TAYLOR®

Tire, Wheel & Rim Assembly SAFETY GUIDE

& Maintenance Practices

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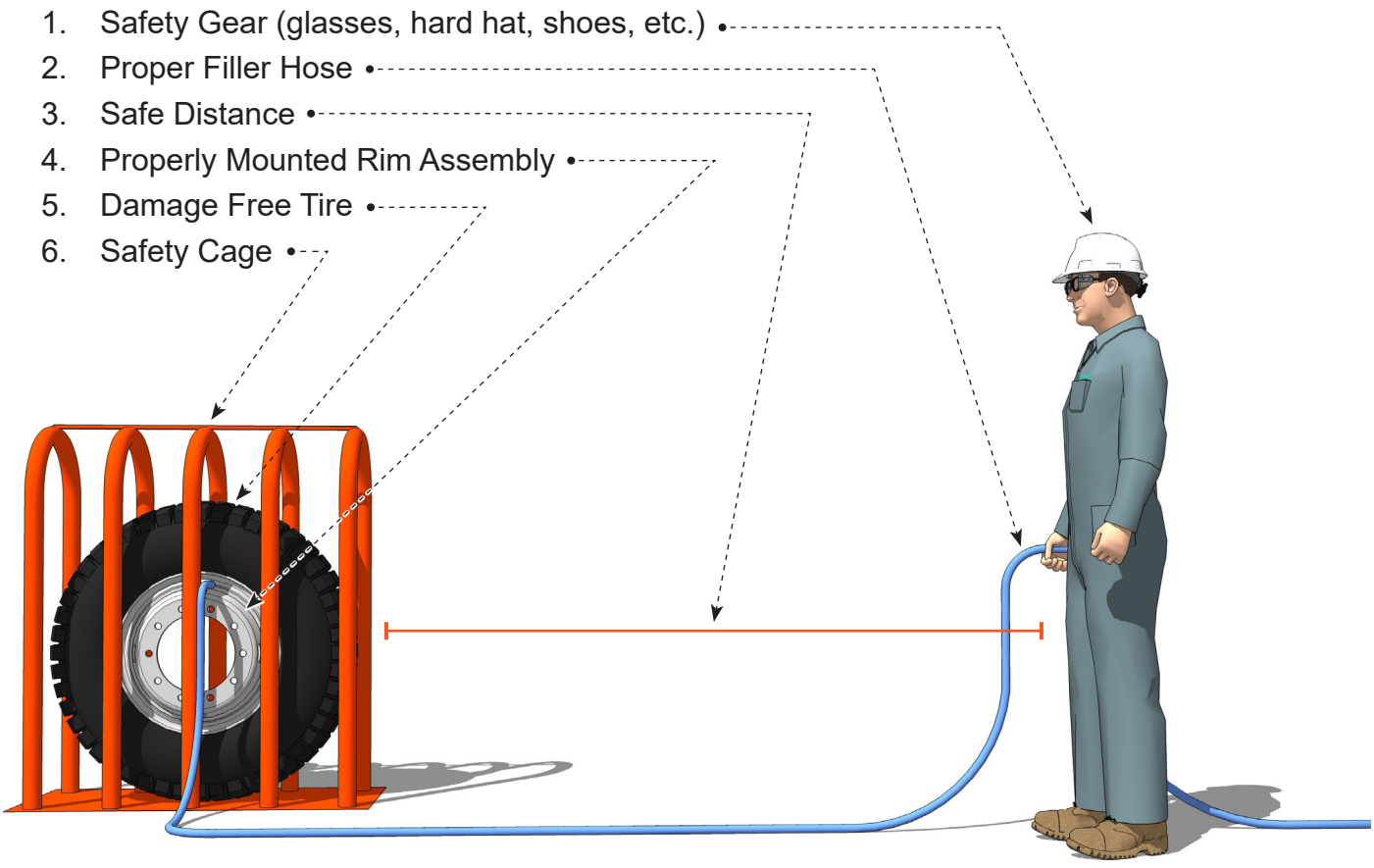


Tire, Wheel, and Rim Assembly Maintenance Practices

⚠WARNING : Death or serious injury can occur from improper training. Follow OSHA rules and regulations, all employer procedures and safety instructions, safety instructions in "Safety Check", and all procedures and safety instructions in your Taylor truck's "Maintenance Manual". Under no circumstances should anyone service, mount or demount tires without proper training as required in OSHA 29 CFR 1910.177 - Servicing multi-piece and single piece rim wheels.

Tires and multi-piece wheel assemblies (sometimes called rims or rim assemblies) are all part of the powertrain system for off-road mobile equipment including powered industrial trucks such as Taylor forklifts and other material handling trucks. All the driveline forces, brake forces, turning forces, as well as the dynamic forces from the road surface must be supported by and transmitted through the tires and wheels. Like other driveline components, wear and tear of the parts occur with normal use. Tires and wheels are open to harsh environments as well. Further, mechanical damage occurs through normal use and through misuse.

To achieve the maximum useful life of these components and to avoid downtime of the equipment, the tires and wheel assemblies must be part of a consistent and detailed inspection procedure. There are also important safety considerations when performing tire and wheel service. This document provides guidance and reference materials which can be used to establish inspection procedures and to inform the user of these important safety considerations.

Tires and multi-piece wheel assemblies require additional training beyond forklift operator training and general forklift maintenance training. OSHA recognizes the expertise required as evidenced by dedicated regulations in 29 CFR 1910.177 - Servicing multi-piece and single piece rim wheels.

Safety First!

