

# Take **TEN**

## for safety

### Multi-Piece Rims Controlling The Hazards



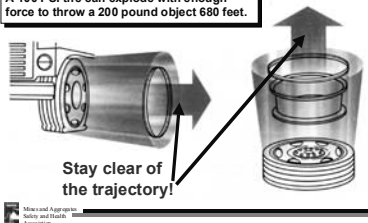
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### Program Leader's Notes

Every year accidents and fatalities occur caused by tire and rim explosions. This short program has been prepared specifically for MASHA's member companies using heavy equipment in underground mines, pits and quarries to help employees understand and control the hazards involved with pressurized tires mounted on multi-piece rims.

#### Multi-piece Rims

A 100 PSI tire can explode with enough force to throw a 200 pound object 680 feet.



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**Trajectory**...a technical term meaning the flight path of an object which has been launched into the air by force. A plane's flight has a trajectory. So does an arrow or a bullet. But the important trajectory we're talking about here is the path which a lock ring or flange will take when exploded off a multi-piece rim.

#### Multi-piece Rims



**20%**  
of all exploding  
tire or rim  
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20% of all exploding tire or rim accidents are fatal. Underinflation, damage, wear, heat, overloading, improper maintenance and assembly...all of these can be factors in a potentially fatal failure of a tire or rim. 100 psi of air pressure in a tire creates the equivalent of 40,000 pounds of force on the outer lock ring or flange. In one fatality a mechanic was driven 30-feet across the shop by the force of an exploding rim.

#### Multi-piece Rims



Multi-piece rims are made in several different styles. Parts from different models or manufacturers are not interchangeable. Part numbers are stamped on each component.

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Multi-piece rims are made in many different styles and configurations. Parts are marked with identifying numbers which must be matched according to the manufacturer's directions. These parts are not interchangeable. A rim assembled from mis-matched components is lethally dangerous.

## Multi-piece Rims

Manufacturers publish charts for their multi-piece rims showing which components may be used together to build or repair a rim.

Using incorrect parts may cause a rim explosion.



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## Multi-piece Rims



### Operators should inspect tires and rims for:

- Flat, soft, cut or worn tires
- Excessive rust or cracks
- Bent, broken, worn parts
- Worn, damaged, elongated bolt holes
- Worn, damaged, loose, missing lug nuts
- Bent, stripped studs

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## Multi-piece Rims

Tires with less than optimum air pressure are very dangerous. Flanges and lock rings may become loose enough to explode off the assembly and injure anyone within the trajectory.



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## Multi-piece Rims

A tire must be completely deflated by removing the valve core and making sure the core is clear of obstructions before taking it off the vehicle or machine. Stay out of the trajectory of rim parts during this procedure.



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## Multi-piece Rims

Tires with 80% or more of their recommended pressure may be inflated if:

remote control chucks and gauges are used and...

no worker is within the trajectory.



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All manufacturers of multi-piece rims publish charts showing the part numbers of rim, flange and lock-ring components which correctly go together to build or repair a rim. Failure to follow these directions may result in an unsafe, hazardous situation when a tire is mounted and pressurized.

Any or all of these conditions may make a rim and wheel assembly weak and prone to explode or break away from the machine or vehicle on which it's mounted. Finding these conditions isn't just for the professional mechanic. All operators should include tire/rim/wheel assembly condition in the "walk-around inspection" before starting every shift.

Tires with less than optimum air pressure are very dangerous. Though there may not be enough pressure to keep a flange and lock-ring in position, there still may be enough pressure available to blow these loose components off the assembly and injure anyone within the trajectory. All tires should be deflated before transporting them.

The only **safe** tire/rim assembly is one that is completely deflated to a zero-pressure state. This can be done safely by staying out of the trajectory zone while reaching around the rim to push in the air release in the stem. Once the air flow has stopped, the valve core must be removed with the appropriate core tool. Experts recommend inserting a short piece of wire through the empty valve stem to make sure there are no internal obstructions to the air flow.

Tire and rim assemblies become dangerous with less than working-level air pressure to hold flanges and lock-rings securely in place. **Manufacturers state the lowest limit for safely inflating a tire is at 80% of recommended pressure and then only if:**

- a remote control valve and gauge are available to keep the operator outside of the trajectory zone and...
- no other worker is within the trajectory.

Tires with less than 80% working pressure should be safely deflated and serviced.

## Multi-piece Rims

Tire and wheel maintenance and repair should only be done by qualified technicians using proper safety equipment and accepted procedures.



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Professional, trained mechanics have a set of safety procedures for building or maintaining tire and rim assemblies. They also use specialized tools and equipment such as safety cages for containing an exploding tire or rim during initial inflation. For these reasons, tire and rim maintenance and repair should **never** be done by people who don't have the training, certification, tools or safety equipment for the job.

## Multi-piece Rims

A suspected defective tire or rim must be treated as a physical hazard capable of causing injury or death. Park the vehicle in a safe place limiting exposure to the tire/rim trajectory. Tag and lock it out of service. Barricade if necessary.



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A damaged or defective tire or rim should be treated like a loaded gun. The vehicle should be parked right away in a safe location where there is no chance for anyone to walk or stand within the trajectory range. Flagging tape and even barricades should be erected if there is any chance of someone entering the danger zone. Vehicle controls should be tagged and locked out to prevent someone from inadvertently starting and moving the hazardous equipment.

