notes:

1. **Do-not enter the flash area if the machine is still in contact with any power sources.**
2. **Any contact by a machine with an electrical power source, must be reported so an inspection can be carried out to ensure the machine is still safe to use.**

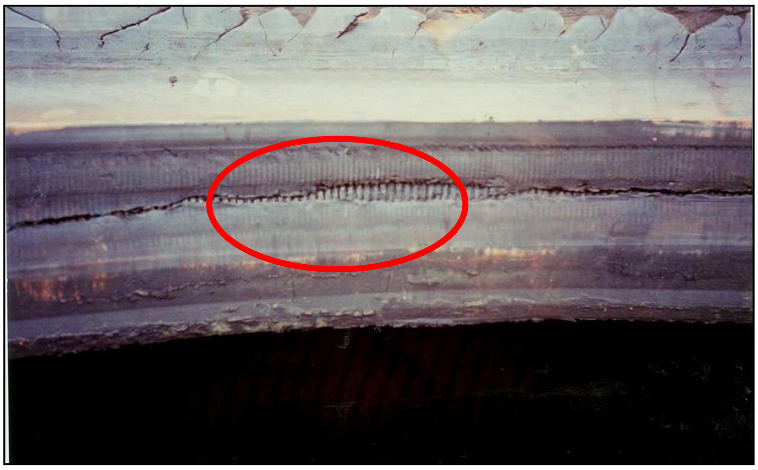
Irregular Bead Contact Area

Definition:

Base of the bead is deformed.

Contributing Factors:

1. Incorrect fitment of centring of the tyre on the rim.
2. Incorrect or defective rim components.
3. Insufficient lubricant when fitting the tyre.
4. Incorrect rim/tyre matching.



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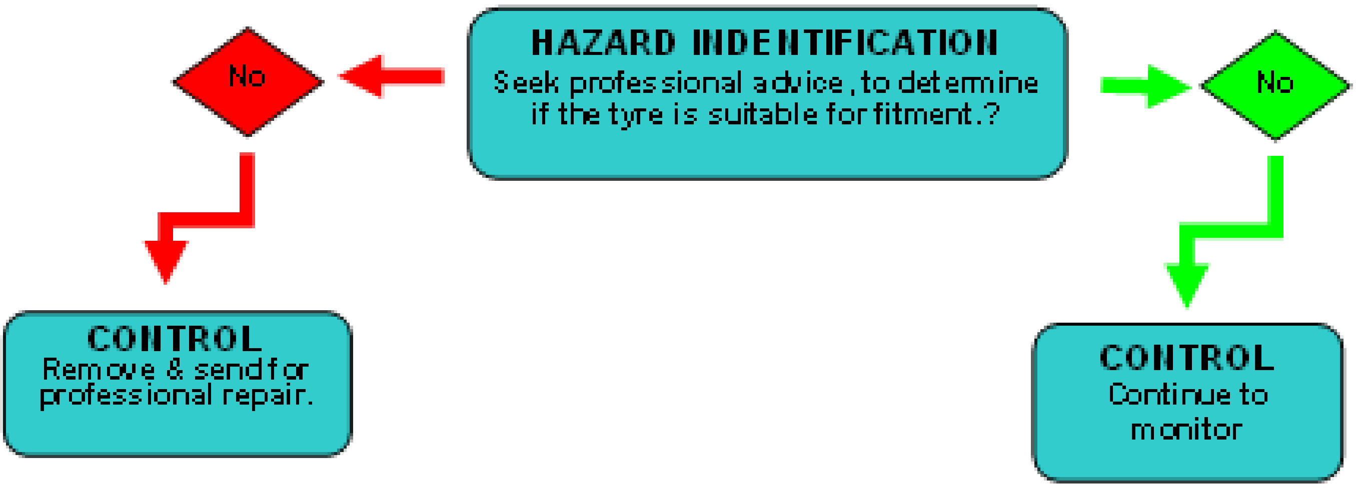


Important Notes:

1. **Decreased bead contact increases the risk of uncontrolled tyre deflation.**

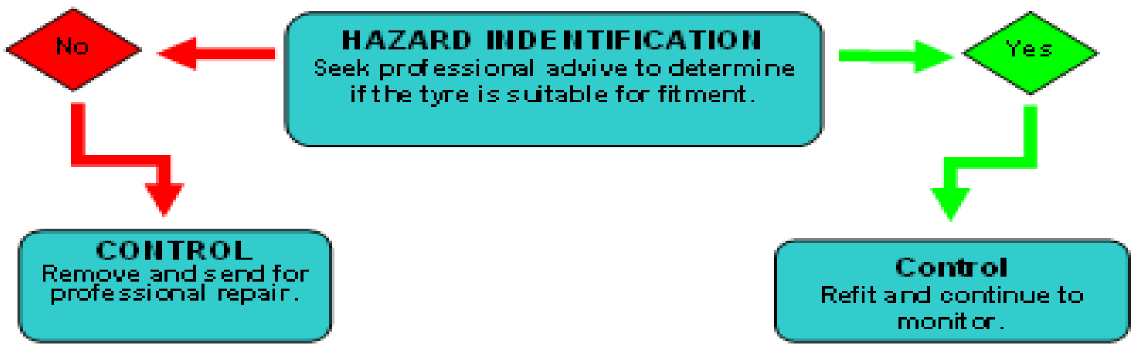
Definition:

Damage or deformation to the bead area, due to incorrect handling.

Contributing Factors:

1. Incorrect or defective handling equipment or methods.
2. Lack of tyre handling skills.
3. Peer pressure.
4. Negligence or abuse.

Process Map



Important Notes:

1. **Follow the correct tyre handling procedures as recommend by the tyre manufacturers.**

Bead Chafer Separation

Definition:

Separation starting from the edge of the chafer, due to fatigue.

Contributing Factors:

1. Improper tyre seating.
2. Incorrect or defective rim components.
3. Improper inflation or overloading.
4. Scuffing from fast cornering.

Process Map

Control
Remove and send for professional scrap analysis.

Important Notes:

1. **Bead separation usually results from bead rocking/wear.**
2. **Bead separation is irreparable.**

Bead Split

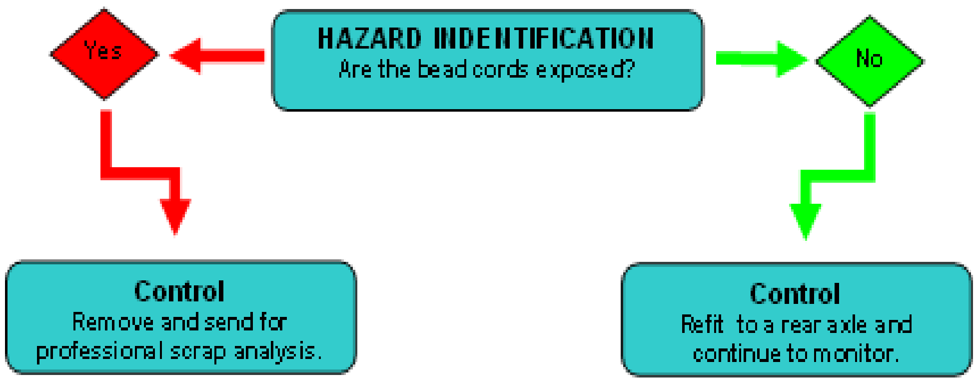
Definition:

Cracks in the centre of the bead.

Contributing Factors:

1. High torque or rim spin.
2. Incorrect or defective rim components/drive lock.
3. Improper inflation or overloading.
4. Incorrect fitment.

Process Map



Important Notes:

1. **Never mix rim components from different manufacturers.**

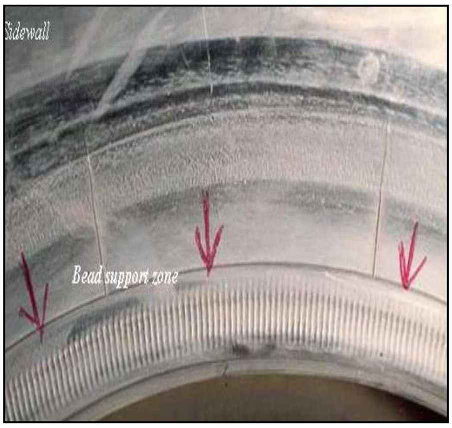
Fitting Damage

Definition:

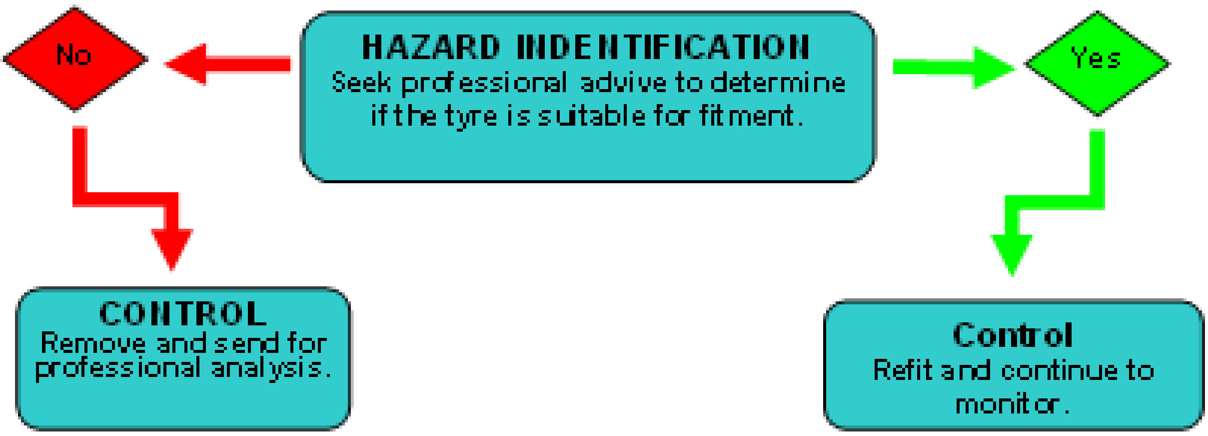
Damage to the bead area during fitment.

Contributing Factors:

1. High torque or rim spin.
2. Incorrect or defective rim components/drive lock.
3. Improper inflation or overloading.
4. Incorrect fitment.



Process Map



Important Notes:

1. **Correct bead lubrication is critical to correct and successful fitment.**
2. **Over lubrication of the bead can result in rim spin and/or O Ring ejection.**

Bead Cracks

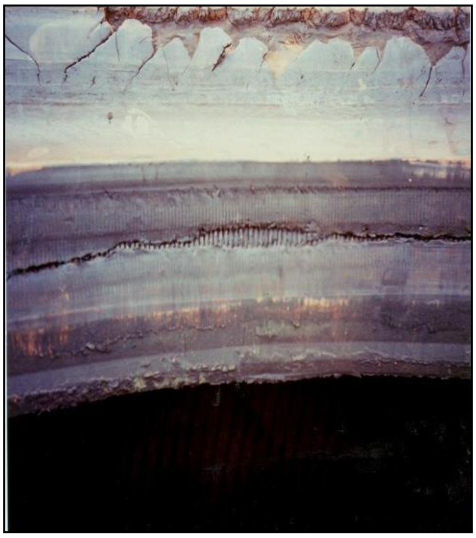
Definition:

Diagonal crack around the bead support area.

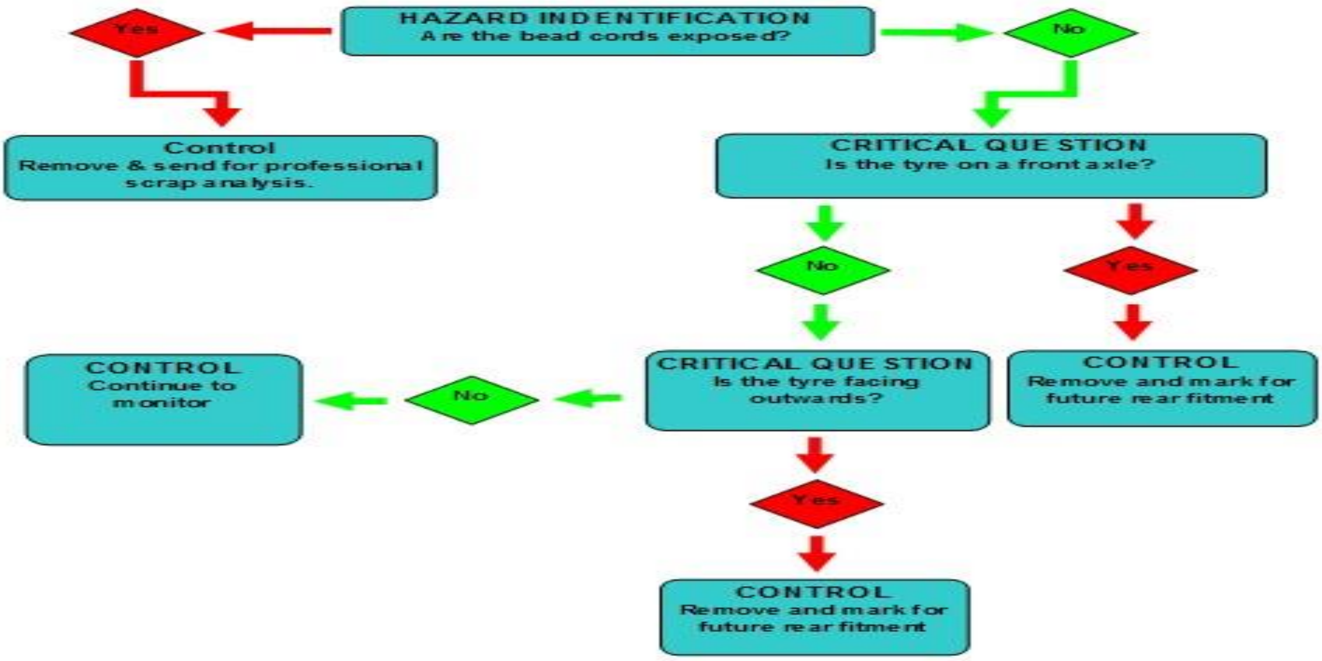
Contributing Factors:

1. Poor underfoot conditions, undulations.
2. Incorrect or defective rim components/drive lock.
3. Improper inflation or overloading.
4. Excessive torque, cornering or rim spin.





Process Map



Important Notes:

1. **Cosmetic repair is advisable before the cords are exposed**

Shoulder Damage Guide

Shoulder Cut

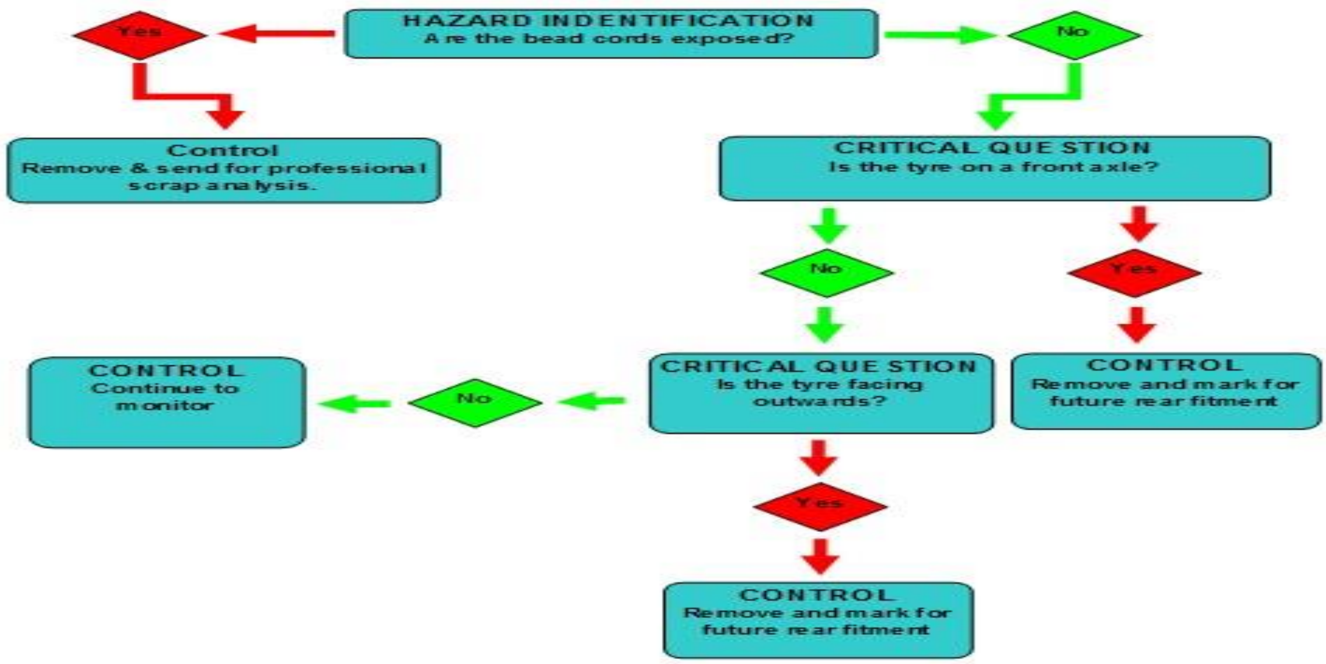
Definition:

A cut in the shoulder area, but not damaging the casing.