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Wheels and Rims

The wheels provide attachment means between the tire and the drive axle or steer axle hub. Wheels come in various types, from single-piece wheels (or rims) to multi-piece rim assemblies consisting of a differing number of components depending on type and application.

Never attempt to weld on an inflated wheel or rim assembly. Do not under any circumstances, attempt to rework, weld, heat or braze any rim components that are cracked, broken, or damaged. Replace with new parts, or parts that are not cracked, broken, or damaged, and which are of the same size, type and make.

Mixing parts of one manufacturer's rim components with those of another is dangerous. Always check with the manufacturer for approval before replacing individual rim components.

Inspect the wheel studs daily. Inspect for missing or damaged components daily. Damaged or missing wheel studs, nuts or clamps indicates possible damage to the wheel assembly components or improperly torqued wheel nuts.

⚠WARNING : If any single wheel stud has broken, a significant reduction of the wheel's total clamping force will be lost. Remove machine from service and repair immediately.

Do not use undersized wheels. Use only the recommended tire matched for the wheel. Consult your Taylor authorized dealer for proper matching of tire and wheel assemblies.

Tires

Tires represent one of the major direct expenses of off-road equipment. To maximize useful tire life, refer to your tire manufacturer's maintenance and operation literature for proper maintenance and repair. Tire OEM's offer useful information covering off-the-road (OTR) tire maintenance that can apply to all brands of tires.

Check the tires and valve caps daily for any damage.

The tire pressure should be checked daily. Refer to the serial data plate, located on the truck, for proper tire inflation pressure. Consider using a Tire Pressure Monitoring System (TPMS) which is provided as an option on many Taylor models of equipment.

Keep tires free of grease and oil. Grease and oil are highly damaging to tires. If grease or oil are allowed to remain on tires for extended periods of time, rubber deterioration will occur.

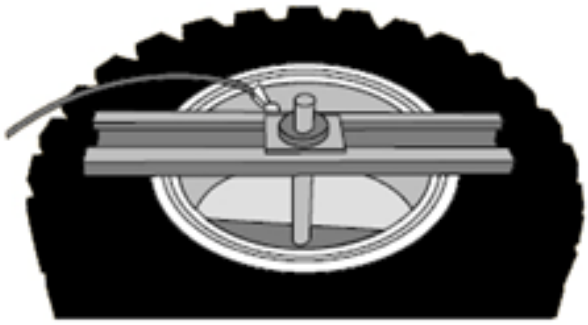
Tire assemblies operated as a dual pair must have the same outside diameter, be from the same manufacturer, be of the same type (industry code), and be of the same construction (both bias or both radials). Never mix bias and radial constructions on a dual pair.

Tire Inflation

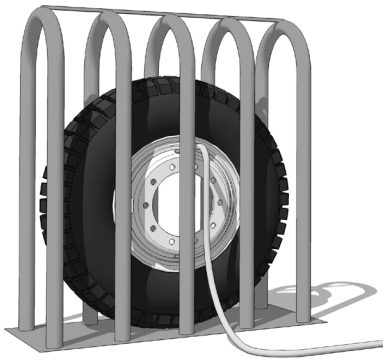
⚠WARNING : Improper tire inflation pressures can lead to tire and wheel assembly failures. Maintain proper tire inflation pressures according to the manufacturer's specifications. Refer to the machine's data plate, maintenance manual or contact your Taylor authorized dealer for correct tire inflation pressure.

Ensure you know the proper tire inflation pressure for both the tire and the wheel assembly. Ensure the tire and wheel assembly are properly matched for the inflation pressure.

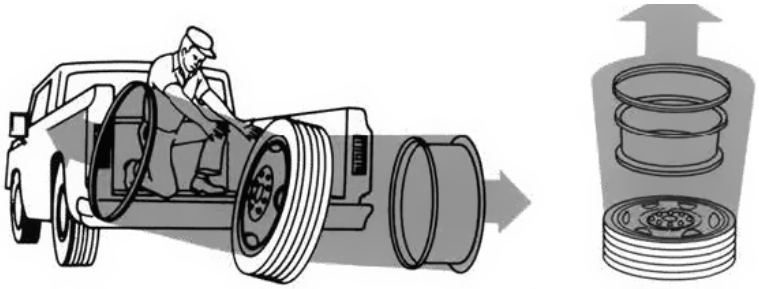
Inflation equipment must have a filter to remove moisture and dirt from the supply line. This will help reduce the likelihood of rusting and corrosion.



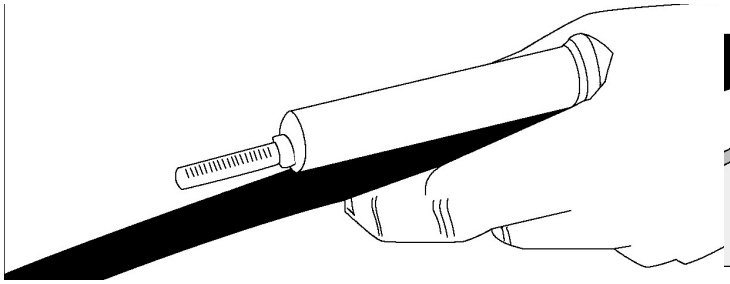
Tire Restraining Device



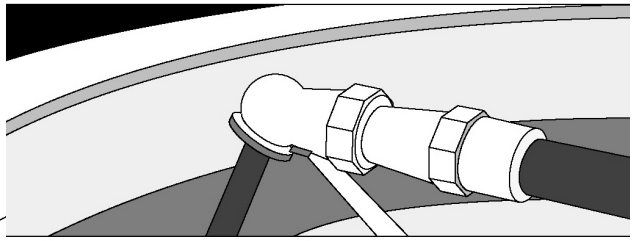
Tire Safety Cage



Trajectories of Exploding Rim Parts



Remote Valve/Gauge: A remote in-line valve and gauge that both inflates and deflates



