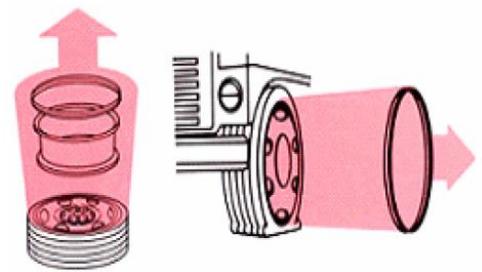




MICHIGAN STATE UNIVERSITY: Prevention of work-related injuries & illnesses through research & investigation

WORK-RELATED FATALITIES WHILE PERFORMING RIM WHEEL SERVICING

From 2011-2018, five workers were killed in Michigan by exploding tires while servicing wheel rims and inflating truck or tractor tires. A rim wheel is the component assembly of wheel (either multi-piece or single-piece), tire and tube, plus other components. A single-piece rim wheel is a vehicle wheel or rim consisting of one part, designed to hold the tire on the rim when the tire is inflated. A multi-piece wheel is a vehicle wheel consisting of two or more parts, one of which is a side or locking ring that holds the tire and other components on the rim wheel by interlocking the components when the tire is inflated.



Graphic Courtesy of the Massachusetts FACE program, [FACE Facts](#)

NARRATIVES OF WORK-RELATED FATALITIES WHILE SERVICING WHEEL RIMS IN MICHIGAN

- A certified diesel mechanic in his 20s died when he was struck and thrown five feet by an exploding rim of a tractor-trailer tire. After removing an old tire, the decedent mounted a replacement tire on a 3-piece rim manufactured in 1960 and propped it against the frame of an overhead door. While filling the tire, he knelt down in front of the tire, filling a few pounds of air at a time. The gauge of the air compressor he was using read 190 psi, far above the recommended pressure.
- A male maintenance worker in his 40s died when he was struck in the neck by the outside portion of an exploding multi-piece tire rim while he was inflating a flat driver's side front tire on a front end loader. While the tire was on the machine, a bottle of "Green Slime" tire leak sealant was placed in the tire as well as an ether-based starting fluid. One of the crew members lit the starting fluid with a hand-held propane torch, which caused the tire to expand and seat against the wheel bead. The decedent used an air hose without a clip-on chuck. While filling the tire, the tire and the outside portion of the multi-piece rim blew off propelling him approximately 10 feet from the loader.
- A male tire company service technician in his 20s died when he was struck in the head/neck by the tire/rim, while positioned over and servicing a manure spreader tire he had removed and placed flat on the ground. To fill the tire, he used an air compressor set at 180 psi. While filling the tire, either the inter-tube or the tire burst, causing the rim on the bottom to slip past the tire. The escaping pressures caused the tire/rim to launch straight up, striking him in the neck, head and shoulder area. Both the tire and the decedent's body were found several feet away from the mat.
- A male dairy farm maintenance shop laborer in his 40s died when he was struck in the chest/neck/face by a non-seated, pressurized, tubeless, 16-inch diameter tine rake tire laying on the ground that he was trying to seat with a hammer. Two of the decedent's coworkers had made several unsuccessful attempts to seat the tire bead on the rim; cleaning the bead, adding a sealant, placing approximately 34 psi of air into the tire, using soapy water from a spray bottle, hitting the tire with a hammer, and picking up the tire and dropping it many times. The decedent unsuccessfully tried to seat the tire by dropping the tire several times. After a hammer strike, the tire explosively separated from the rim and propelled upward.
- A male truck driver in his 60s who was standing directly in front of a tire, died when the sidewall of the tire failed and released pressurized air, propelling him 12 feet from the tire onto a concrete floor. Two mechanics, after unsuccessful attempts to inflate a flat inside left trailer tire, used a jack to raise the rear of the truck. After several more unsuccessful attempts, the mechanics removed the outside tire. Using a bead-seating tool, they seated the tire, but could hear air leakage. A piece of metal was found in the tire tread. Mechanic #1 was positioned to the right of the tire. The decedent was in front of the tire and to the left of Mechanic #1 when the sidewall of the tire failed.