Contributing Factors:

1. Spillage and foreign objects.
2. Course material on the berm/windrow.
3. Poor pit conditions.
4. Aggravated by water.

Process Map



Important Notes:

1. **Carry out repairs as soon as possible to prevent the damage from getting worse.**

Shoulder Belt Separation

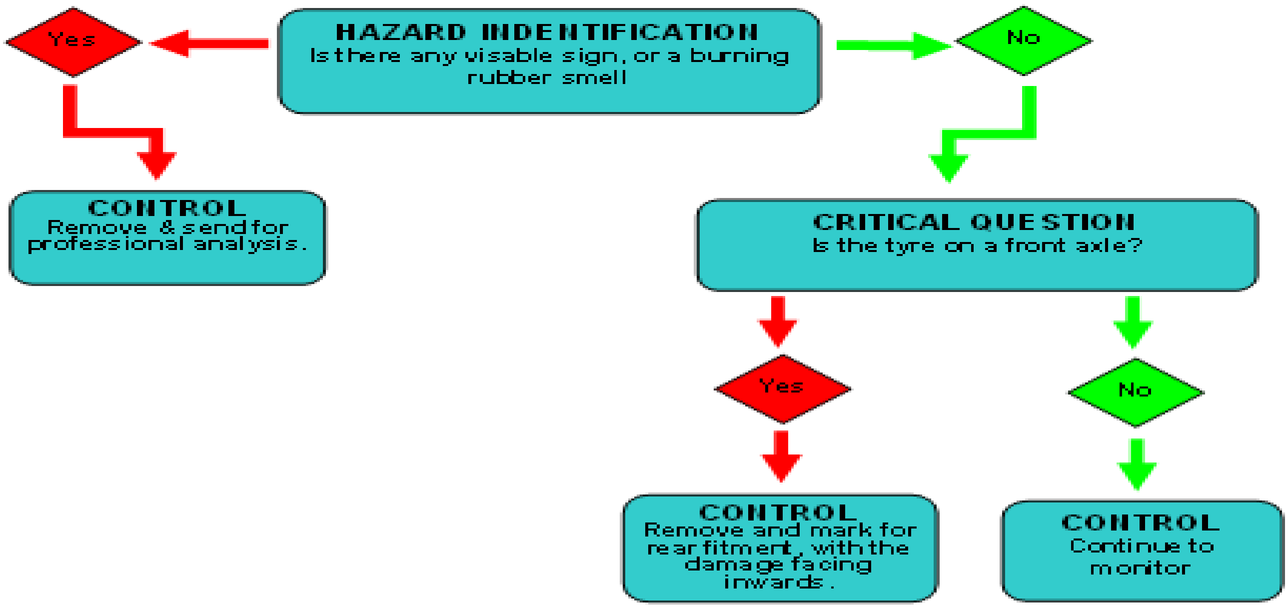
Definition:

Separation of the crown plies from the casing plies in the shoulder area causing cracks of deformation of the shoulder.

Contributing Factors:

1. Heat, excessive cornering, speeding and exceeding the TKPH of the tyre.
2. Improper inflation, overloading or an impact.
3. Poor site conditions.
4. Aggravated by water.

Process Map



Important Notes:

1. **Shoulder belt separation is irreparable.**

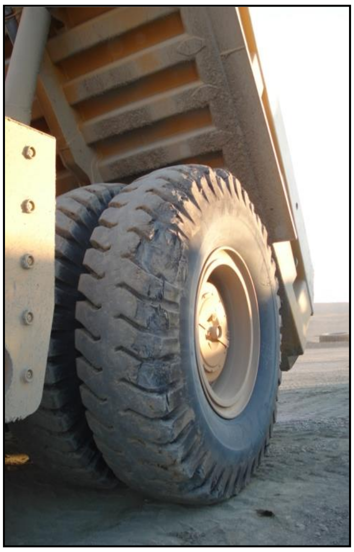
Shoulder Lug Tear

Definition:

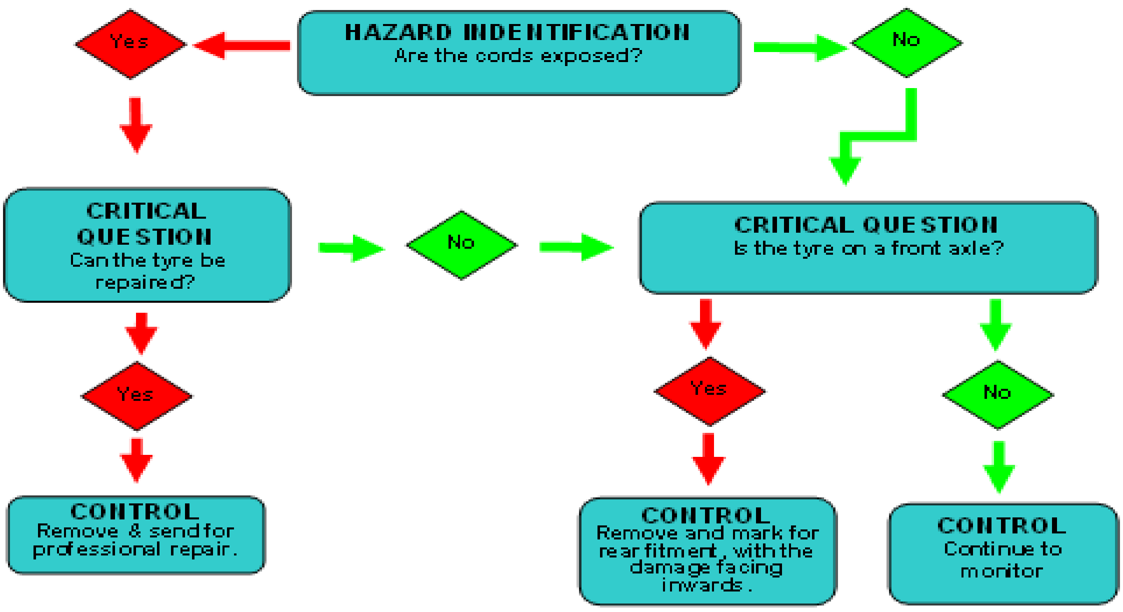
Shoulder lug torn away from the sidewall or tread by an external force.

Contributing Factors:

1. High speeds, hair pins, sharp cornering or wheel spinning.
2. Improper inflation, overloading or abrasive conditions.
3. Driving or reversing onto the tip wall, windrow or berm.



Process Map



Important Notes:

1. **Carry out repairs as soon as possible to prevent the damage from getting worse.**

Uneven Shoulder Wear

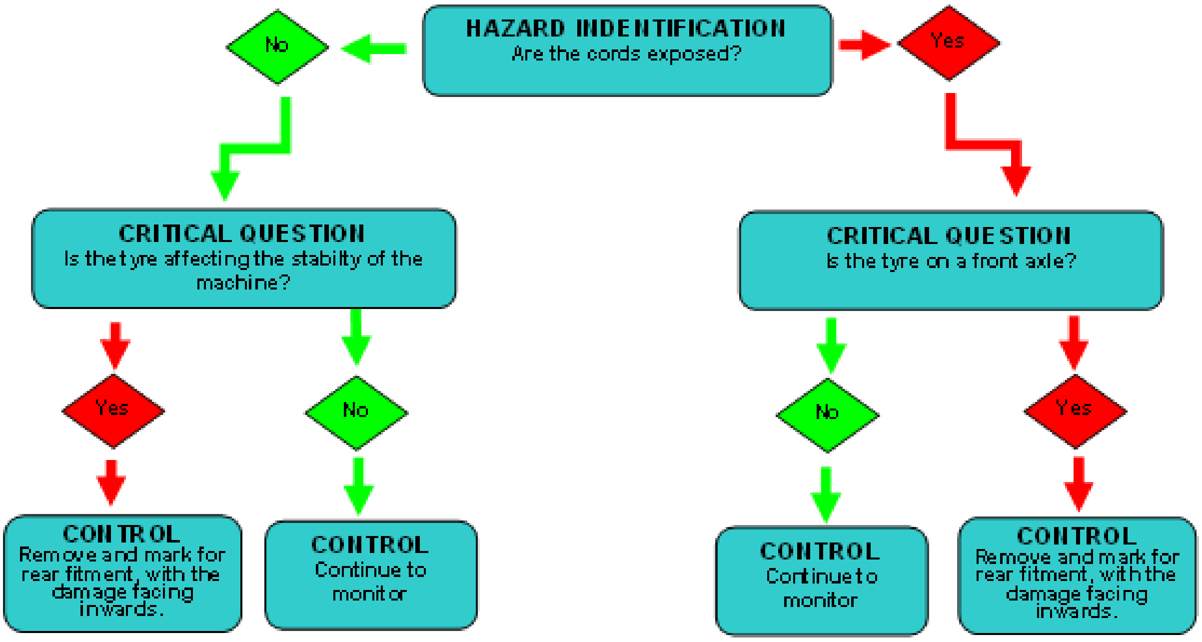
Definition:

Uneven or increasing wear from the shoulder to the tread.

Contributing Factors:

1. High speed cornering, hard braking or rapid acceleration.
2. Improper inflation, overloading or improper tyre matching.
3. Faulty suspension or wheel alignment.

Process Map



Important Notes:

1. **The reason for uneven wear must be investigated and rectified.**

Foreign Object Damage

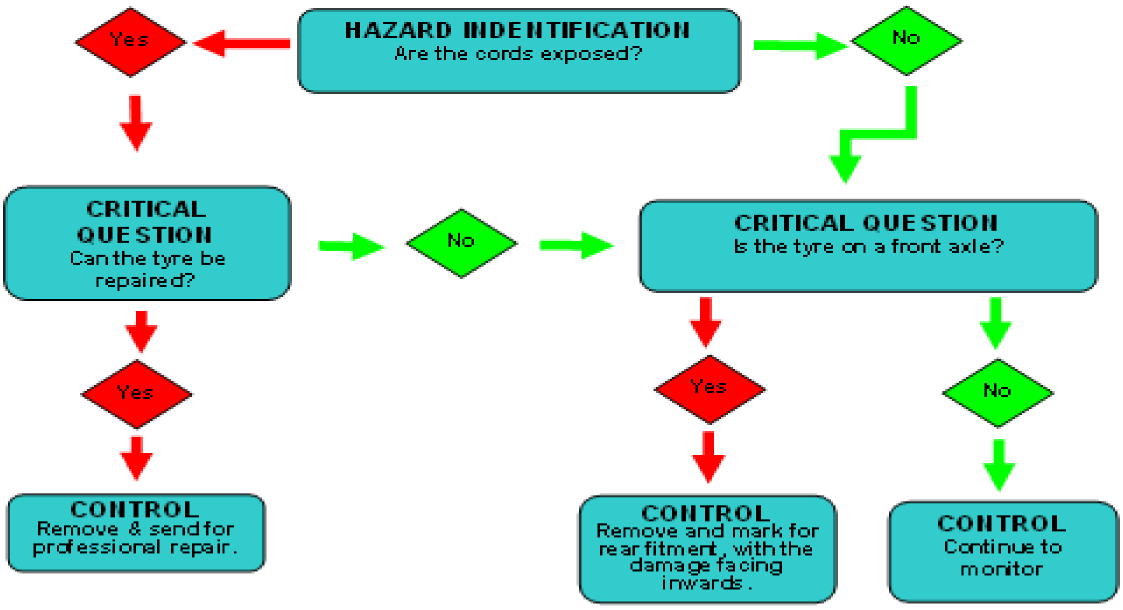
Definition:

Damage to the shoulder area due to external factors.

Contributing Factors:

1. Machine defects, rock ejector damage or Grader blade.
2. Accident damage or vehicle recovery.
3. Foreign object strike between dual fitted tyres.

Process Map



Important Notes:

1. **The reason for the damage needs to be investigated and rectified.**

Shoulder Impact

Definition:

External damage to the shoulder casing causing destructive damage to the protection plies and casing.

Contributing Factors:

1. Poor underfoot conditions, spillage, water, potholes or undulations.
2. Improper inflation.
3. Speed verses road conditions.
4. Driving habits, negligence or overloading.

Process Map

Control
Remove and send for professional scrap analysis.

Important Notes:

1. **Shoulder impact is irreparable.**

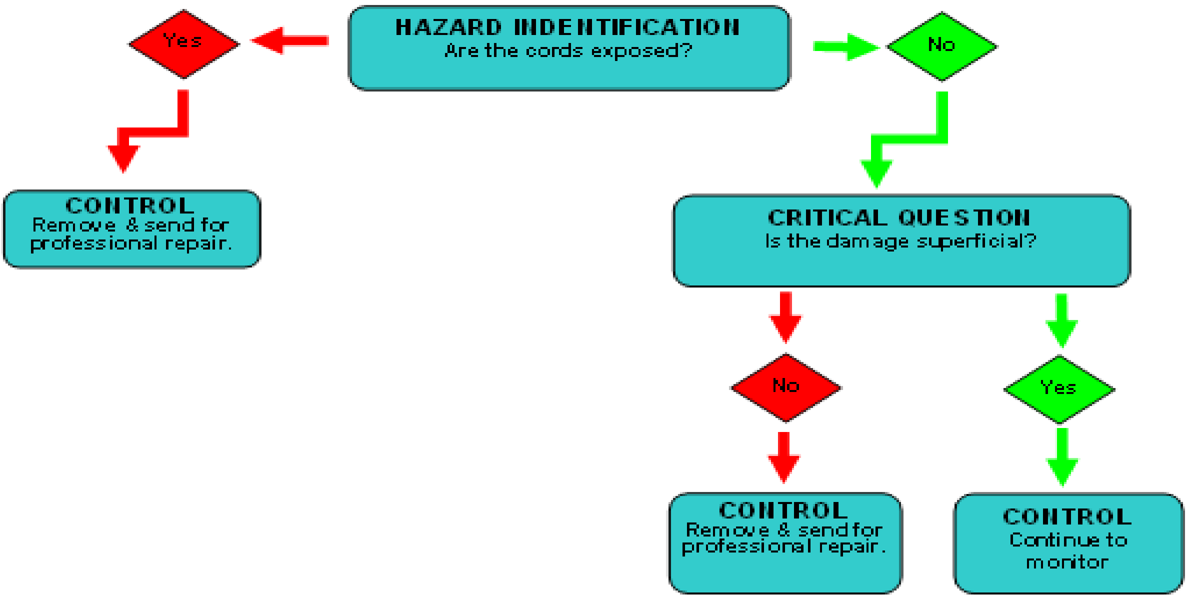
Definition:

Damage to the shoulder area by the external machine structure.

Contributing Factors:

1. Equipment defects or rock ejector damage.
2. Accident damage or vehicle recovery.
3. Movable machine parts, for example, Grader blade, bucket pins etc.

Process Map



Important Notes:

1. **Tyres with damage should be fitted to dual wheel assemblies, with the damage or repair facing inwards.**

Shoulder Penetration

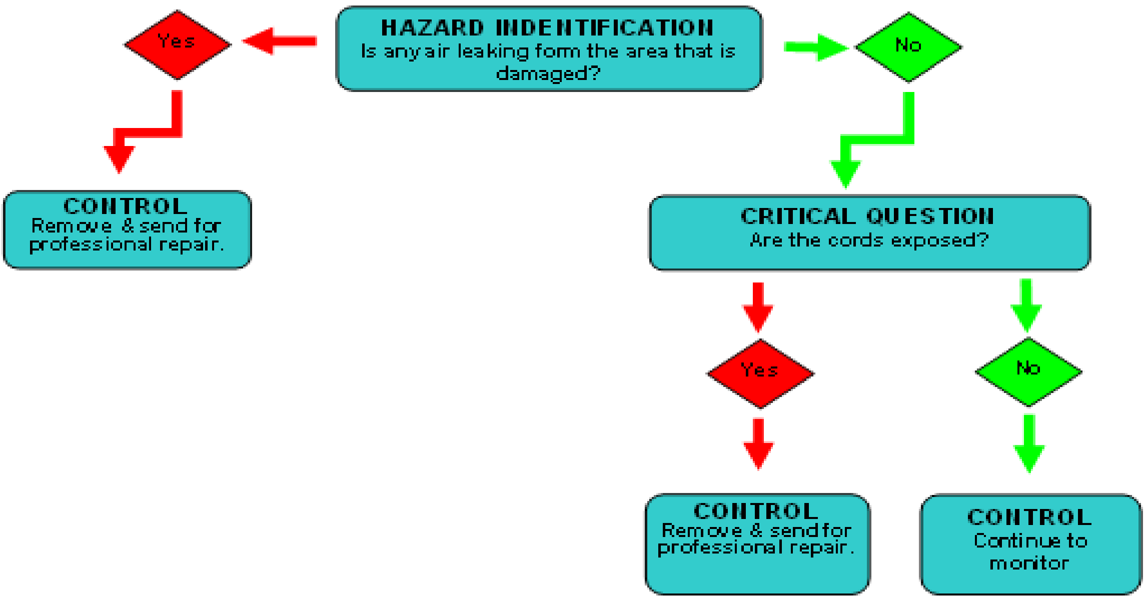
Definition:

Cuts which penetrate through the casing in the shoulder area.

Contributing Factors:

1. Poor housekeeping or road conditions.
2. Driver abuse, negligence or deviation from an authorised route.
3. Foreign objects in the working area.