Clip-on Chuck

During inflation, improperly assembled, mismatched or damaged components may fly apart with deadly, explosive force. The tire and wheel assembly must be placed in a safety cage or equivalent restraining device, or bolted on the machine and positioned behind a barrier*. All personnel must stay out of the trajectory when inflating a tire. Never sit on or stand in front of a tire and wheel assembly being inflated. Always use a clip-on chuck and make sure the inflation hose is long enough to permit the person inflating the tire to stand to the side of the tire, not in front or behind the tire assembly.

**NOTE: A barrier is defined by OSHA as fence, wall or other structure or object (such as a large piece of mobile equipment) placed between a tire and wheel assembly and the personnel during tire inflation, to contain the components in the event of the sudden release of the contained air of the tire and wheel assembly.*

After tire inflation, the tire and wheel components must be inspected while still within the restraining device to make sure that they are properly seated and locked. If further adjustment is necessary, the tire must be deflated before adjustments are made.

Handle inflated tire and wheel assemblies only when they have been properly assembled and inspected. Always stay out of the potential trajectory of exploding parts. Do not handle inflated tire and wheel assemblies which have not been in your control.

Over-inflation - Over-inflation results in high tire cord stress even when the tire isn't overloaded. Stress reduces resistance to blowouts from impacts. Stress also increases the danger of the tire being cut by resulting in less flexibility. The problem can be compounded by poorly maintained working terrain.

Under-inflation - An under-inflated tire will deflect too much. Under-inflation also leads to excessive sidewall flexing. It is very important that each tire have the correct air pressure. On trucks with dual pairs of tires, under-inflation results in one tire carrying more of the load than the other. Excessive flexing of an under-inflated tire in a dual pair could also lead to the underinflated tire rubbing the other tire which then could lead to premature tire failure. Tires exhibiting radial cracks indicate continuous under-inflated operation. Other under-inflated indications include the following:

1. Spotty or uneven tread wear
2. Ply separation
3. Loose or broken cords inside the tire
4. Fabric carcass fatigue

Mounting Tires to Wheel Assemblies

⚠WARNING : **Under no circumstances should anyone service, mount or demount tires without proper training as required in OSHA 29 CFR 1910.177.**

Do not be careless or take chances. If you are not sure about the proper mating of rim and wheel parts, consult a wheel and rim expert. Mixing parts of one manufacturer's rims with those of another is dangerous. Always check with the manufacturer for approval.

Do not seat rings by hammering while the tire is being inflated. If a part is tapped, the part or the tool can fly out with explosive force.

MD type lock ring notch tabs must be out (facing you).

Do not inflate the tire before all side and lock rings are in place. Double check to make sure all components are properly seated. Refer to the Taylor Maintenance Manual for component identification and orientation. Check components for proper assembly a second time after inflating to approximately 5 psi (34.5 kPa). Refer to the section, "Tire Inflation" for important information before inflating the tire after mounting.

Demounting Tires from Wheel Assemblies

⚠WARNING : **Death or serious injury can occur from mistakes made due to improper training. Under no circumstances should anyone service, mount or demount tires without proper training as required in OSHA 29 CFR 1910.177. This is Federal Law.**

Do not let anyone mount or demount tires without proper training as stated in OSHA Rules and Regulations 1910.177 "Servicing multi-piece and single piece rim wheels." Do not be careless or take chances. If you are not sure about the proper mating of rim and wheel parts, consult a wheel and rim expert.

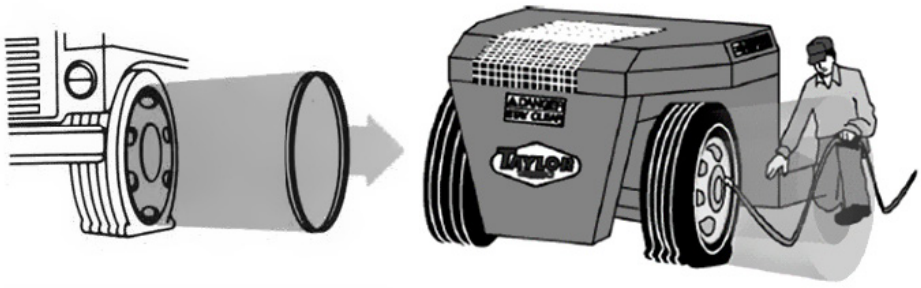
Whenever you demount a tire from the wheel assembly, ensure the tire is completely deflated by removal of the valve core before attempting to demount the tire. Check the valve stem by running a piece of wire through the stem to make sure it is not plugged.

Demounting tools apply pressure to rim flanges to unseat tire beads. Keep your fingers clear. Slant the demounting bead tool about 10° to keep it firmly in place. If it slips off, it can fly with enough force to kill. Always stand to one side when you apply hydraulic pressure.

Never force or hammer rim components. If it is necessary, to tap uninflated wheel components together, use rubber, lead, plastic, or brass faced mallets.