## Multi-piece Rims

Pyrolysis (high energy, heat-related tire failures) caused by:

- welding on a wheel or rim
- using a cutting torch on a wheel or rim
- electricity from power lines or lightning
- vehicle, wheel or brake fires
- under-inflated tires
- vehicle gross overloading
- combustible contaminants inside the tire
- fuel or other chemicals spilled onto the tire

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Rubber is a well-known insulator which, when heat is applied, breaks down into flammable oil and gases in a process known as pyrolysis, the same method used to decompose old tires to reclaim their contents. Any source of heat may be sufficient to cause this breakdown to happen even in a small portion of a tire's tread or sidewall. The decomposition may not happen right away so a tire which has been exposed to heat may remain in an extremely dangerous state for hours or even days. The machine should be locked and tagged out of service and barricaded so no personnel can approach the danger area. After the quarantine period, the tire should be completely deflated in a safe manner and given professional service.

Remember that a vehicle or machine with an under-pressure tire or damaged or defective tire or rim endangers everyone who works on or near it and everyone it passes while in service.

Report any tire or rim defects you see on the job.

## Notes:

Here are some additional ideas to help you get your point across more effectively.

1. **Ask your mechanical department or tire supplier for an unserviceable damaged or worn out rim assembly for demonstration purposes.**
2. **Conduct a guided inspection of some tire/wheel assemblies from your own operation. Deflated and unmounted examples are the safest for the purpose and also provide an opportunity to see webs, mounting stud holes and other area where wear or damage may occur.**
3. **Review the following section on "sources" for further information on this subject.**

## Sources

To order additional copies of this MASHA program please mail or fax the attached coupon as directed.

**Technical and safety manuals, wall charts and posters** are available from major tire and wheel manufacturers such as *Firestone*, *Goodyear* and *Accuride*. Generally, there is no charge for these materials which are usually available through tire and wheel dealers and service centres.

## The Occupational Health and Safety Act for Mines and Mining Plants currently contains only the following regulations in Part V - Haulage.

107. (1) A motor vehicle in a mine shall be equipped with wheel chocks that comply with Society of Automotive Engineers Standard SAE J348 JUN90 "Wheel Chocks." O. Reg. 31/04, s.5.
- (2) The wheel chocks shall be used to block movement whenever the vehicle,
  - (a) is left unattended on a slope
  - (b) is being maintained or repaired. O.Reg. 31/04, s.5.
- (3) Despite subsections (1) and (2), an alternative means of blocking the movement of a motor vehicle in the circumstances described in subsection (2) may be used if the alternative means is developed by the employer in consultation with the joint health and safety committee or the health and safety representative, if any, for the workplace. O.Reg. 31/04, s.5.
- (4) Whenever work is to be performed on an energized rubber tire with a multi-piece wheel, a device shall be used to prevent injury to a worker. O.Reg. 31/04, s.5.
- (5) The device mentioned in subsection (3) is not required when topping off air pressure in a tire. R.R.O. 1990, Reg 854, s.107

## Pyrolysis

This term refers to a specific hazard which can develop when flammable or explosive gases build up inside a tire. This can be the result of chemical decomposition or if the vehicle's tires, rims or wheels have been overheated by the vehicle touching a high voltage power line. It can also be caused by overheated brakes, by heating seized components with a torch, by flame-cutting old studs or by welding. Some canned materials used to seal punctures or leaks from the inside of the tire may also produce explosive vapours. MASHA has a technical report available on pyrolysis.

## Accident cases

A worker was critically injured when he was struck by a solid tire ring which blew off a rim assembly. He was increasing the air pressure in a tire on a float trailer and sustained a broken left arm, broken right hand and a bruise to the left leg. The 57 cm. solid rim ring flew another 25 meters after hitting the worker.

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An 85-ton truck came close to a 138,000 volt line with its box elevated. The truck traveled for about 1,000 feet before the operator got out to look at the tires. Another worker called the driver away to a safe point after the first tire blew up and before the rest of the six tires exploded at 20-second intervals. The truck was seriously damaged by the explosions and some rim assembly components were found as far as 100 feet from the truck.

One employee was killed and another received a broken arm while inflating an underground tractor tire at an Ontario mine. The multi-piece rim components became loose when the tire was flat and came apart as the tire was being inflated. The worker who was standing in front of the tire was hit and killed by the wheel assembly when the tire, lock ring and side ring jammed under the fender of the tractor.

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Two mechanics were replacing the driver-side outside dual tire on a haulage truck. The tire was normally inflated to 95 psi. They were getting ready to install the unit when they heard air leaking from the inside tire. One mechanic left for the shop to get sealing materials for the leak leaving the second man standing in front of the assembly. Suddenly, the lip on the rim base holding the lock ring separated and the tire and rim exploded firing parts at the mechanic. The force threw him approximately 30 feet where he landed on a concrete pad. He died 13 days later from injuries received in the accident.

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A welder was welding a tire/rim assembly to modify the single wheel unit to a dual wheel assembly for a 25-cubic-yard scraper. The tires were inflated. The victim was sitting inside the rim and was welding the last of 36 gussets when one of the two tires exploded. The welder was thrown 15 feet to land against a parts trailer against which he was fatally crushed by the tire and rim assembly also thrown by the explosion. Another worker was thrown about 45 feet out of the shop by the same explosion but, fortunately, received no injuries. The force caused the second tire's rim to explode firing the outer rim flange 60 feet away.

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# Tire and Rim Safety Awareness Program

The U.S. Department of Labor, Mine Safety and Health Administration, has posted this extensive part of The Instruction Guide Series in PDF format for free download from the following Internet web site: [www.msha.gov/s&hinfo/ig60.pdf](http://www.msha.gov/s&hinfo/ig60.pdf)

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