Process Map



<u>**Important Notes:**</u>

1. **Once the cords are exposed, then a repair should be carried out as soon as possible.**

Sidewall Damage Guide

Sidewall Bubbles

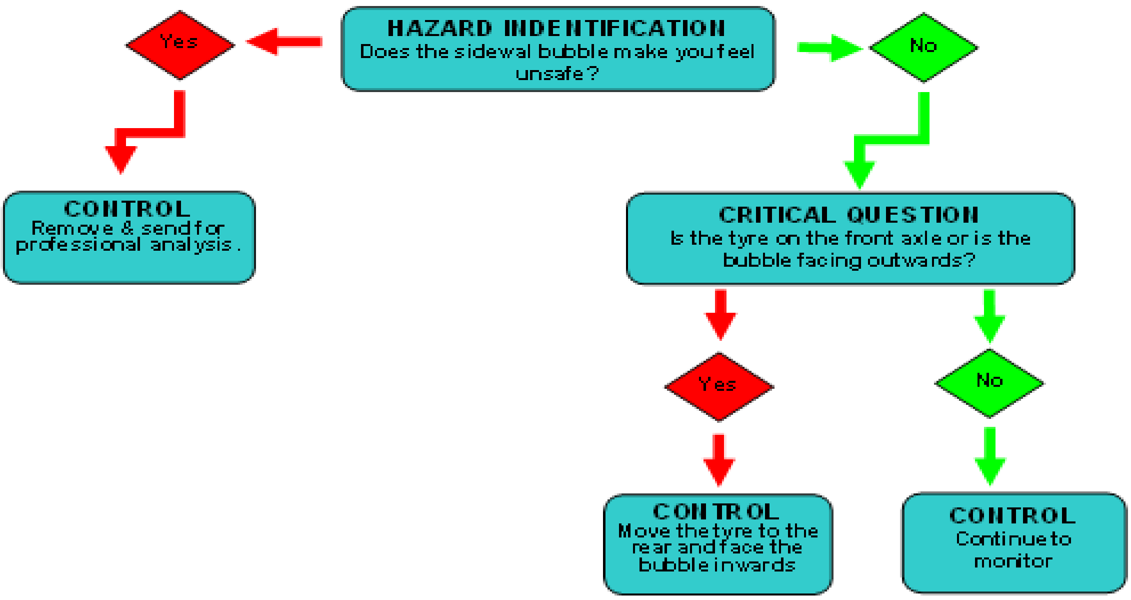
Definition:

Swelling or deformation to the sidewall caused by broken cords in the casing structure or inner liner damage.

Contributing Factors:

1. Improper inflation or loading.
2. Manufacturing defect in the casing construction causing the sidewall cords to be unevenly spaced.
3. Poor underfoot conditions.
4. Excessive sidewall flexing, undulations potholes or high speed cornering.

Process Map



Important Notes:

1. **Cosmetic repair is advisable before the cords are exposed**

Lateral or Radial Cracks

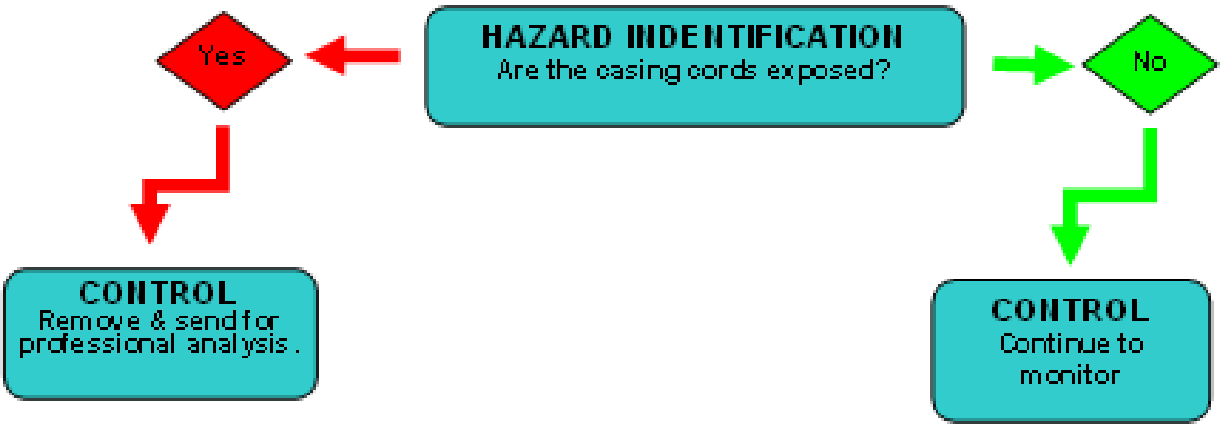
Definition:

Cracking or tearing in the sidewall.

Contributing Factors:

1. Undulations or excessive stress.
2. Under inflation or overloading.

Process Map



Important Notes:

1. **Cosmetic repair is advisable before the cords are exposed.**

Mechanical Damage

Definition:

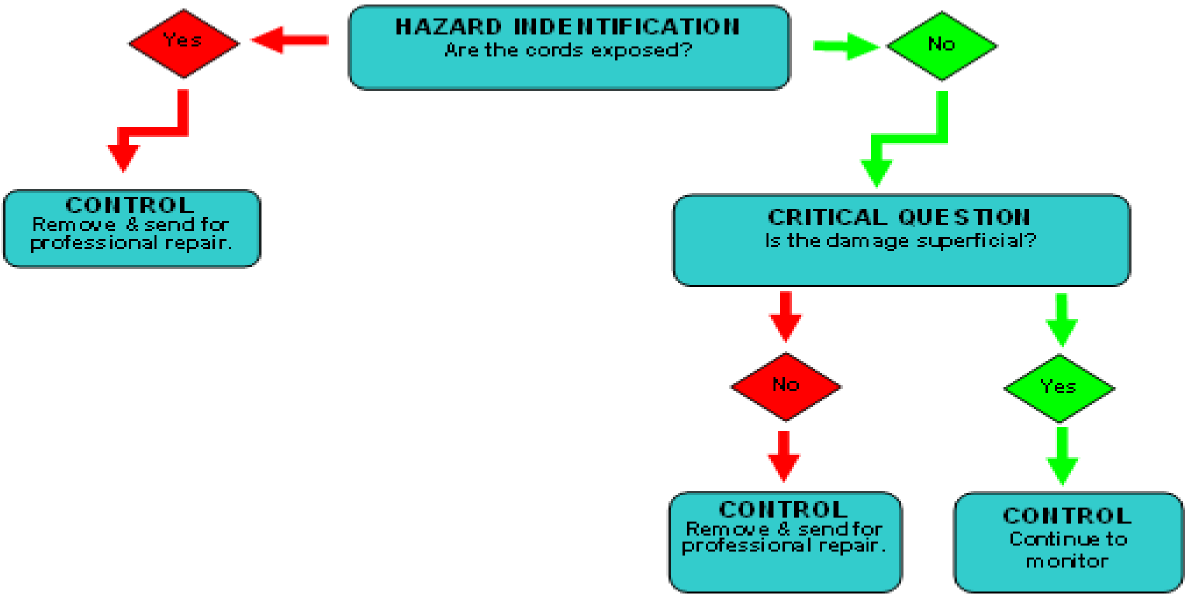
Damage to the shoulder area by the external machine structure.

Contributing Factors:

1. Equipment defects or rock ejector damage.
2. Accident damage or vehicle recovery.
3. Movable machine parts, for example, Grader blade, bucket pins etc.



Process Map



<u>Important Notes:</u>

1. **Tyres with damage should be fitted to dual wheel assemblies, with the damage or repair facing inwards.**

Sidewall Penetration

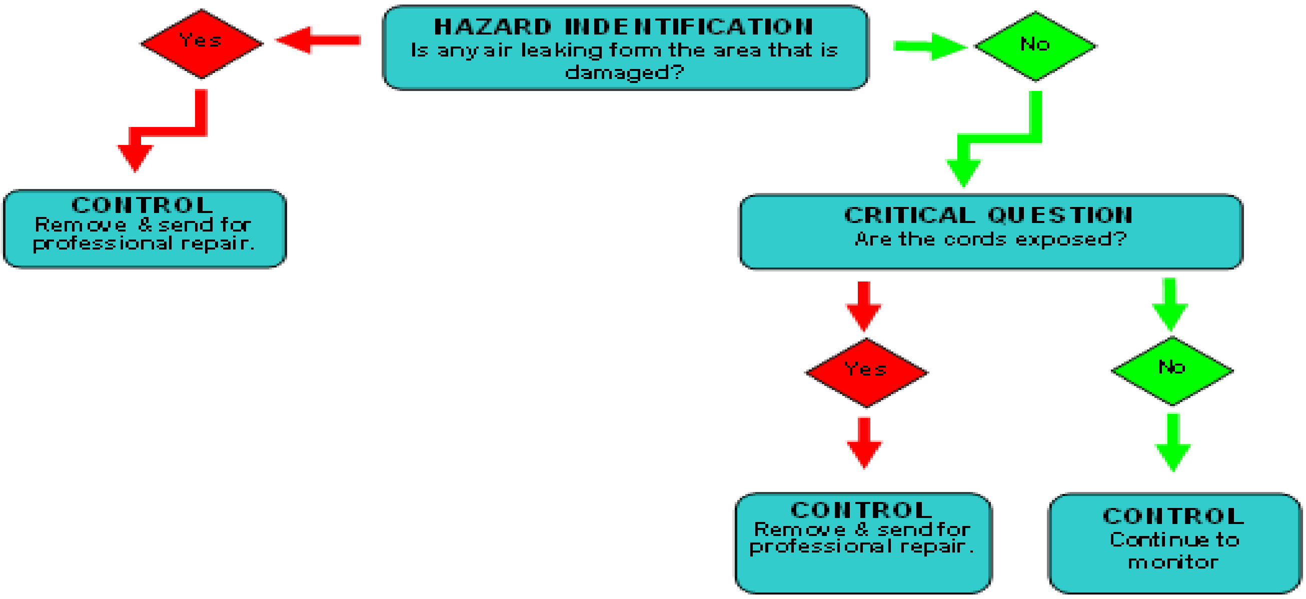
Definition:

Cuts in the sidewall that reach or go through the inner liner.

Contributing Factors:

1. Sharp objects in the work area or spillage.
2. Rocks caught between dual fitted tyres.
3. Operator negligence.
4. Excessive flexing of the sidewall due to overloading.
5. Poor underfoot conditions.
6. Aggravated by water.

Process Map



Important Notes:

1. **Once the cords are exposed, a repair should be carried out as soon as possible.**

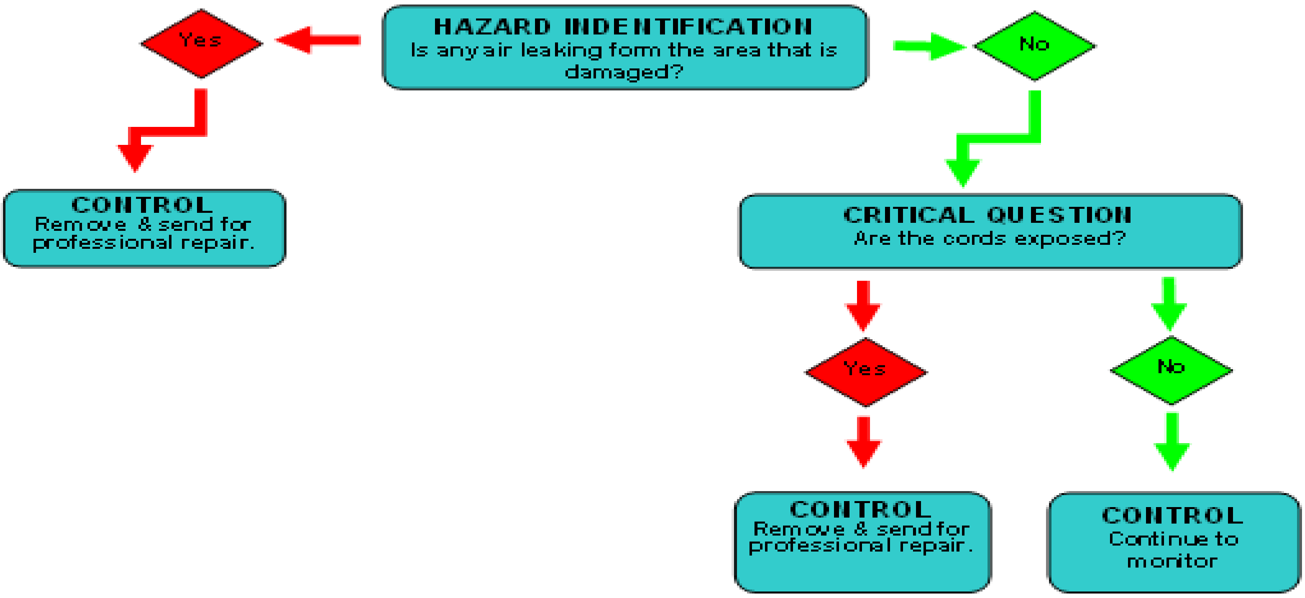
Definition:

Pressure loss at the site of a repair.

Contributing Factors:

1. Improper inflation or overloading.
2. Operating conditions, water or undulations.
3. Repair defect.
4. Repair outside recommended specifications.
5. Poor workmanship.
6. Secondary damage to the repair.

Process Map



Important Notes:

1. **Repaired areas are more prone to secondary damage.**

Loose or Cracked Repair

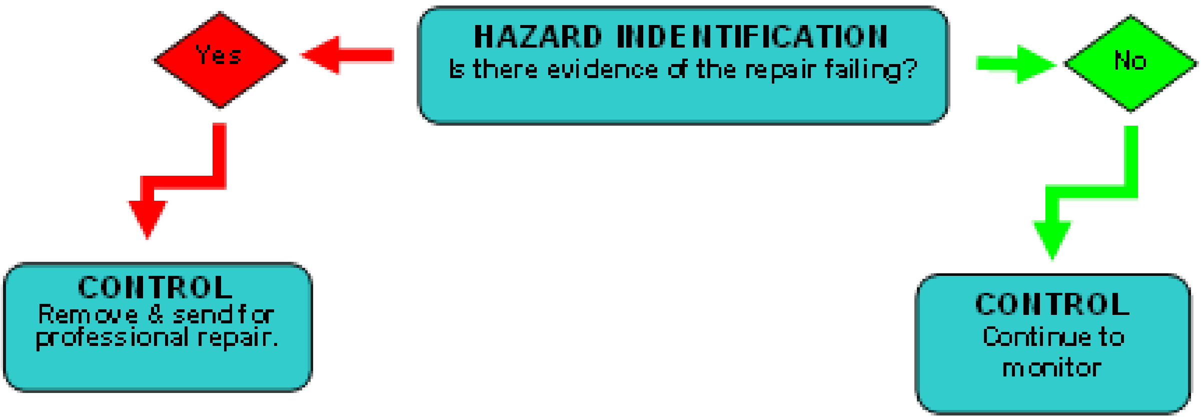
Definition:

A repair that shows signs of a possible failure occurring.

Contributing Factors:

1. Improper inflation or overloading.
2. Bad operating conditions, water or undulations.
3. Repair defect.
4. Repair outside recommended specifications.
5. Poor workmanship.
6. Secondary damage to the repair.

Process Map



Important Notes:

1. **Repaired areas are more prone to secondary damage.**

Circumferential Cracks

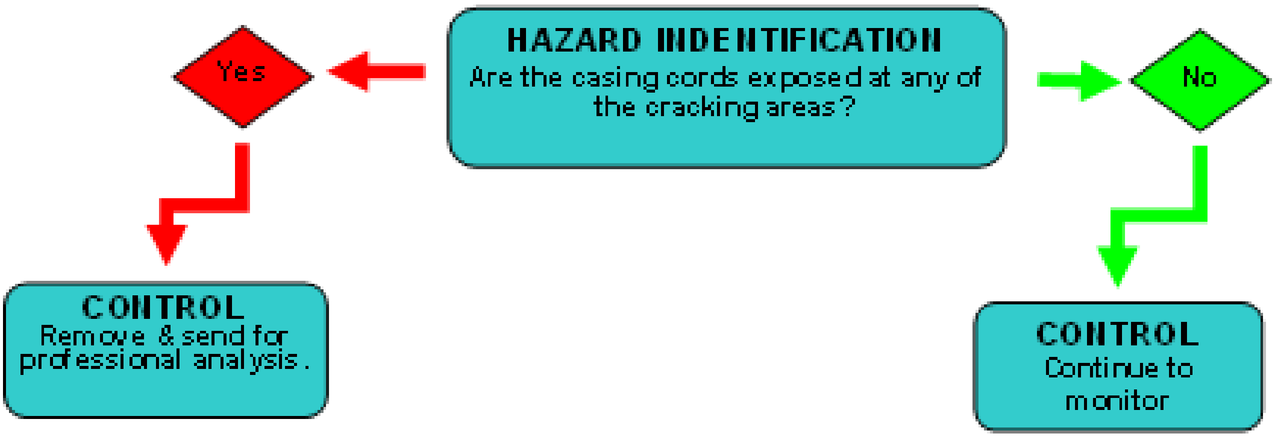
Definition:

Lateral splitting at the rubber juncture (where the shoulder and sidewall meet

Contributing Factors:

1. Excessive stress.
2. Improper inflation or overloading.
3. Operating conditions, undulations.
4. Sharp cornering.
5. Manufacturing defect.