Servicing Tire and Rim on Vehicle

⚠WARNING : **Death or Serious injury can occur due to a runaway truck or from improperly securing the truck during service. Always properly secure the vehicle with wheel chocks and cribbing before performing any service.**



Trajectories of Exploding Rim Parts

Before removing a tire and wheel assembly from the axle or hub, always exhaust all air from a single tire and from both tires of a dual assembly prior to removing any wheel components such as lug nuts and rim clamps. Do not stand in front of the tire during deflation. Make sure to remove the valve core to exhaust all air from the tire. Remove both cores from a dual assembly. Check the valve stem by running a piece of wire through the stem to make sure it is not plugged.

The tire pressure should be checked daily. Refer to the serial data plate, located on the truck, for proper tire inflation pressure. Consider using a Tire Pressure Monitoring System (TPMS) which is provided as an option on many Taylor models of equipment.

If a tire has been driven underinflated at 80% or less of its recommended pressure, or if there is any obvious or suspected damage to the tire or wheel components, the tire and wheel assembly must be deflated, removed and inspected before returning to service. Allow only a trained tire specialist to service the tire.

A tire which has been driven underinflated but has more than 80% of its recommended pressure, and has no obvious or suspected damage, may be inflated while the wheel is on the vehicle provided remote inflation equipment is used and no personnel remain in the parts trajectory during inflation.

Block the other tires of the vehicle before you place the jack in position. Regardless of how hard or firm the ground appears, put hardwood blocks under the jack. Always crib up vehicle with blocks just in case the jack should slip.

Wheel components are heavy and bulky. Some parts are large enough to require lifting devices. If parts can be handled manually, and when removing the bead seat band, side ring, lock ring, etc., proceed slowly to prevent parts from dropping off and crushing your toes. Support the parts on your thigh and roll it slowly to the ground. This will protect your back and toes.

When using a cable sling, stand clear; it might snap and lash out.

Tire and Wheel Jacking

⚠WARNING : Industrial trucks, tires, wheels and service tools are all large, bulky and heavy objects. Improperly handled, these heavy objects can fall and cause severe injury, property damage or even death. Follow safe maintenance practices. Never get under, near or between heavy objects that are supported only by a jack or hoist.

Never rely solely upon jacks or hoists to support the lift truck while removing tires and wheels. Always place oak or other hardwood block cribbing under the load after the jack or hoist has lifted the load. Make sure the cribbing is large enough to have sufficient contact with the supported load to be stable. Before placing jack in position, block tire and wheel on the other side of the truck.

Wheel Nut Torque

Tire and wheel assemblies require a run-in period. The dynamic forces experienced by wheel nuts, fasteners, clamps, etc. can cause redistribution of the clamping forces (torque) which requires checking and re-torqueing to stabilize. The torque of the wheel nuts must be checked every 10 hours of operation until the components are fully seated and the torque stabilizes.

Perform the Torqueing Procedure prescribed in the Taylor Maintenance Manual to tighten the wheel nuts of each hub each time tires are removed from the drive or steer axle.

In general:

1. There is a specific pattern of torqueing the wheel nuts which evenly applies clamping force to the rim components. Refer to the Taylor Maintenance Manual.
2. Repeat torqueing procedure until none of the wheel nuts move and the proper torque value has been applied to each wheel nut.
3. The torqueing procedure requires several repetitions after short periods of service (10 operations hours) for the wheel nuts to maintain proper torque value.

Compressor Precautions

There have been instances of tires failing and exploding violently while on vehicles. The forces involved in this type explosion are great enough to cause serious personal injury to anyone in the immediate vicinity. Some of these explosions are believed to have been caused by flammable vapors entering the tire during inflation. During operation, the temperature of the air and vapor mixture inside the tire will increase. The temperature inside the tire will also increase with an increase in ambient temperature and when subjected to direct sunlight. If the vapor and air mixture inside the tire are within the ratio limits that will support combustion, and any of the above heat increasing factors cause the temperature to rise, an explosion may occur.

The following are some warnings that can prevent flammable vapors from entering the compressor and subsequently being entrapped in tires:

Do not locate the compressor in the same space used for storing flammable solvents, paints, thinners, etc. The flammable vapors will be sucked into the compressor intake while the compressor is charging. Do not locate the compressor near a battery charger. Batteries emit hydrogen gas, which is highly flammable, during the charging process, and could be sucked into the compressor intake.

Do not clean the compressor air filter with a flammable solvent. Use a non-flammable solvent, such as carbon tetrachloride.

Do not use alcohol, methanol, or other flammable agents in the compressor to prevent freezing of the condensation inside the compressor. Drain the compressor tank frequently or locate the compressor inside to eliminate the freezing problem.

Truck Operation

Events which lead to damaged components most often occur during operation of the equipment, and many of these events can be avoided through attention to surroundings and ensuring the equipment is operated as outlined in the Operators Guide and Safety Check. The guidelines below must be followed to avoid damaged components which, if not discovered during your tire and wheel inspection program, can lead to failure with little to no warning.