PREVENTING WORK-RELATED FATALITIES WHILE SERVICING WHEEL RIMS

- **First** remove the valve core and completely deflate the tire before demounting it from the vehicle:
 - When the tire has been driven underinflated at 80% or less of its recommended pressure.
 - When there is obvious or suspected damage to the tire or wheel components.
- **Before** mounting and inflating a tire, ensure the mating surfaces of the rim gutter ring are free of any dirt, surface rust, scale, or rubber buildup. **Ensure** the tire is properly sized for the rim. A rubber lubricant **must** be applied to the bead and rim mating surfaces when assembling the wheel and inflating the tire unless the tire or wheel manufacturer recommends against its use.
- **Before** assembly, inspect all wheel components. **DO NOT** use rims, rim bases, side rings, or lock rings that are bent out of shape, pitted from corrosion, broken, or cracked and **DO NOT** attempt to repair them by welding, brazing, or other forms of heat. The defective components are unusable for tire mounting and should be discarded.
- **DO NOT** interchange multi-rim wheel components except as permitted by “Multi-piece Rim/Wheel Matching Chart” publication or “Safety Precautions for Mounting and Demounting Tube/Type Truck Tires,” as revised January 1978 (see below).
- When inflating tires, use a restraining device, such as a tire cage, meeting regulatory standards. Watch and listen for signs that might indicate a zipper failure.
 - Consider marking a safety exclusion zone on the workshop floor as a reminder to staff.
 - **Do Not** permit workers to rest or lean any part of his/her body, or equipment, on or against the restraining device.
- Tires may be inflated without being constrained by a restraining device when:
 - The wheel assembly is on a vehicle
 - If remote control inflation equipment is used and no employees remain in the trajectory path during inflation when:
 - Tires are underinflated, but have more than 80% of the recommended pressure.
 - Tires are known not to have been run underinflated.
- Use a clip-on chuck with a sufficient length of hose so a worker can stand clear of the potential trajectory of the wheel components and an in-line valve with a gauge or a pressure regulator preset to the desired pressure.
- **Do NOT** exceed 3 psi when partially inflating a tire without a restraining device when attempting to seat the lock ring or to round out the tube.
- During assembly of the tire and wheel, apply only industry-accepted tire lubricant to the bead and the rim mating surfaces. **DO NOT** use flammable materials to assist seating the tire.
- Inspect tire rim and rings after tire is inflated while tire is in the restraining device to assure they are properly seated and locked. If further adjustment is necessary, the tire must be deflated by removing the valve core before the adjustment is made.
- **DO NOT** attempt to correct the seating of side and lock rings by hammering, striking, or forcing the components while the tire is pressurized.
- Employees **MUST** receive training and their ability evaluated to service rim wheels safely. Additional training must be provided when necessary to maintain proficiency.

DID YOU KNOW?

- A 20-inch tire inflated to 100 psi can contain up to 40,000 pounds of explosive force.
- A tire used while flat or under-inflated can damage ply cords in the sidewall of the tire. When the tire is inflated, the ply cords may break, which can then stress and break adjacent cords. The failures continue and can cause a “zipper” failure – the tire bursts suddenly and violently.
- MIOSHA Part 72 applies to servicing single piece wheel rims used on vehicles such as trucks, trailers, buses, and off-road machines with a tire-inflation pressure of 45 psig or greater. It does not apply to single-piece rim wheels used on automobiles and light-duty trucks or vans utilizing automobile tires.

Resources

- MIFACE Investigation Report #17MI007: Truck Driver Died After Being Thrown Back by Air Release from a Pressurized Tire Sidewall Failure
- MIOSHA Standard Part 72. Automotive Service Operations.
https://www.michigan.gov/documents/lara/lara_miosha_GI_72_422576_7.pdf
- OSHA Resources
 - Standard 1910.177: Servicing multi-piece and single piece rim wheels.
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9825
 - OSHA Publication 3421-10R 2014: Demounting and Mounting Procedures for Tubeless/Tube-Type tires + Multi-Piece Rim Matching Chart.
<https://www.osha.gov/Publications/wheel/wheel-chart-booklet.pdf>