Process Map



Important Notes:

1. **Once the cords are exposed, a repair should be carried out as soon as possible.**

Sidewall Cut

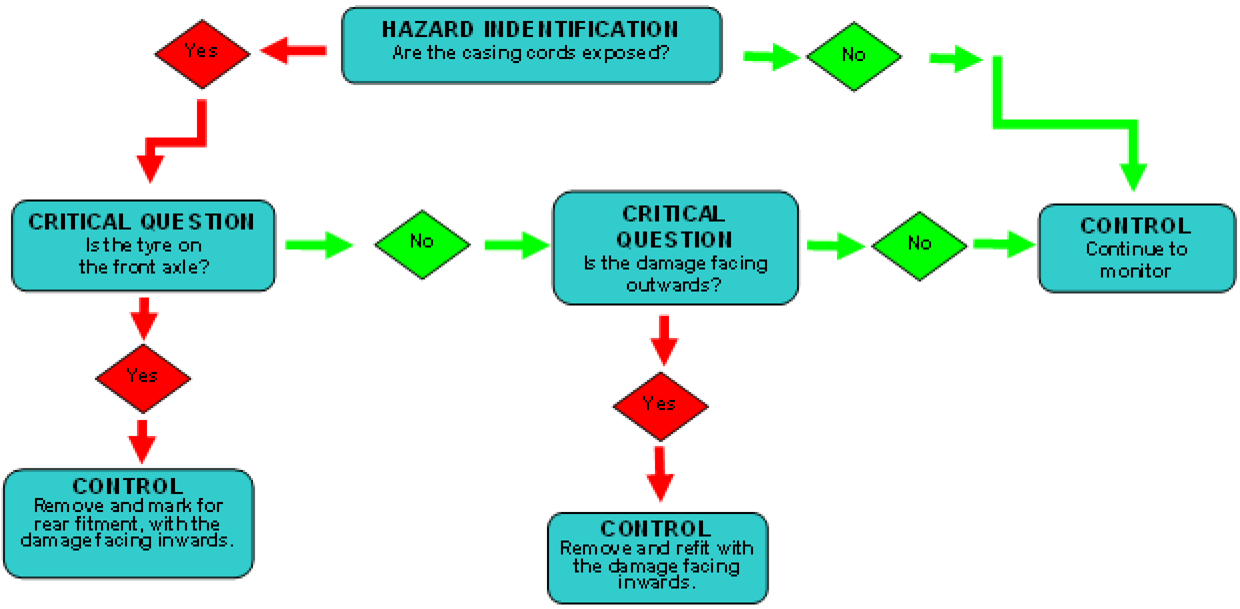
Definition:

A cut observed in the sidewall, but not penetrating the casing.

Contributing Factors:

1. Sharp objects in the work area.
2. Rocks caught between the dual wheels.
3. Operator negligence.
4. Under inflation or overloading.
5. Poor underfoot conditions or water.

Process Map



Important Notes:

1. **Bead separation usually results from bead rocking/wear.**
2. **Bead separation is irreparable.**

Turn-Up Ply Separation/Zipper

Definition:

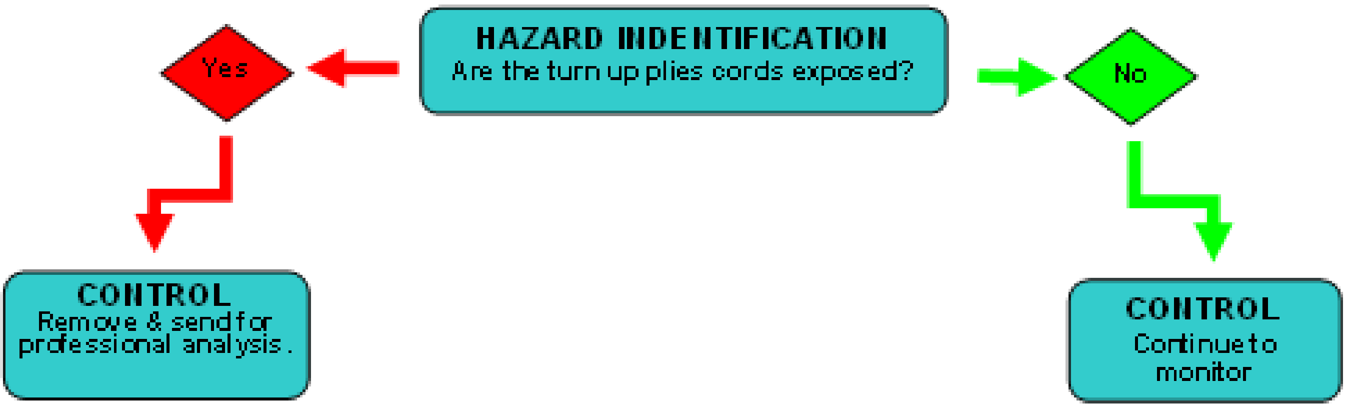
Separation occurring from the end of the casing cords due to fatigue.

Contributing Factors:

1. Improper inflation or mounting.
2. Overloading, excessive braking or speeding.
3. Scuffing form sharp cornering.
4. Manufacturing defect.



Process Map



Important Notes:

1. **This only relates to radial tyres.**

Run Flat

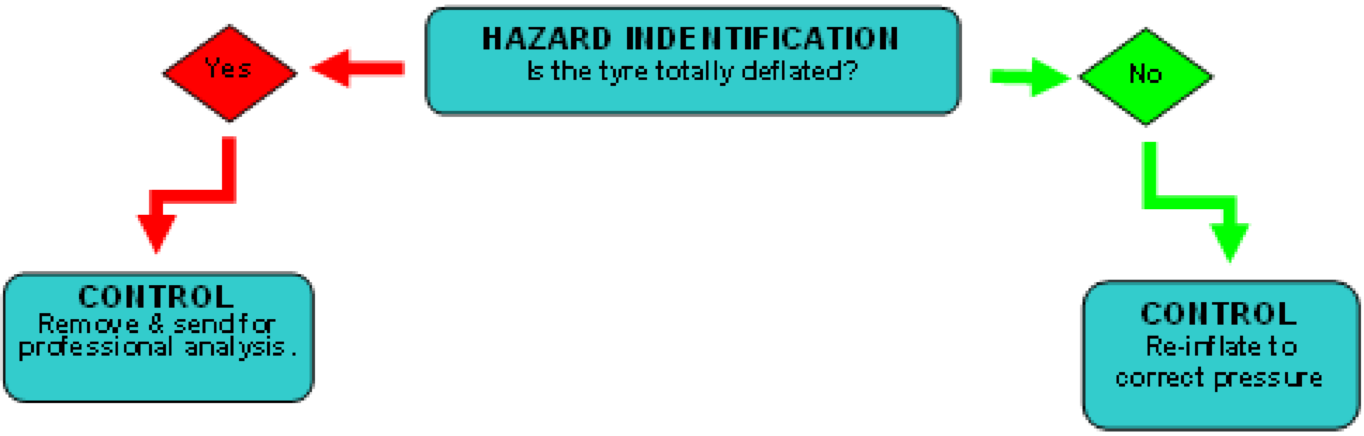
Definition:

Destruction of the casing caused by driving with no air in the tyre.

Contributing Factors:

1. Impact of penetration.
2. Valve, O Ring or rim failure.
    - Ring ejection.
3. Poor pressure maintenance.

Process Map



Important Notes:

1. **Inflation procedures must always be followed.**
2. **Low pressure can cause the tyre to overheat.**

Duals Rubbing

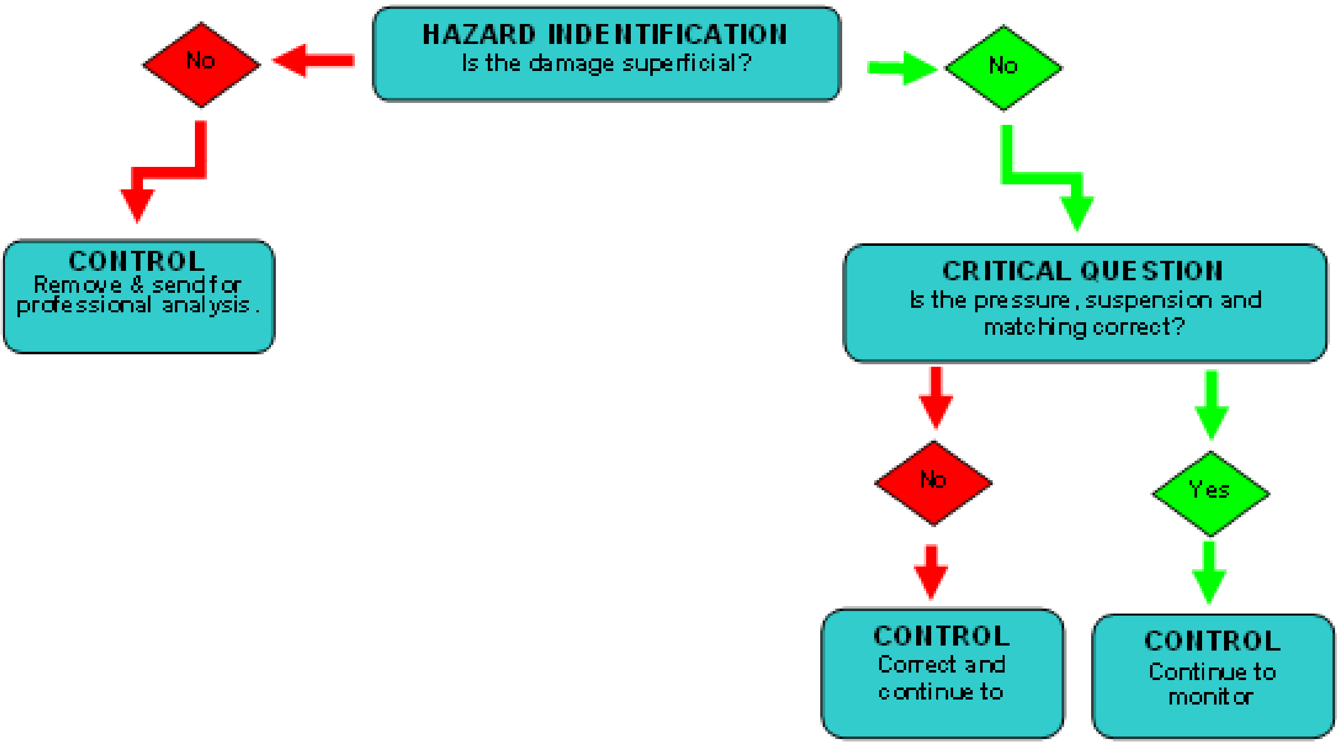
Definition:

Signs of friction on the inner walls of dual tyres.

Contributing Factors:

1. Under inflation, mismatching or incorrect dual spacing.
2. Overloading, off centre loading or undulations.
3. Suspension defects.

Process Map



Important Notes:

1. **Dual tyres rubbing, produces friction and heat.**
2. **Wider tyres require wider rims, to change specifications, always seek manufacturer's advice.**

Tread Damage Guide

Tread Cut Separation

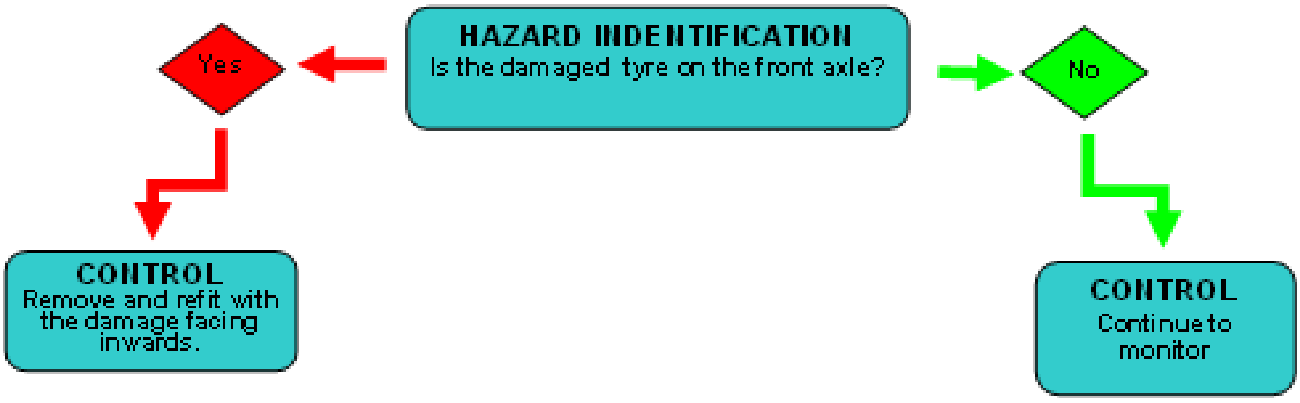
Definition:

Separation caused by cuts on the tread crown area.

Contributing Factors:

1. Improper inflation or underfoot conditions.
2. Aggravated by water.
3. Over loading or speeding.
4. Spinning, skidding or sliding.

Process Map



Important Notes:

1. **Separations are irreparable.**

Tread Cut

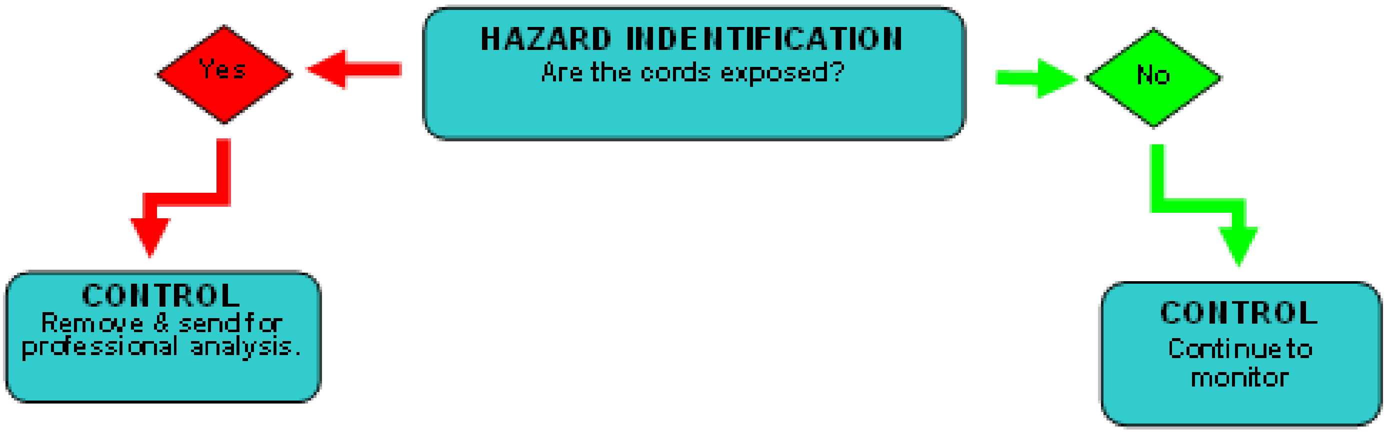
Definition:

Cut in the tread crown, but not penetrating the casing.

Contributing Factors:

1. Improper inflation or underfoot conditions.
2. Aggravated by water.
3. Foreign objects in the work area.
4. Spinning, skidding or sliding.

Process Map



Important Notes:

1. **Tread cut can be repaired.**
2. **Tread cuts not repaired, could result in tread separation.**

Chunking

Definition:

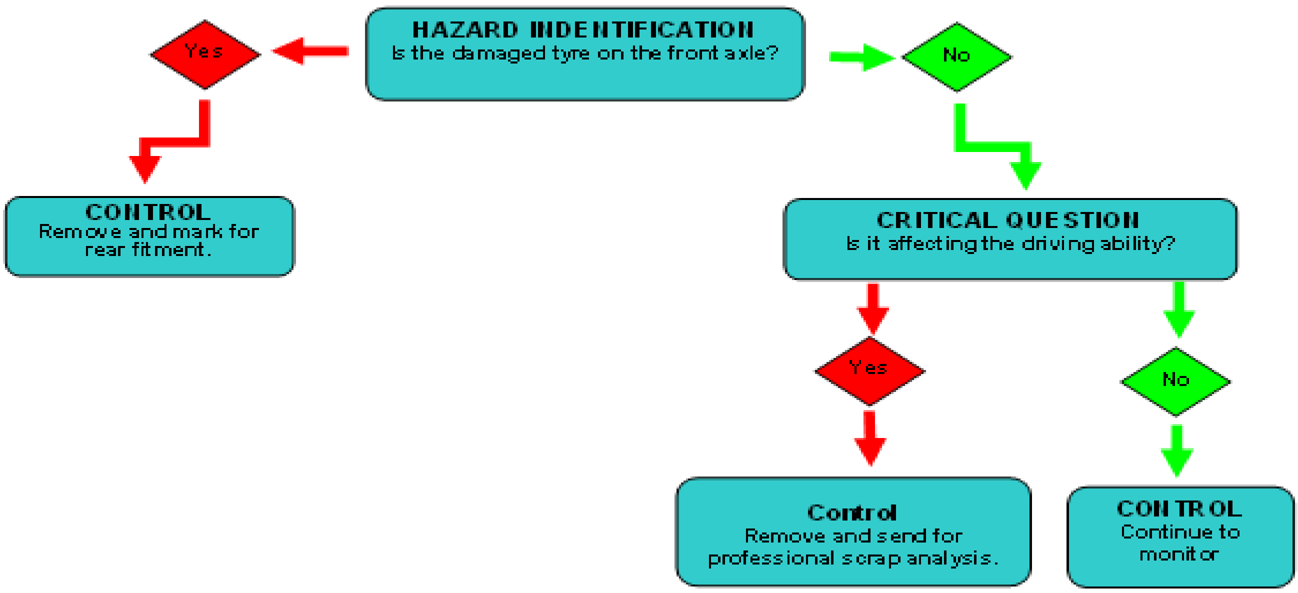
Chunks of tread partially or completely torn off.