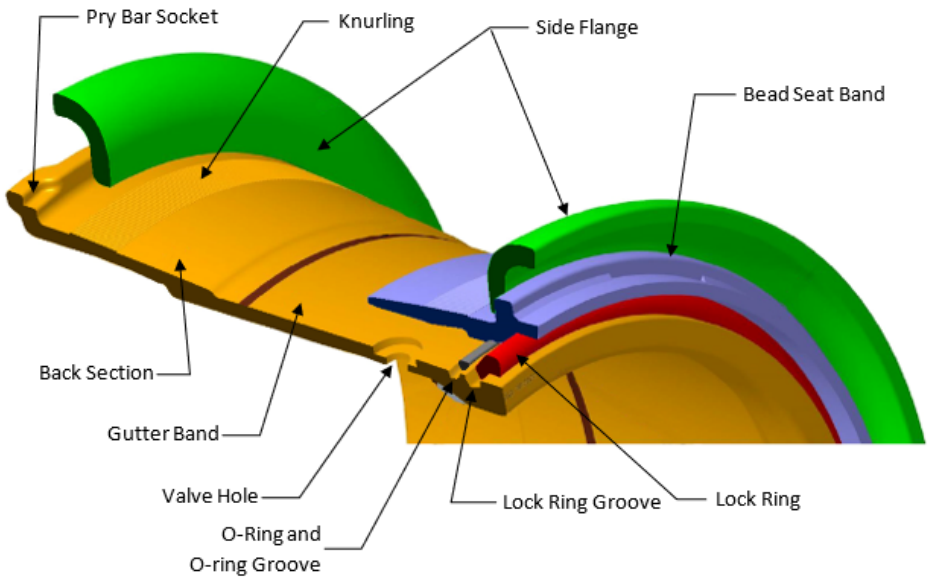
Never overload the truck. Misuse or overloading may not only result in injury to the operator or bystanders due to overturning and loss of control, but may cause damage to property, the truck and the truck's components including the tires and wheels. Only trained and authorized operators, who know lift truck capacity and safety rules, should be permitted to operate the truck. Refer to the truck's Capacity Plate, located in a protected area of the truck, for specific information concerning loading and capacity.

Never operate a vehicle on one tire of a dual assembly. The carrying capacity of the single tire and wheel is dangerously exceeded and operating a vehicle in this manner can result in damage to the tire and wheel.

Excessive turning of the steering axle tires, when the truck is stopped, should be avoided. It can cause excessive wear (flat spots) to develop.

Inspection

⚠WARNING : Mismatched, misassembled or damaged components can fail with deadly explosive force. Do not be careless or take chances. If you are unsure about the proper mating of rim and wheel parts or the condition of these parts, consult a wheel and rim expert.



Typical Five-Piece Wheel (Rim) Assembly Nomenclature

Any rim or rim component which is bent out of shape, pitted from corrosion, broken, or cracked must not be used. The component must be marked or tagged as unserviceable and removed from the service area and discarded. When part condition is in doubt, replace it with genuine Taylor parts.

Ensure that all parts correctly match the type of wheel being assembled. Check with the manufacturer if there is any doubt.

Rim bases, rim flanges, rim gutters, lock rings, and bead seat bands must be free of any dirt, surface rust, scale or loose, flaked rubber buildup prior to re-assembly. All dirt and rust must be removed from the lock ring gutter. Clean and repaint rims to stop the detrimental effects of corrosion.

Rims have a useful service life that is dependent on variables such as inflation pressure, duty cycle, yard conditions, and overloading. Although actual rim life will vary from one application to another, complete replacement after 10,000 hours or 10 years (whichever occurs first) of service life is recommended regardless of periodic inspection outcomes. These rims should be tagged as unserviceable and removed from the service area and discarded.

Inspection Frequency

Powered industrial trucks, such as forklifts, operate in a wide variety of applications. “One size fits all” DOES NOT apply to tires and wheels. Corrosive environments, extreme duty cycles, poor yard conditions, truck misuse, etc. can contribute to a situation where special inspections, inspection intervals, or replacement intervals are necessary. When in doubt, consult a tire and wheel expert.

In general, two types of inspections are necessary:

A. Daily Inspection
Visual inspection for damaged, mismatched or missing tire and wheel components must be part of your OSHA 29 CFR 1910.178 daily inspection. *Industrial trucks shall be examined before being placed in service and shall*

not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.

B. Detailed Inspection

Wheels, multi-piece rims and all rim components must be inspected before re-assembly each time the tire is removed from the rim. Regardless of service intervals, rims and all rim components should be disassembled, and each component inspected annually or every 3,000 hours.

Wheel assemblies must be discarded after 10,000 hours or 10 years of service life, whichever occurs first.

Daily Inspection Practices

During the Daily Inspection, the machine operator should check tire inflation pressures and should be looking for obvious signs of damage or other abnormalities that might have occurred during the previous working shift. Examples include dents, gouges, missing paint, flat tires, broken or missing studs, loose fasteners, etc.

This simple task can identify issues before they become serious. Damaged components must be reported to the responsible personnel.

Detailed Inspection Practices

To gain access for a Detailed Inspection of the wheel assembly and components, the wheel assembly must be fully removed from the machine hub or axle. Disassemble all components (lock ring, flange or side flange, and bead seat band) from the wheel or rim base.

All dirt and mud that is covering the wheel and wheel components must be removed. Use of a wire brush may be required to fully remove rust and other debris from the surface of the rim and wheel components.

Any parts that show indications of the following must be removed from service and discarded:

- Any suspected fatigue cracks. Non-destructive testing (NDT) methods can be used to verify the existence of a crack in any of the wheel or wheel components. Dye Penetrant Testing (DPT) or Ultrasonic Testing (UT) are more comprehensive and can reveal small fatigue cracks before they are visible to the eye.
- Excessive wear. Excessive wear is present when there is 10% or greater reduction of the initial material thickness.
- Excessive corrosion. Excessive corrosion is present when there is 10% or greater reduction of the initial material thickness.
- Surface corrosion pitting – Excessive pitting is present when the pitting depth or diameter is greater than .09” (2.3 mm).
- Distorted, twisted or sprung lock rings

Verify that correctly matched parts are being used in the wheel assembly. If the part numbers and OEM markings are not visible, DO NOT USE!