Contributing Factors:

1. Improper inflation or underfoot conditions.
2. Excessive speeding or aggressive braking.
3. Overloading.
4. Mismatched diameters on dual tyre machines.
5. Spinning, skidding or high torque.



Process Map



Important Notes:

1. **If it is close to the end of its tread life, it is not recommend using chunked tyres for retreading.**
2. **Chunking is not repairable.**

Mismatching

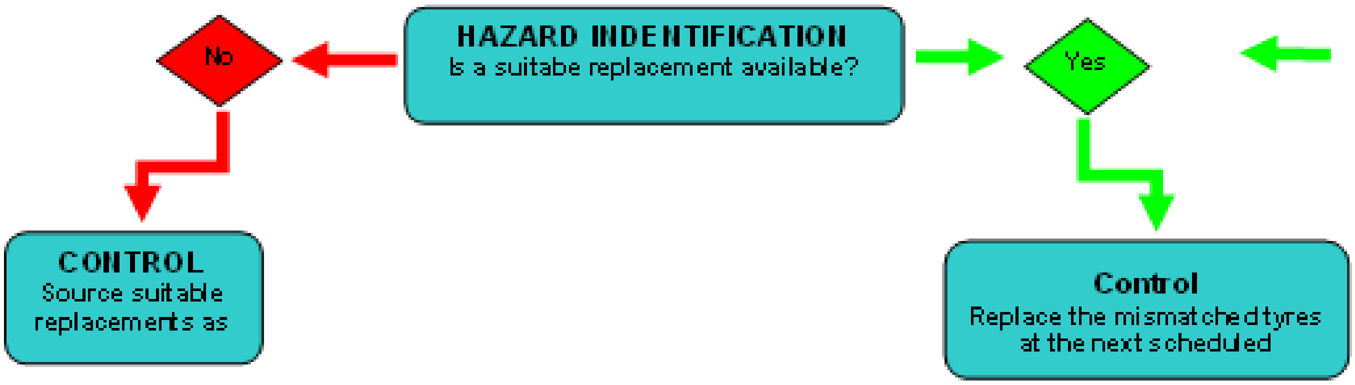
Definition:

Fitting of tyres causing a mismatch of brand, diameter, size or application.

Contributing Factors:

1. Lack of supervision.
2. Lack of suitable tyres.
3. Lack of knowledge or experience.

Process Map



Important Notes:

1. **Loader variance – front to rear 4%, left to right 3%.**
2. **Haul machines 10% difference on duals, 3% left to right.**

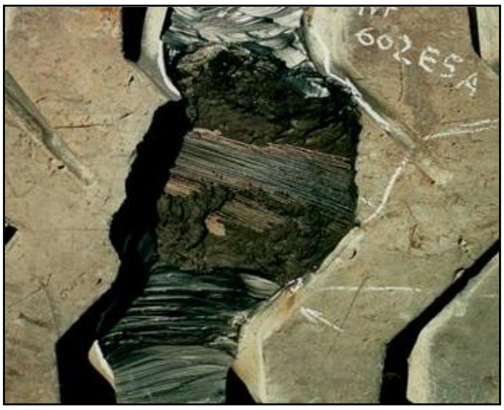
Tread Separation

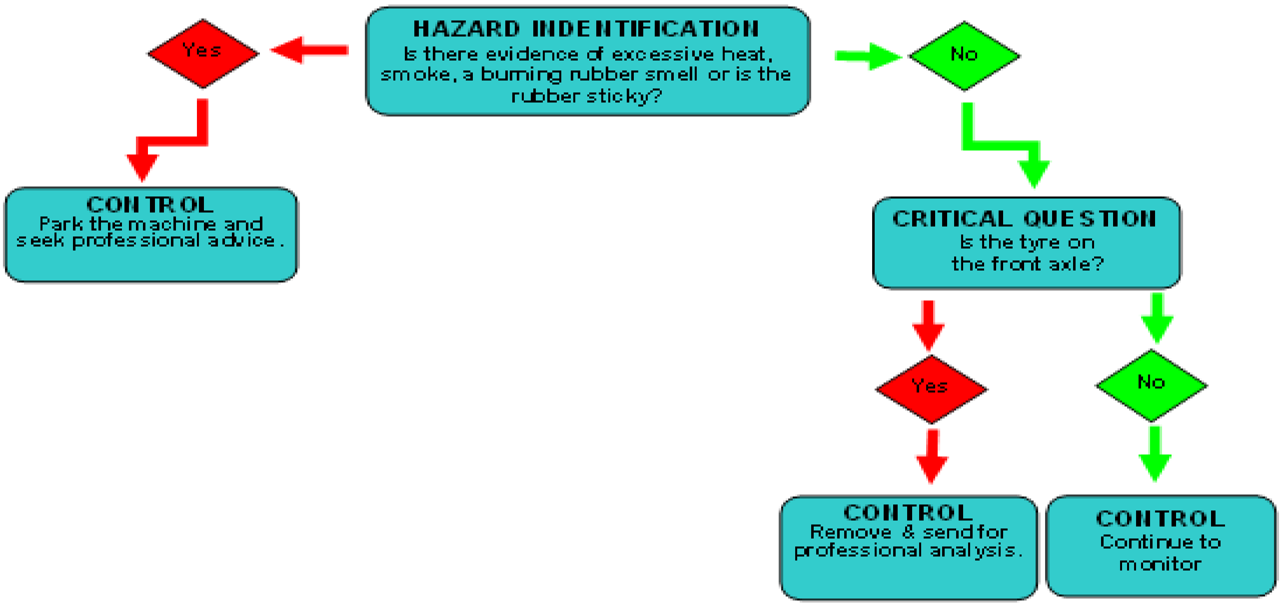
Definition:

Deformation of the tread area due to the tread band separating from the casing ply.

Contributing Factors:

1. Excessive heat generation.
2. Exceeding the TKPH for the tyres.
3. Excessive cornering.
4. Incorrect inflation or speed.
5. Overloading.





Important Notes:

1. **Tread separation is irreparable.**

Worn Out

Definition:

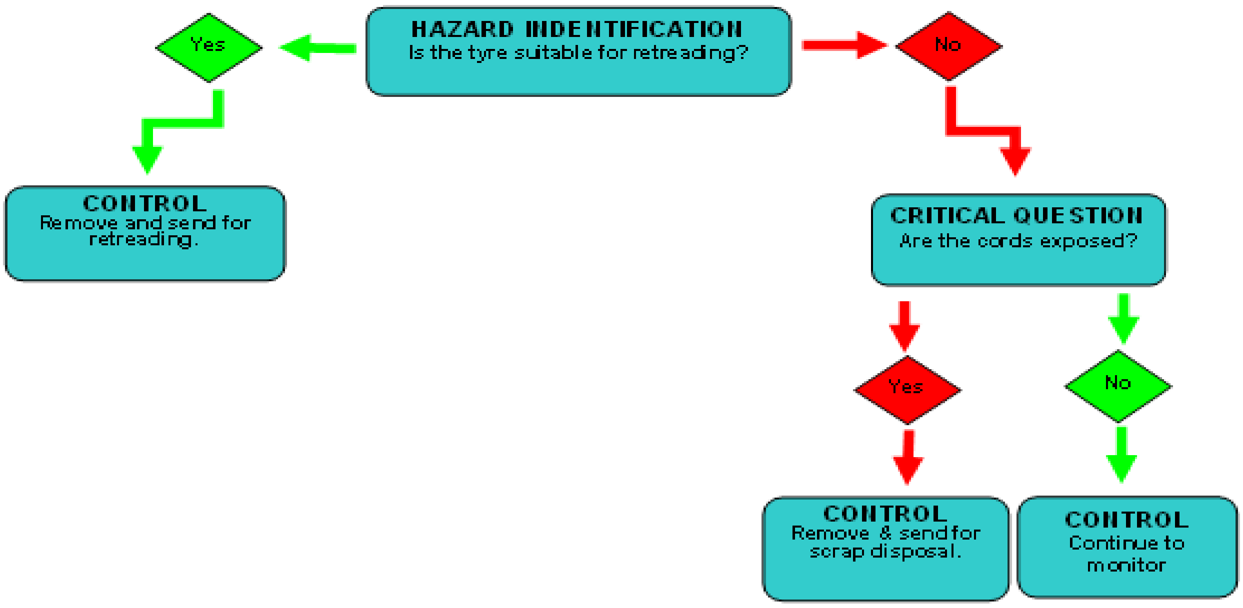
Normal wear resulting from on or beyond the bottom of the tread grooves.

Contributing Factors:

1. Improper inflation or overloading.
2. Bad operating conditions, water or undulations.
3. Repair defect.
4. Repair outside recommended specifications.
5. Poor workmanship.
6. Secondary damage to the repair.



Process Map



Important Notes:

1. **A lower rolling resistance increases tread life and extends the life of the tyre.**
2. **Percentage of tread worn does not affect traction ability.**

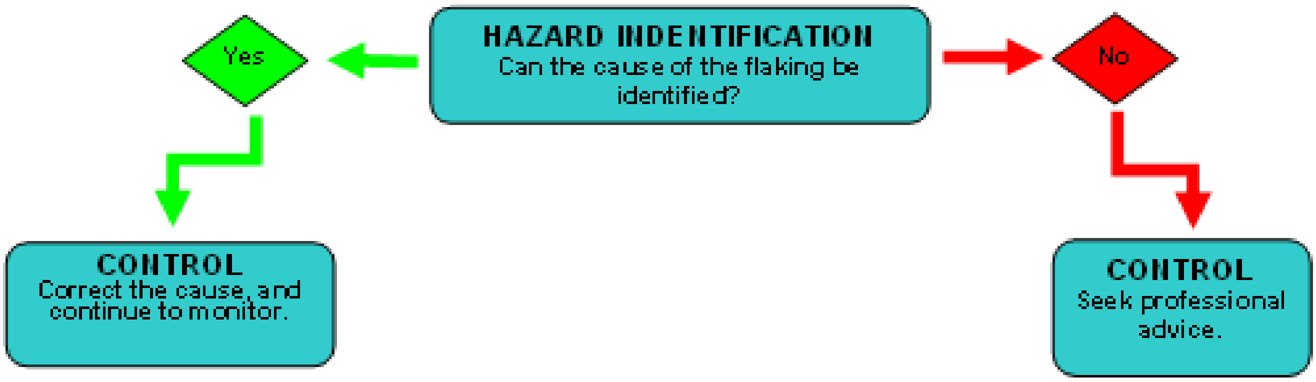
Definition:

The tread breaks off with the appearance of fish scales, usually throughout the surface of the tread crown.

Contributing Factors:

1. Fatigue in the tread rubber due to bad underfoot conditions.
2. Over inflation.
3. Incorrect tyre specifications.
4. Overloading.
5. Improper braking.
6. Abrasive road surfaces.

Process Map



Important Notes:

1. **Flaking is not classed as a removal reason, and does not pose a risk of tyre failure.**

Lug Tear

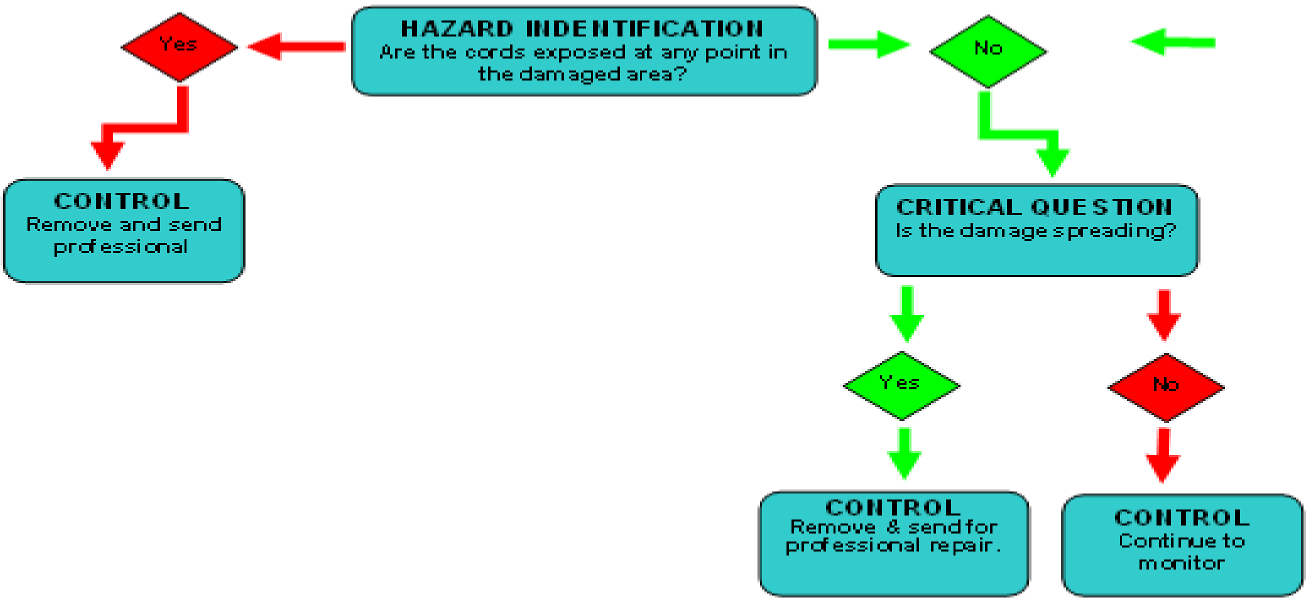
Definition:

Ribs, lugs or blocks torn off by external force.

Contributing Factors:

1. Improper inflation maintenance.
2. Excessive loading.
3. Driving over/onto curbs and walls at tipping areas.
4. Turning sharply.
5. Harsh braking.
6. Stone retention.
7. High torque on steep gradients
8. Wheel spinning.

Process Map



Important Notes:

1. **A repair can be done to prevent possible separation.**
2. **Ensure that the repair is done using a patch for strength.**

Spin Cuts

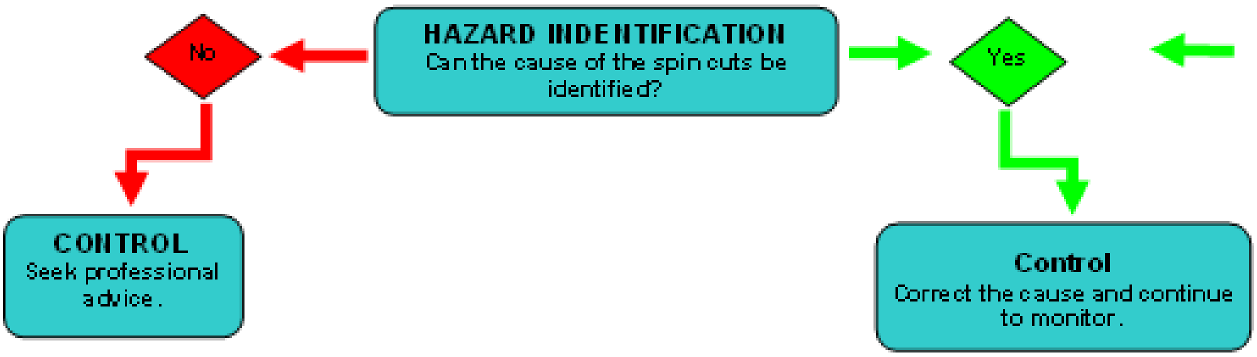
Definition:

Circumferential cuts or scratches on the tread area, but not penetrating the casing.

Contributing Factors:

1. Spinning due to loss of traction.
2. Spillages.
3. Sharp foreign objects. Aggravated by water.

Process Map



Important Notes:

1. **Percentage of tread worn does not affect traction ability.**

Tread Penetration

Definition:

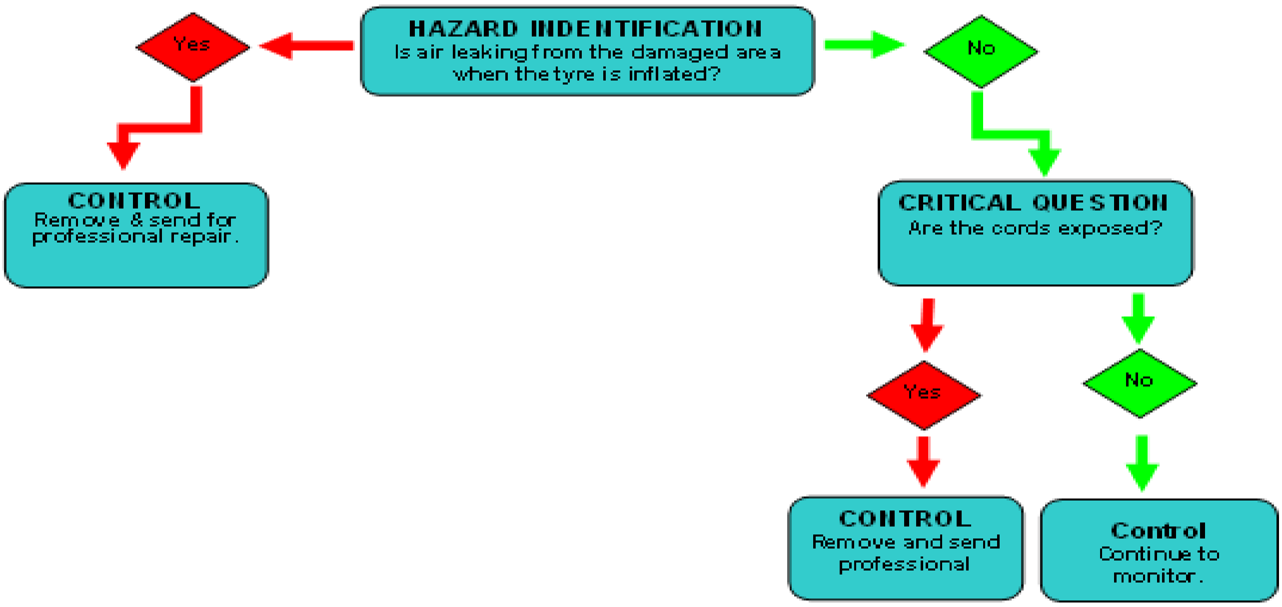
Cut in the tread reaching through or penetrating the inner liner.

Contributing Factors:

1. Over inflation.
2. Foreign objects.
3. Stone retention.
4. Bad operator practices.
5. Aggravated by water
6. Bad housekeeping.



Process Map



Important Notes:

1. **Only remove foreign objects that have penetrated the tyre after the tyre has been deflated.**
2. **Stones trapped between the tread lugs, can be safely removed with the tyre still inflated, as long as they have not penetrated the casing at any point.**

Uneven Tread Wear

Definition:

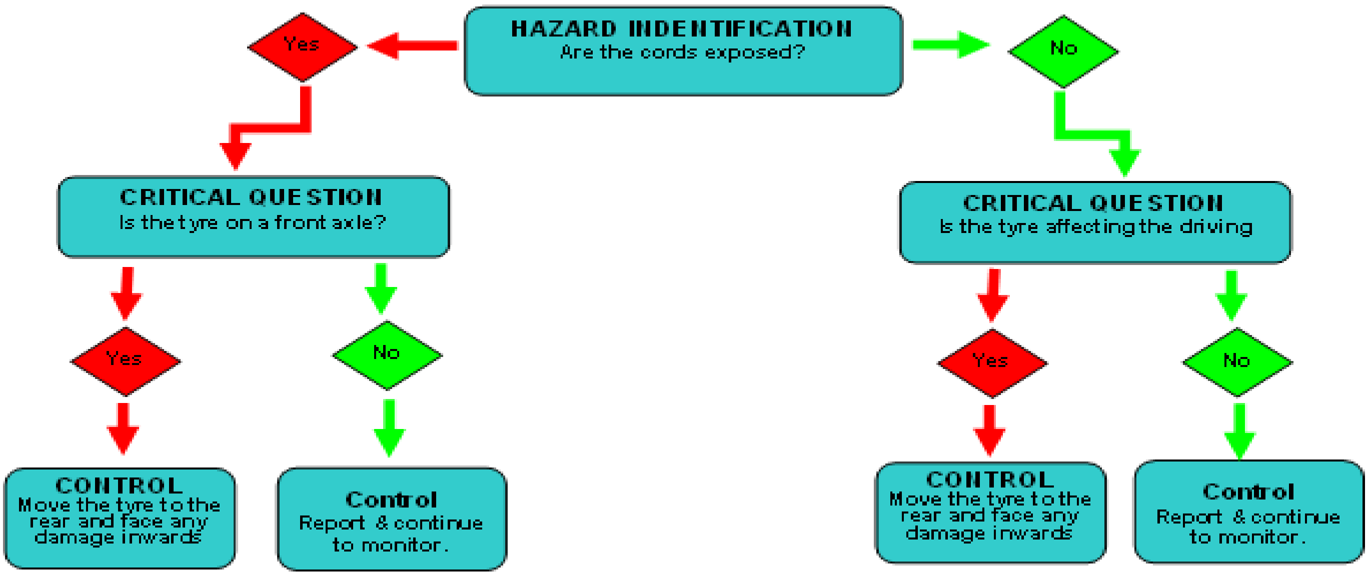
Uneven wear on the tread area as follows:

- Conical Wear – Both shoulders wear symmetrically quicker.
- Centre Wear – Wear increases shoulder to crown.
- Irregular Wear – Wear increases from one shoulder to the other.
- Heal & Toe Wear – Wear increases on one part of the lug.

Contributing Factors:

1. Improper inflation maintenance.
2. Road cambers.
3. Mechanical defects.
4. Improper tyre or rim matching.

Process Map



Important Notes:

1. **Main contributing factors are mechanical defects, but also:**
   - **Centre wear, over inflation, conical wear; suspension/under inflation & Heel/Toe, under inflation, harsh braking/acceleration or incorrect dual matching.**

Delamination

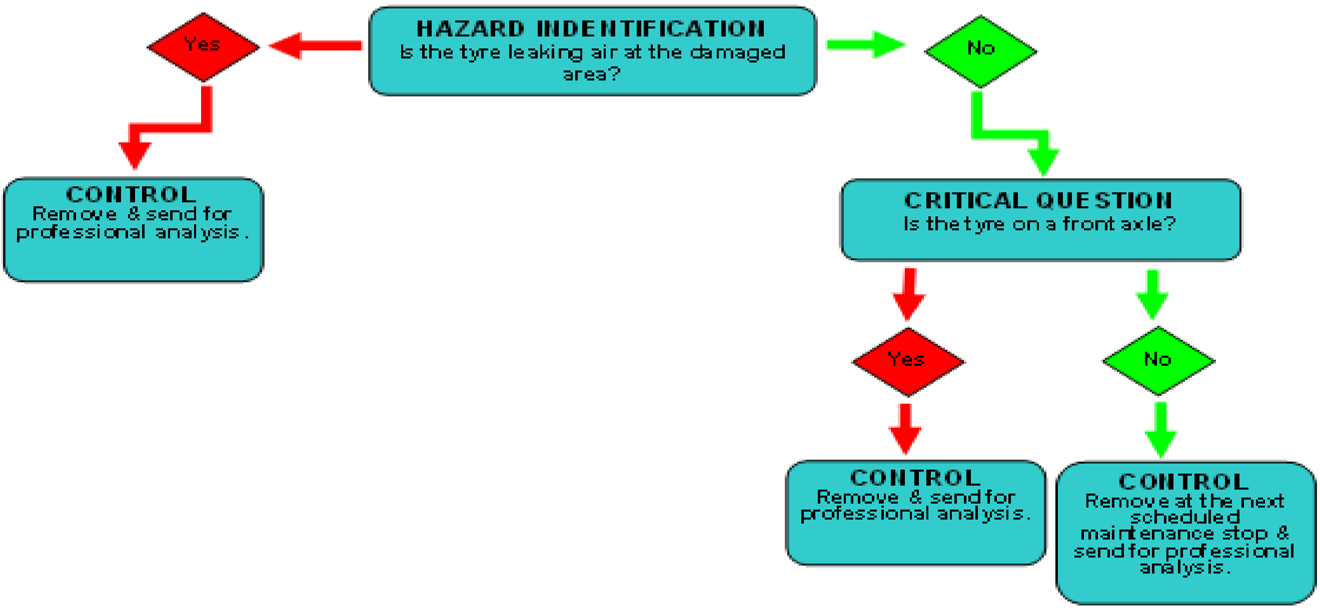
Definition:

Separation between layers of rubber.

Contributing Factors:

1. Heat generated through exceeding the tyres TKPH.
2. Loss of adhesion between the compounds in the tread.
3. Manufactures defect.

Process Map



Important Notes:

1. **The surface of separated layers of rubber will be smooth.**
2. **Separated tyres cannot normally be repaired.**

Tread Repair Failure

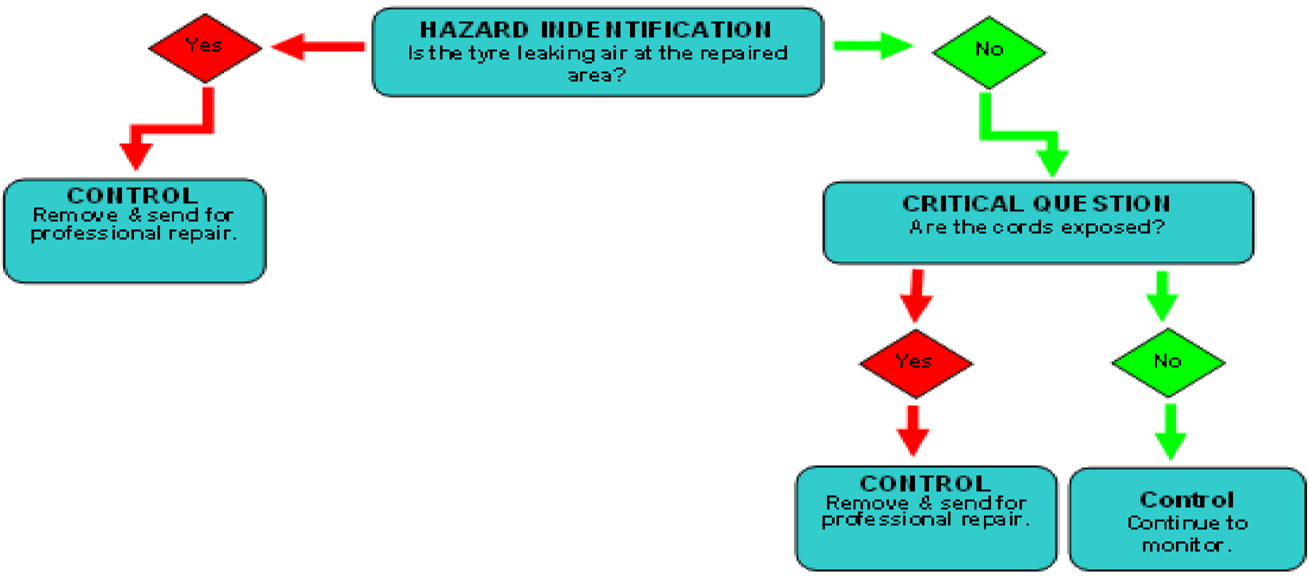
Definition:

Pressure loss at the site of the repair.

Contributing Factors:

1. Improper inflation.
2. Poor housekeeping.
3. Overloading.
4. Exceeding the tyres TKPH.
5. Repair defect.
6. Poor workmanship.

Process Map



Important Notes:

1. **Repaired tyres should only to be fitted on the rear of machines.**

Tread Impact

Definition:

External damage to the tread causing destructive damage to the protective plies and casing.

Contributing Factors:

1. Poor underfoot conditions.
2. Poor housekeeping.
3. Over inflation.
4. Speed verses site conditions.
5. Over loading.
6. Bad operating practices.

Process Map

CONTROL
Remove and mark for scrap analysis.

Important Notes:

1. **Tread impact fractures are irreparable.**

Electrical Contact Damage

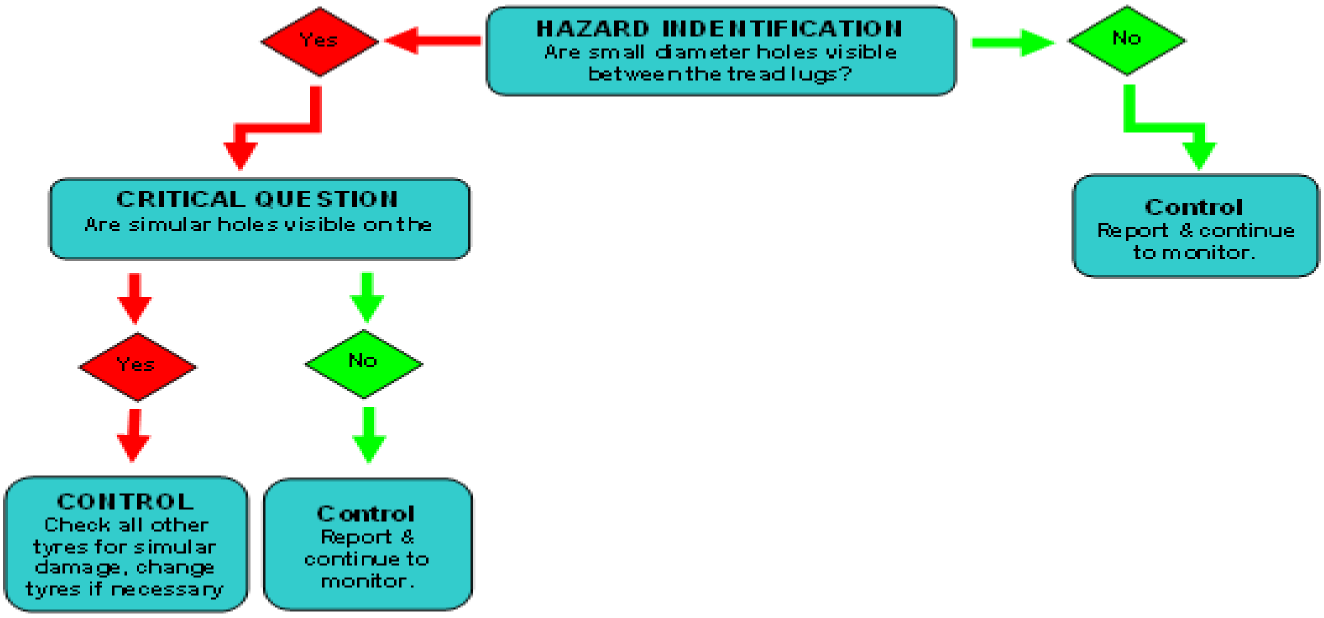
Definition:

Small diameter holes are visible between the lugs on the tread.

Contributing Factors:

Contact either direct or indirect with a power source, for example power lines.

Process Map



Important Notes:

1. **Do-not enter the flash area if the machine is still in contact with any power sources.**
2. **Any contact by a machine with an electrical power source, must be reported so an inspection can be carried out to ensure the machine is still safe to use.**

Stress Cracks

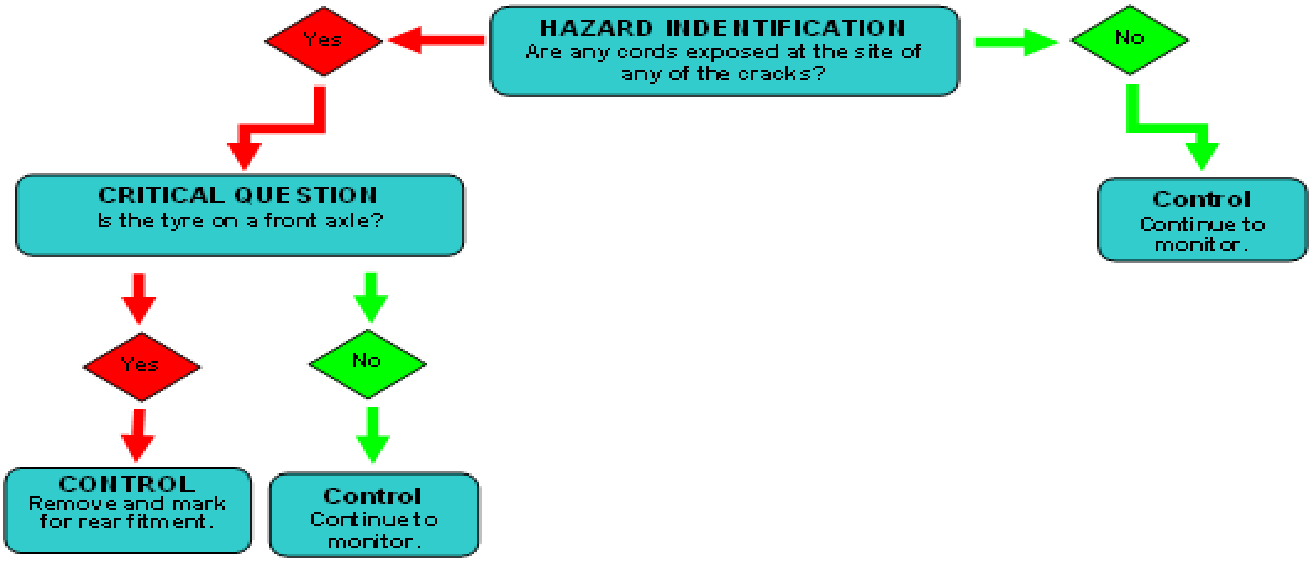
Definition:

Cracks visible between the tread lugs but not at the lug base.