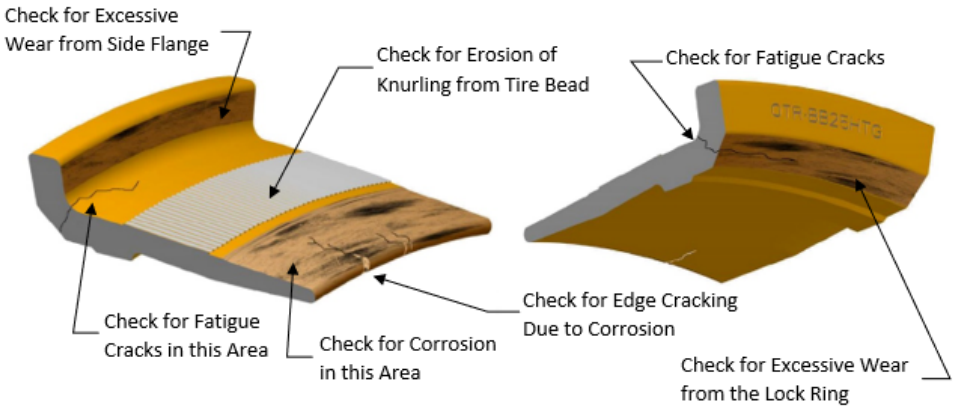
Do not - under any circumstances - attempt to rework, weld, heat or braze any rim components. Do not attempt to repair cracked, broken, or damaged rim components. Replace damaged components with new parts, or parts that are not cracked, broken, or damaged, and which are of the same size, type and make.

Never put a tire tube in a tubeless rim or wheel assembly to stop an air leak.

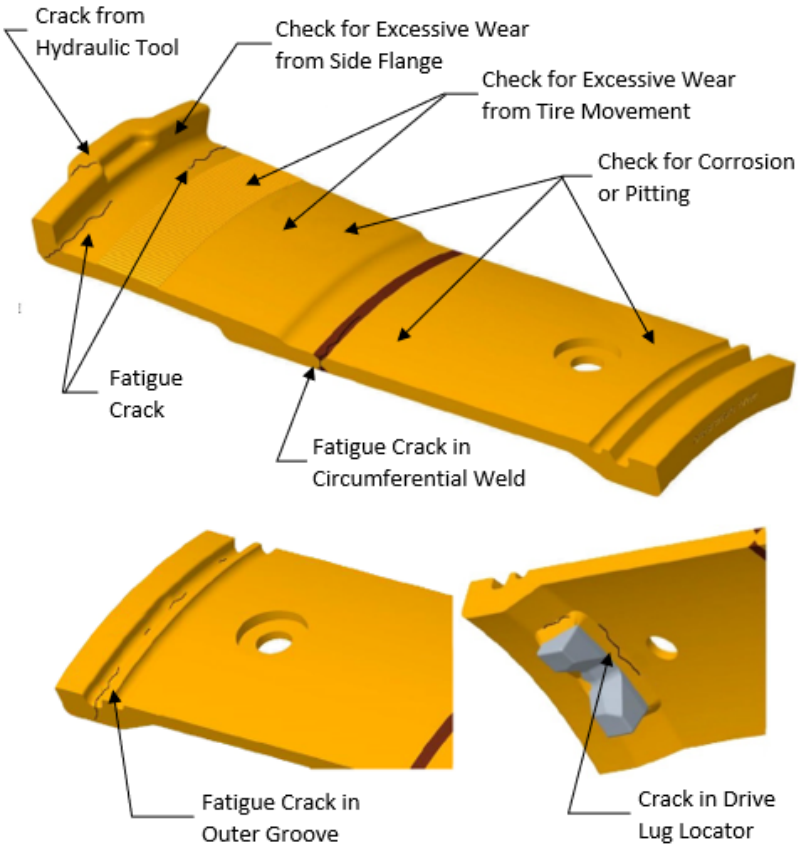
Never weld or apply heat to a rim or wheel assembly especially if a tire is still mounted on the wheel. Heat from the welding torch can cause explosive gases to be released from the rubber tire, possibly causing an explosion.

Detailed Wheel Assembly Components Inspection

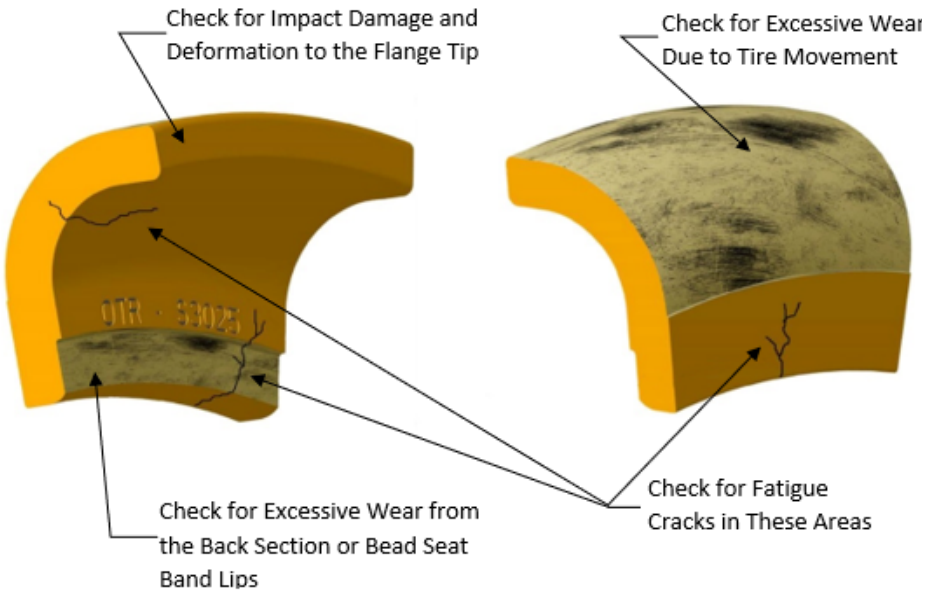
Once the tire is removed and the wheel has been completely disassembled, a thorough inspection of the wheel assembly components can be performed. Illustrated below are primary areas of inspection. The most important areas to review on the rim base are the lock ring groove and the radius corner of the back section. The entire surface of the rim base outside diameter should be cleaned with a wire brush to fully remove all rust and debris from the surfaces to be inspected.