Contributing Factors:

1. Under inflation.
2. Over loading.
3. Stone retention.
4. High torque.
5. Steep inclines.

Process Map



Important Notes:

1. **Stone retention cracks can normally be repaired.**
2. **If there are multiple cracks across the tyre, it is not recommended to have it repaired.**

Spot Wear

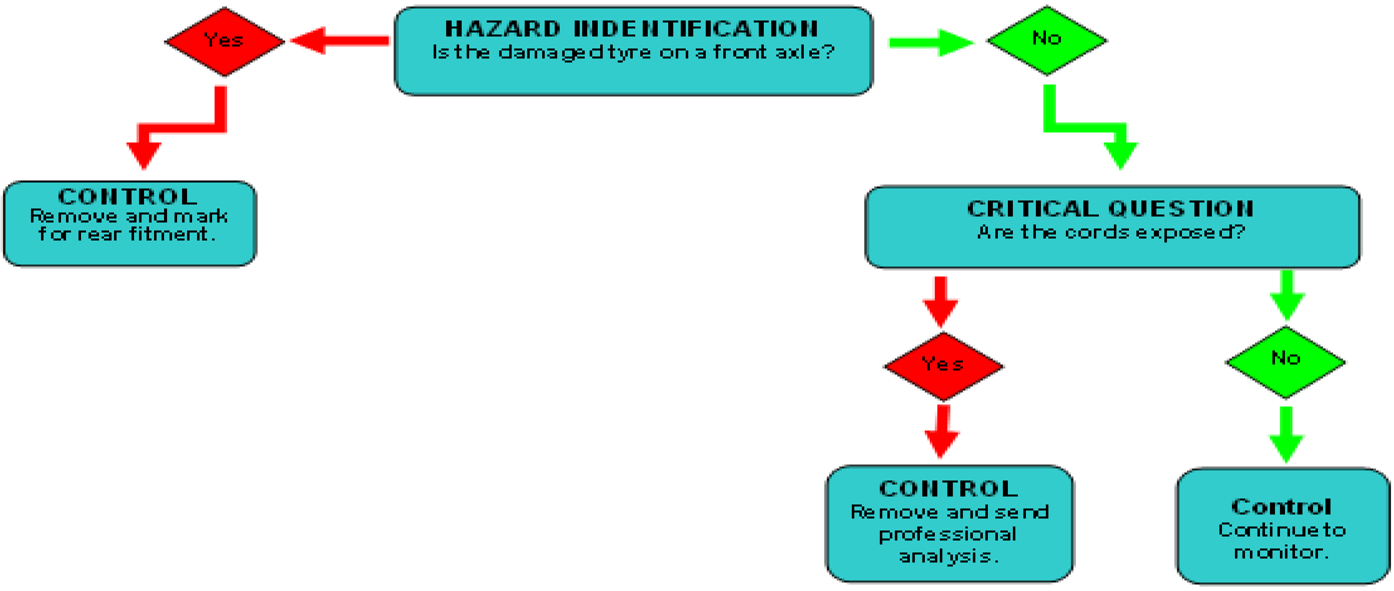
Definition:

Increased wear in one or more areas.

Contributing Factors:

1. Mismatching of tyres.
2. Locked or excessive use of brakes.
3. Tyre bouncing caused by faulty suspension of undulations.
4. Poor bead seating caused by bad fitment.

Process Map



Important Notes:

1. **Spot wear tyres can normally be repaired if removed before the damage is too great.**

Inflating & Re-Inflating Tyres All Sizes

Objective
To provide employees with guidance to follow for safely inflating and re-inflating tyres, and a clear understanding of the hazards and controls required when performing the tyre inflating task.

Requirement To Use Restraining Device
Employees are required to follow proper inflation practices, and are to ensure that appropriate restraining devices and remote inflators are being used. Carrying out tyre inflation is one of the highest risks activities with regards to tyres. A bursting or exploding tyre, wheel or rim assembly can result in extensive injuries or even death, this applies to all wheel or rim configurations and all types of tyres.

Special Tools and Equipment

1. A remote inflation device with sufficient hose length to ensure that you remain outside the trajectory zone.
2. A purpose built and fitted vehicle mounted automatic inflation system, (optional).
3. Safety inflation hose.
4. An appropriate restraining method as described in this procedure.

Critical Rules

- Ensure that the equipment has been either, locked/tagged out, keys removed or signage applied indicating not to move the vehicle.
- Never inflate a tyre or wheel assembly unless it is restrained by using one of the methods described in this procedure.
- Always use an extension hose with an inline gauge fitted for checking the pressure, or the automatic inflation system supplied on some tyre trucks, or a purpose made tyre safety inflation hose.
- Watch for abnormal conditions from outside the trajectory zone and discontinue if any are detected.
- Wear correct PPE.
- Ensure that an exclusion zone has been established and also some type of warning to other people that inflation is taking place.
- Personal must remain outside of the trajectory zone during the inflation process.
- All tyres that have been operated in a run low or run flat condition (less than 80% of the cold operating pressure), must be inspected for damage. If deflation occurs again, then the tyre must be removed for internal visual inspection.
- You must be able to control the air flow from outside the trajectory zone.
- Ensure that tyres, rims and components are all correctly matched, and are fitted correctly.

Inspection

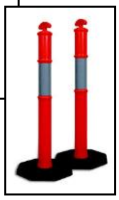
A thorough inspection is critical to a safe inflation, watch out for sharp edges, metal burrs and pinch points, use appropriate gloves when carrying out this inspection of the components.

- Prior to inflation, inspect the assembly to make sure that all the components are correctly matched next ensure that they are seated correctly. If they are not, then you must seek expert advice.
- Inspect air lines, connectors and crimps for damage or wear, check the threads on the inflators for wear, and always replace any damaged or worn out parts.
- Take time to ensure that all wheel components are properly seated.
- Weak airline components can result in an airline failure creating dust and possibly flying projectiles, this can also cause the hose to whip out of control, potentially causing serious injury to someone.
- If you are asked to continue an already in progress inflation task, then you must ensure that you carry out a further full inspection to ensure it is safe to continue.

Preparation

The work area

Although you might be protected in the event of a tyre assembly failing, passers-by might not be, and could be caught in the trajectory path of a ruptured tyre.

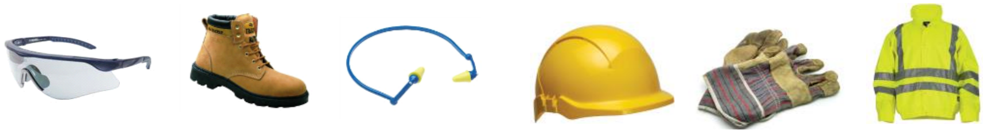


Ensure your work area is safe, prevent other people from entering your work area and that the area is coned off and signs are erected warning of tyre inflation.

If someone enters the exclusion zone or your work area, then you must stop what you are doing and investigate as to why they entered a danger area without permission.

Personal Protective Equipment

Always conduct a Risk Assessment, prior to starting the job and ensure that the correct PPE is worn at all times.



Hazards include

- Noise from compressed air being released in the event of a structural failure.
- Dust and flying debris.

Controls

- Identify the extent of the trajectory zone based on the tyre size and ensure that you are working outside the trajectory zone until the assembly has been safely inflated. Ensure inflation warning signs and cones are positioned to ensure that everyone knows what is happening and to stay out of the area.
- Always wear eye protection as compressed air can contain or stir up particles (projectiles).
- Compressed air blasts can cause damage to the skin, never expose unprotected skin to compressed air.

Suitable Restraining Devices

The following table shows suitable restraining methods that are to be used for different tyre sizes during inflation for fully deflated tyre.

Commercial truck tyres are not to be inflated from fully deflated whilst on the vehicle.

Type of tyre	Tyre changing machine	Tyre cage	Mounted back on the vehicle with a restraint barrier in place	Crane/ manipulator arm or forklift forks.
Passenger	Yes	Yes		
Light Truck	Yes	Yes		
Commercial Truck 19.5 to 24.5”	Yes	Yes		
Small OTR or Agricultral smaller than 25”	Tyre machine arm can act as a restraint for Wheelbarrow or ATV tyres	Yes	Yes	Yes
Large OTR or Agricultral 25” and larger			Yes	Yes





1. All restraining devices must be inspected for signs of damage before use.
2. Tyre cages must NOT be bolted to the floor, and must be at least one Metre away from any wall or structure.
3. If the manipulator is to be used as a barrier, then it must be grounded as shown in the picture, with the manipulator fully closed and angled away from the tyre.

Inflation adjustments conducted on tyre assemblies that are above the 80% rule do not require the use of a restraining device; however, all other safety aspects must be adhered to.

Restraining The Assembly

The hazard potential of a tyre or tyre assembly failing during inflation can be lethal, positioning something in front of the assembly to act as a barrier can reduce the potential of debris scatter if the assembly fails during inflation.

Mounted back on the vehicle with a restaint barrier in place
For OTR & Agricultral tyres, bolt the assmebly to the vehicle, and utilise a barrier of some design, if using the crane/manipulator, then it must be grounded, fully closed and at a angle.

Horizontal mount with a restaint barrier in place
For OTR & Agricultral tyres, the crane or manipulator arm is considered an accepatable restraining device, when placed over the trajectory zone of the wheel components.

In any restraining situation

- The manipulator equipment must be positioned with the parking brake applied, the wheels chocked and the operator out of the cab and the trajectory zone.
- Ensure that no-one passes under the arms of the manipulator when used as a barrier. Leave a safe means of egress so employees can enter/exit the trajectory zone when inspecting/seating the components.

Selecting An Inflation Device

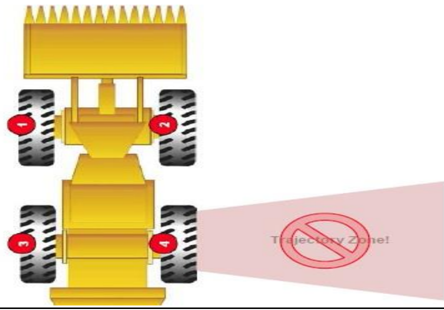
Select the appropriate device for the type of tyre and wheel assembly being inflated.

- **ensure the airline hose is long enough to allow the operator to stay outside the likely explosion trajectory during inflation**
- The shut off for the air flow must be on the remote end of the inflator hose
- Being able to control the air flow and check the pressure remotely, reduces the need to be in front of the assembly during the inflation process.
- Inspect the inflator components for damage or wear.
- Worn threads or clamps can result in the inflator device coming off of the valve stem when under pressure and striking and injuring someone.
- Tag and remove damaged components from replacement or service.
- Depending on the size of tyre being inflated, you may be using a clip on style chuck or a screw type such as an IN-80 or IN-95 inflator. Inflators may have adaptors for the various sizes of valve stems. Make sure you have the correct components for the tyre size you are working on.

The Trajectory Zone

Tyre and rim assemblies can come apart violently without warning

The trajectory zone is the path that debris etc. will travel in the event of a tyre/rim assembly failing.
Even if it is restrained, there is still a risk of injury or even death if you are in the trajectory zone. So never stand in the trajectory zone and do not let others stand in the trajectory zone during the inflation process.

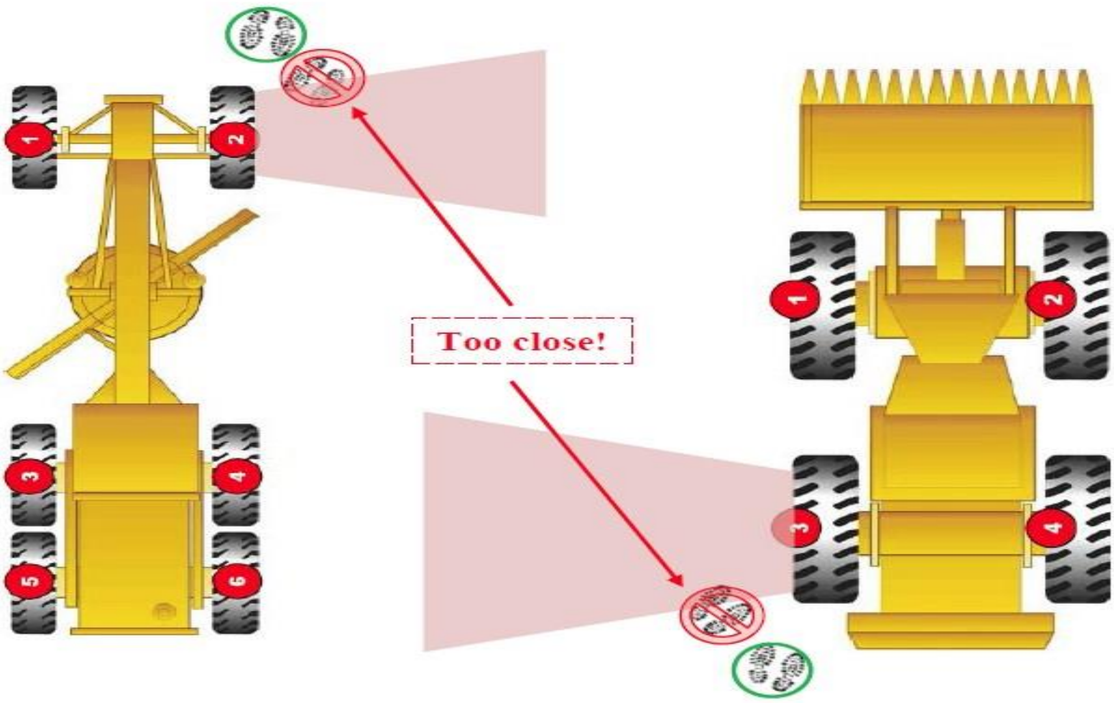


The Trajectory Zone

Large OTR and Agriculture

Standing this close to a rim that fails could result in serious injury or even death

The correct method is to be well away from the trajectory path with the assembly restrained and a barrier in place



Monitoring The Inflation Process

Multi Piece Wheel/Rim Assembly

Stand out of the path of any projectiles and begin to inflate the tyre, whilst carefully tapping the lock ring, using a soft metal bar and a dead blow hammer at various sections around the circumference to ensure that the wheel/rim components are seating correctly.
Once the components are seated correctly, then everyone must remain outside the trajectory zone during inflation.
The maximum pressure for employees inspecting and verifying the correct seating of the wheel/rim components within the trajectory zone is:

- Passenger/Light Truck/Commercial Tyre – 10 Psi.
- Small OTR/Agriculture – 15 Psi.
- Large OTR/Agriculture – 20 Psi.

Watch for any unusual noise or distortion of movement of the tyre.

- Continuing to inflate a tyre with a defect can result in serious injury or death.
- Listen for abnormal sounds such as popping, snapping or escaping air indicating a possible structural failure.
- **STOP** inflation if you need to make a closer inspection or remedy any equipment malfunction such as a frozen airline or inflation device.
- If you hear or see anything abnormal, **STOP** and deflate the tyre remotely and determine the problem.

Problems with sidewall bulges can be minor or they can be indicators of a belt failure, tyres that have been run flat have the potential for belt breakage resulting in a split failure called a zipper



Arrange your work area so that in the event of a tyre failing you have a safe route of escape, and in the event of a failure or if it is suspected that a failure is going to occur:

- Do not go toward the tyre assembly to remove the air supply.
- Cut the air supply and deflate remotely if safe to do so.

If everything appears to be okay, continue to inflate to the correct working pressure and once that has occurred, install the core housing and remove the inflator device, or remove the inflator device and install the valve core, finally replace the valve cap.

Monitoring The Inflation Process

On smaller applications where the core has been removed for inflation purposes, you may have to top up the air after installing the valve core

- Continue to check the pressure but stay out of the trajectory zone.
- Time spent in front of the assembly must be limited to reinstalling the valve core housing or valve core, removing the inflator device and installing the valve cap.
- Verify that the valve core and housing are correctly tightened and no leaks are evident.
- Lose valves, caps or core housings can lead to low air pressure and premature tyre failure.

Caution

Liquid and debris can get into the valve stem and become a projectile. Position yourself out of the path of any projectiles when removing inflators/chucks or when installing/removing valve cores. Wear eye, ear and hand protection to guard against noise and any liquid, ice or other debris that may spray from the valve stem when removing the inflator device.

Initial Inflation – Large OTR

When initially inflating a large OTR tyre assembly after mounting, it is critical to ensure that the tyre beads seat correctly on the wheel/rim components.

In an effort to achieve this, the restrained tyre should be:

- Remotely inflated to 20% above recommend cold inflation pressure.
- Then remotely deflate the assembly back down to the recommend cold pressure if mounted on the vehicle, or to the cold storage pressure if stored loose.
- Visually inspect to ensure that the distance between the flange edge and the moulded guide rib on the tyres sidewall is consistent around the circumference.
- Ensure that the rim can withstand the bead seating pressure before commencing seating the bead.