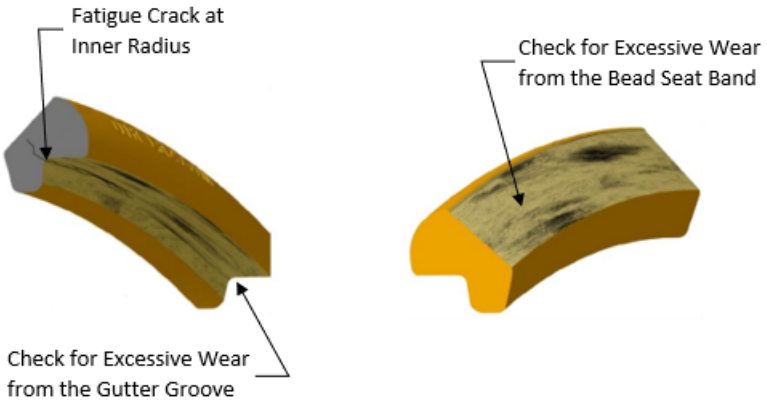
Bead Seat Band

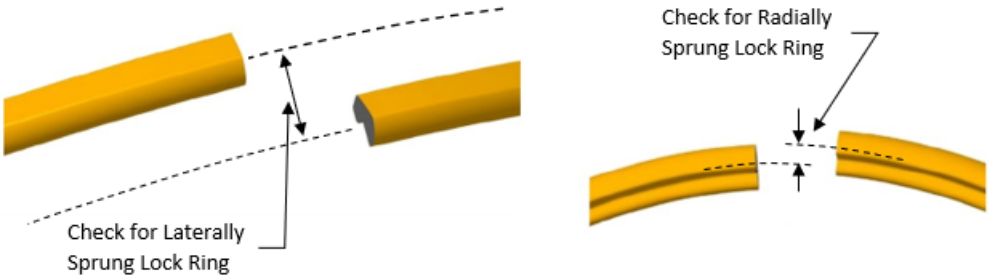


Typical Rim Base



Side Flange





Lock Ring

Inspection Documentation

Tires on off-road equipment are wear items. As such, tires require replacement on a regular basis. During routine tire rotations, corresponding wheel assemblies undergo disassembly and re-assembly. Often, a wheel assembly is re-installed onto a machine which may be different from the machine on which the wheels were originally installed. Tracking operational hours on wheel assemblies and wheel components can be a difficult task.

Records of the service tasks, the operational hours and the detailed inspection activities are a must. The minimum information must include at least: the wheel or rim assembly part number with an identification of the work site, the date the inspection was made, the operational hours on the wheel at the time of the inspection, inspection findings and the disposition of the items. Damaged components must be reported to the responsible personnel.

In Case of a Vehicle Fire – First Responders

In the case of machinery fires, and to ensure the safety of first responders (firemen, EMT's, etc.), employer safety practices must include warnings to the first responders that extreme heat from fire can cause elevation of internal inflation pressure in tire and wheel assemblies. The inflation pressure could increase beyond the ratings of the wheel and tire. Therefore, first responders must stay clear of the trajectories of exploding rim parts.

Safety Reminders

Servicing of tires and rim assemblies is dangerous. Large forces resulting from the internal air pressures exist which can cause damaged or improperly serviced wheel and rim assemblies to come apart with explosive force. Because of this, important safety information must be followed to prevent serious injury property damage or even death. Read and understand the safety warnings in this section before attempting to service tires and wheels.

Service and maintenance personnel must have and use Personal Protective Equipment (PPE). This includes a hard hat, hearing protection, safety glasses, work gloves, and safety shoes. Other personal protection may be required based on the requirements of the local work site.

Always use lifting equipment or lifting aids to avoid personal injury. Many tire and wheel assemblies are heavy to lift and move. Lifting aids must have adequate lifting capacity for the task. Follow the manufacturers' instructions for operation and use.

⚠WARNING : Before removing a wheel from the vehicle, NEVER remove a single lug nut or rim clamp without FIRST DEFLATING THE TIRE and without FIRST DEFLATING BOTH TIRES on dual-tire assemblies. Ensure the tires are totally deflated before removing lug nuts or rim clamps.

⚠WARNING : Under no circumstances should anyone service, mount or demount tires without proper tools and training as required in OSHA 29 CFR 1910.177. This is Federal Law. OSHA requires every employer who handles multi-piece tire and rim assemblies to have a training program, a restraining device, and proper tools and equipment, including a clip-on-chuck and an in-line air gauge with enough air hose to allow the individual to stand outside the trajectory path.