Tire Deflation 80% Rule All Tyres

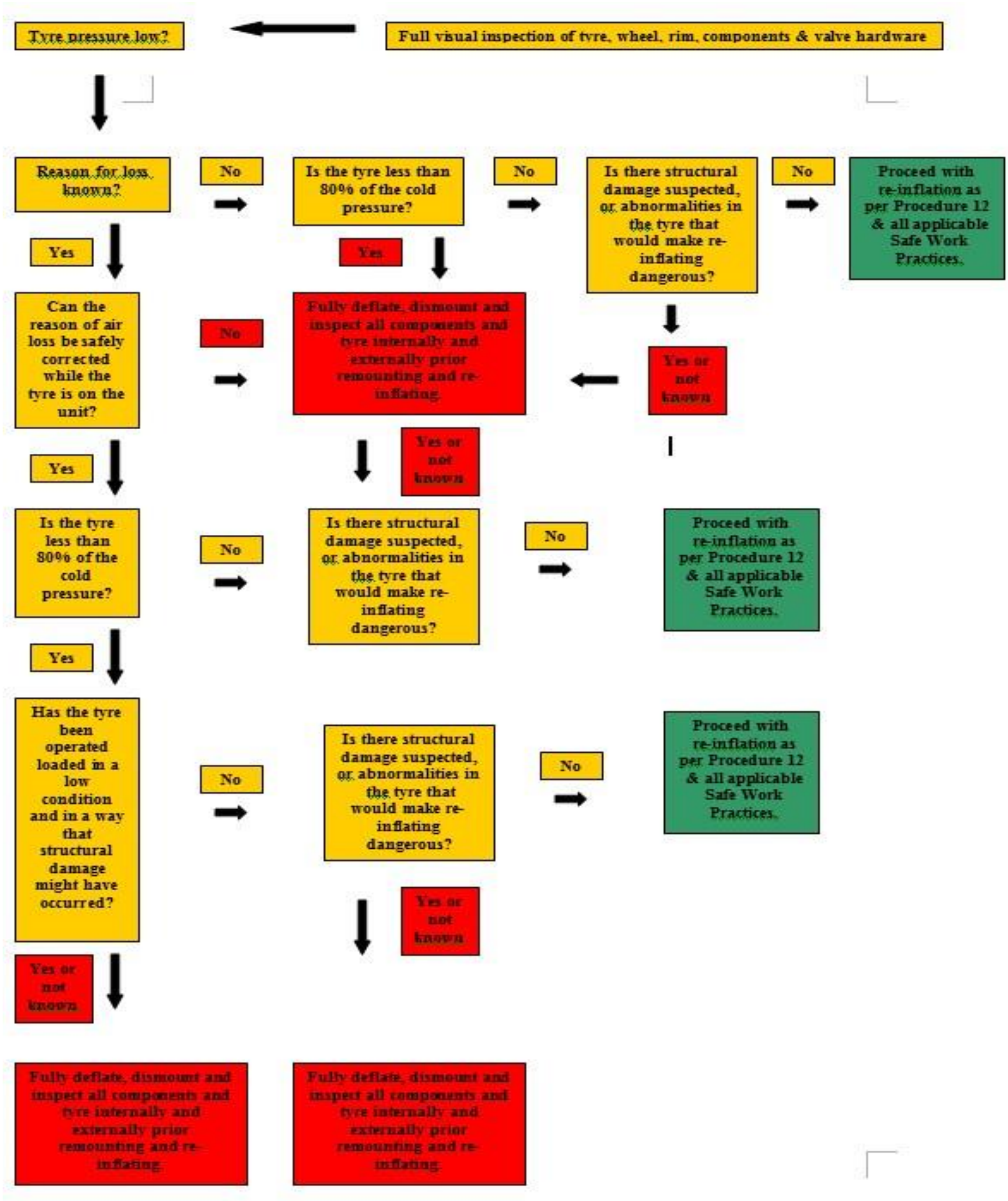
All tyres that have been operated in a run low or run flat condition (less than 80% of the tyres normal cold pressure), must be assessed to see if it needs removing for an internal inspection. If the tyre is not removed and is re-inflated, and subsequently comes back in with low pressure, then it MUST be removed for a thorough inspection, before being remounted.

The 80% rule is designed to help to identify the root cause of the air loss and to safeguard the safety of the employee against the hazard of possible tyre or wheel/rim failure during re-inflation. The operating pressure is defined as “the cold inflation pressure” if at any time an employee is unsure, then he is to seek advice from their Supervisor/Manager.

There is an additional rule for Large Earthmover tyres above 25”, and that is:

“Where the cause of the air loss cannot be established, then the Low Pressure Flow Chart is to be referred to, however this has to be authorised by the employees Supervisor/Manager

Inflation Process Map



Inflation Maintenance

Definition:

Cold pressure is defined as pressure measured from.

- Any tyre taken from stock and fitted, but not in operation.
- Any equipment parked for at least 8 hours without an external heat source.

Hot pressure is defined as pressure measured from:

- Any tyre that is fitted on a machine and that machine is being utilised in production.

Incorrect pressure is defined as:

- Cold pressure below or above the recommend cold pressure setting.
- Hot pressure below recommend cold pressure or 25% above recommend cold pressure setting.

Contributing Factors:

1. Exceeding the tyres TKPH.
2. Overloading or incorrect loading.
3. Under inflation.
4. Incorrect compressor size.
5. Uncalibrated pressure gauges or master gauge.
6. Poor inflation maintenance.
7. Defective or incorrectly matched rim components.
8. An external heat source.
9. Defective tyre.

Cold Recommend Pressure			
0%	**75%**	**100%**	**125%**
Dangerously underinflated	**Underinflated**	**Correctly inflated (slight variance due to ambient temperatures)**	**Dangerously overinflated**

Important Notes:

1. **Tyres that are fitted on rims should be stored at a pressure of 10 Psi.**
2. **Tyres should only be fully inflated whilst fitted on the machine, or by being restrained by an approved restraining device, for example:**
   - **Tyre cage.**
   - **Tyre handler.**
   - **Tyre removal machine.**

Definition:

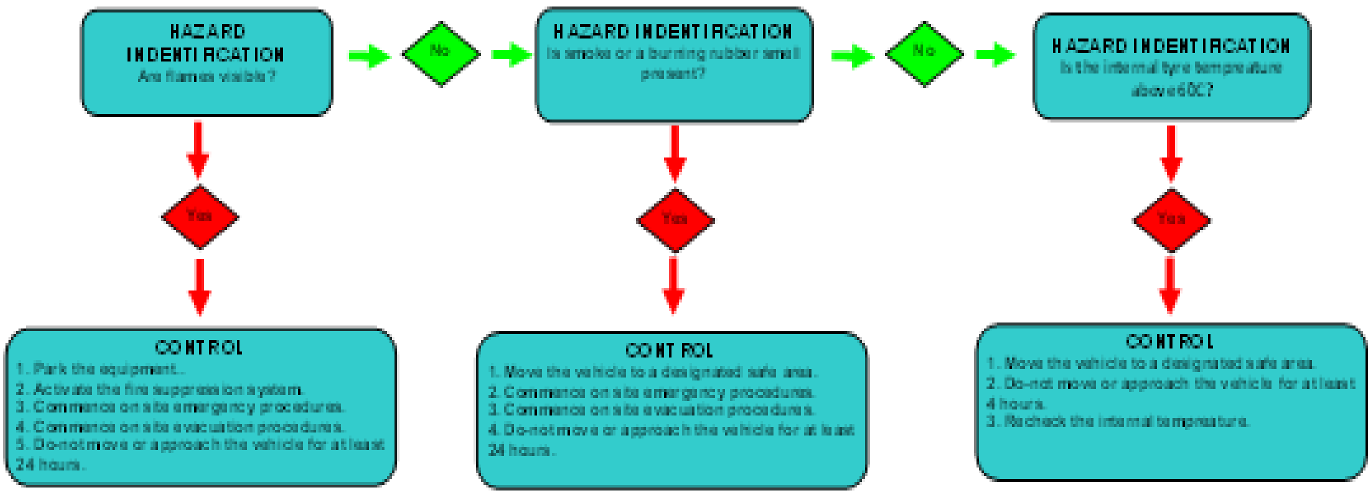
Excessive heat is present if one or more of the following occur:

- A burning rubber smell.
- Smoke.
- An internal tyre temperature above 60° C.
- Sticky rubber between the lugs.

Contributing Factors:

1. Exceeding the tyres TKPH.
2. Welding on the rim with a tyre fitted (can be done, but the tyre must be fully deflated).
3. Contact with power lines, or a lightning strike.
4. Brakes locking on or excessive braking force.
5. Overheating of drive axle components.
6. Internal tyre fire.

Process Map



Important Notes:

Internal temperature should not be checked if there are visible signs of heat present, assume the internal temperature is above 80° C.

Electrical Contact

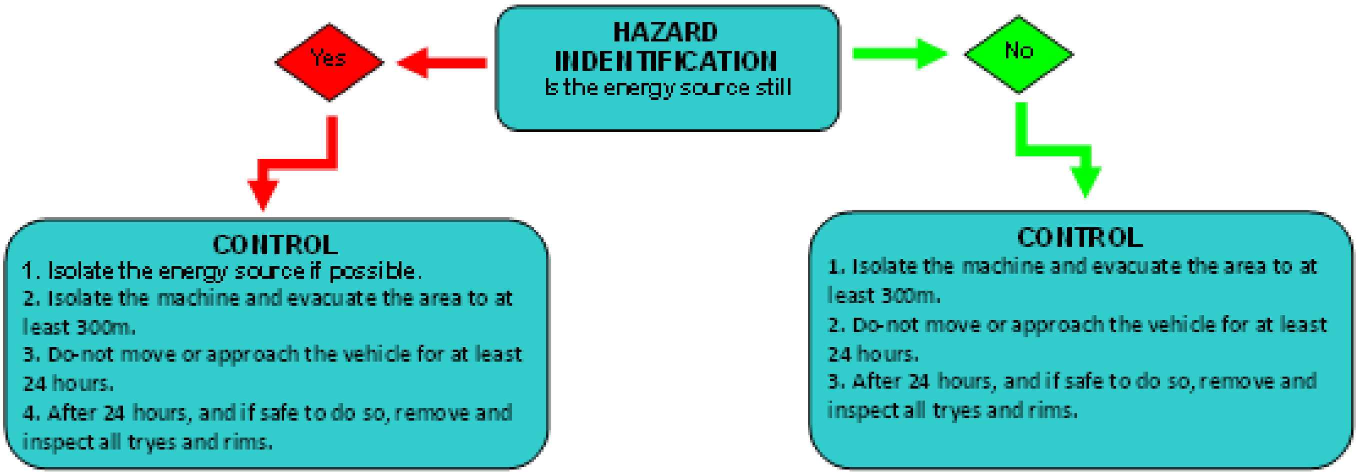
Definition:

Direct or indirect contact with an electrical source, for example overhead power lines or a lightning strike.

Contributing Factors:

1. Working during a thunder storm.
2. Operating within the distance of power lines (this includes arcing).

Process Map



Important Notes:

1. **Be aware that electricity can arc.**

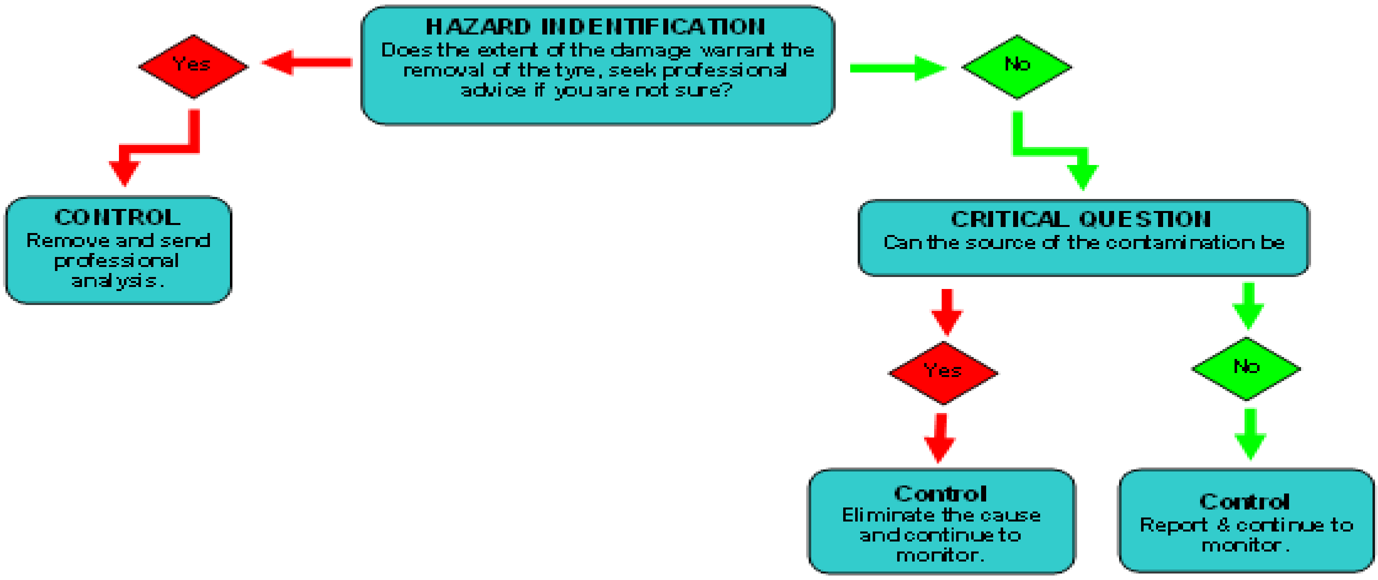
Definition:

External damage caused to the tyre by contact with hydro carbon substance, for example petrol, diesel etc.

Contributing Factors:

1. Leaking final drives.
2. Contaminated equipment, for example a leaking tyre handler or dirty equipment.
3. Wrong lubricants used for fitment.
4. Poor housekeeping.

Process Map



Important Notes:

1. **Chemical degradation is not normally repairable.**
2. **Ensure that the tyres are clean before fitment.**

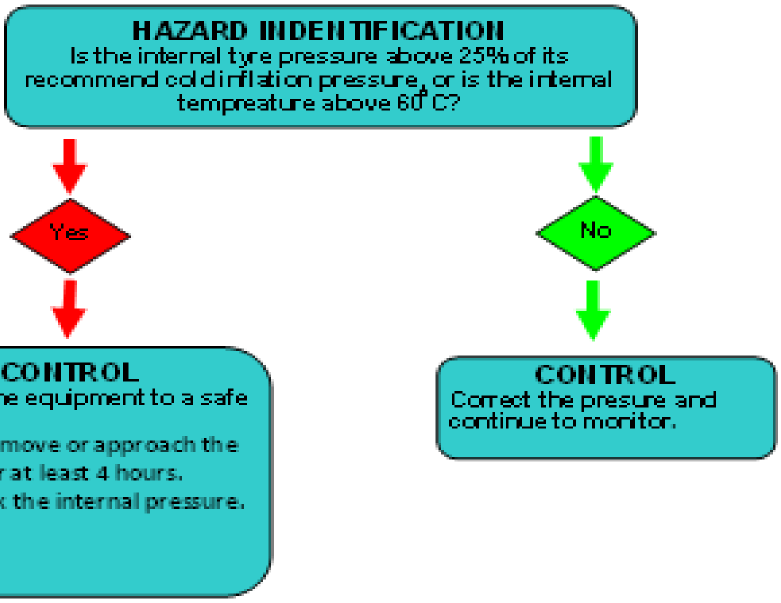
Definition:

Hazardous pressure is when there is a pressure variance of more than 25% of the tyres cold pressure.

Contributing Factors:

1. Exceeding the tyres TKPH.
2. Overloading or incorrect loading.
3. Under inflation.
4. Defective rim components.
5. An external heat source.

Process Map



Important Notes:

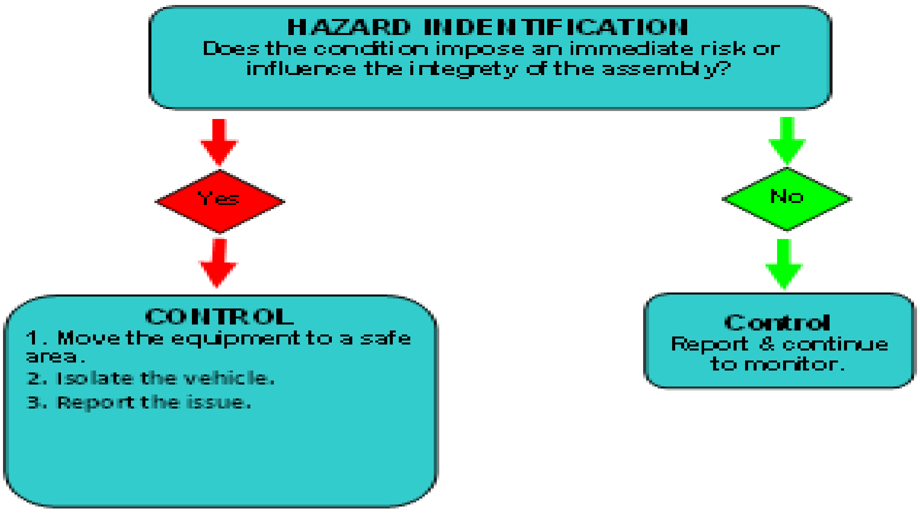
1. **Always seek professional advice if you are not sure what the pressure or internal temperature is.**

Definition:

Irregularities are classed as anything that could or has affected the integrity of the tyre, for example:

- Tyre bubbles.
- Cracked wheel components.
- Foreign objects protruding for the tyre.
- Worn lock ring or lock ring groove.
- Visible casing cords.
- Broken or missing wheel studs or nuts.
- Signs of excessive heat.
- Welding with the tyre still fitted and inflated.

Process Map



Important Notes:

1. **Tyres should be removed or at least the air removed, the bead broken and the O Ring removed before any welding can take place on the rim or the rim assembly or any related components.**