⚠WARNING : Follow all employer procedures and safety instructions. Follow all tire and wheel related safety instructions in "Safety Check" which is provided with every piece of Taylor equipment. Follow all procedures and safety instructions in your Taylor truck's "Maintenance Manual".

⚠WARNING : Inflate tires in a safety cage. Or, use safety chains or an equivalent restraining device during inflation. Misassembled rim parts may fly apart with explosive force during inflation.

⚠WARNING : Never sit on or stand in front of a tire and wheel assembly that is being inflated. Use a clip-on chuck and make sure the inflation hose is long enough to permit the person inflating the tire to stand to the side of the tire, not in front of or behind the tire and wheel assembly.

⚠WARNING : Maintain the proper tire inflation pressure. Refer to the machine's data plate, maintenance manual or contact your Taylor authorized dealer to ensure you know the correct inflation pressure.

⚠WARNING : Do not be careless or take chances. If you are not sure about the proper mating of rim and wheel parts, consult a wheel and rim expert. This person could be the trained technician who is servicing your fleet or the tire and wheel distributor.

⚠WARNING : Use only Taylor genuine parts. Non-OEM parts are potentially dangerous as they are not designed for the machine. Never mix different manufacturer's wheel parts without express manufacturer's approval.

⚠WARNING : Do not - under any circumstances - attempt to rework, weld, heat or braze any rim components. Do not attempt to repair cracked, broken, or damaged rim components. Replace damaged components with new parts, or parts that are not cracked, broken, or damaged, and which are of the same size, type and make.

⚠WARNING : Do not overload tires and wheels or over-inflate. If special operating conditions exist, you must first consult the manufacturer for approval before operating.

Additional Information

Taylor and Taylor Sudden Service are dedicated to providing our customers safe, durable and reliable industrial trucks and replacement components. Taylor provides Operator Guides, Maintenance Manuals, and Taylor “Safety Check” with all its products. Taylor Sudden Service provides additional information and bulletins related to servicing, maintenance and parts replacement. Users and maintenance personnel must read and understand all this information to be able to effectively and safely operate and service Taylor products.

However, some components such as tires and multi piece wheel assemblies require additional information and training. OSHA recognizes the expertise required when servicing tires and wheel assemblies as evidenced by dedicated regulations in 29 CFR 1910.177 - *Servicing multi-piece and single piece rim wheels*.

Below are additional resources available with valuable safety information pertaining to tires and wheels. Taylor recommends comprehensive training and education through such resources.

- Department of Labor, Occupational Safety and Health Administration (OSHA) 29 CFR 1910.177 - “Servicing of single piece and multi-piece rim wheels”
- Booklet, OSHA 3086 - Servicing Single-Piece and Multi-Piece Rim Wheels
- Chart, OSHA 3401 – Demounting and Mounting Procedures for Tubeless Truck and Bus Tires
- Chart, OSHA 3402 – Demounting and Mounting Procedures for Tube-Type Truck and Bus Tires
- Chart, OSHA 3403 – Multi-Piece Rim Matching Chart
- Society of Automotive Engineers
    - J1337 Off-Road Rim Maintenance Procedures and Service Precautions
    - J2611 Off-Road Tire Replacement Guidelines
- Association of European Wheel Manufactures (EUWA)
    - ES 1.03 Safety and Maintenance Recommendations for Wheels
    - ES 1.04 Safety Recommendations for Divided Wheels
    - ES 1.07 Safety Instructions for the Use of Wheels in Tyre Shops
- Department of Labor, Mine Health and Safety Administration, MHSA IG 60 Tire and Wheel Safety Awareness Program

OSHA 29 CFR 1910.177 - Servicing multi-piece and single piece rim wheels.

1910.177(a): Scope.

1910.177(a)(1): This section applies to the servicing of multi-piece and single piece rim wheels used on large vehicles such as trucks, tractors, trailers, buses and off-road machines. It does not apply to the servicing of rim wheels used on automobiles, or on pickup trucks and vans utilizing automobile tires or truck tires designated “LT”.

1910.177(a)(2): This section does not apply to employers and places of employment regulated under the Longshoring Standards, 29 CFR part 1918; Construction Safety Standards, 29 CFR part 1926; or Agriculture Standards, 29 CFR part 1928.

1910.177(a)(3): All provisions of this section apply to the servicing of both single piece rim wheels and multi-piece rim wheels unless designated otherwise.

1910.177(b): Definitions.

Barrier means a fence, wall or other structure or object placed between a single piece rim wheel and an employee during tire inflation, to contain the rim wheel components in the event of the sudden release of the contained air of the single piece rim wheel.

Charts means the U.S. Department of Labor, Occupational Safety and Health Administration publications entitled “Demounting and Mounting Procedures for Tube-Type Truck and Bus Tires,” “Demounting and Mounting Procedures for Tubeless Truck and Bus Tires,” and “Multi-Piece Rim Matching Chart.” These charts may be in manual or poster form. OSHA also will accept any other manual or poster that provides at least the same instructions, safety precautions, and other information contained in these publications, which is applicable to the types of wheels the employer is servicing.

Installing a rim wheel means the transfer and attachment of an assembled rim wheel onto a vehicle axle hub. “Removing” means the opposite of installing.

Mounting a tire means the assembly or putting together of the wheel and tire components to form a rim wheel, including inflation. “Demounting” means the opposite of mounting.

Multi-piece rim wheel means the assemblage of a multi-piece wheel with the tire tube and other components.

Multi-piece wheel means a vehicle wheel consisting of two or more parts, one of which is a side or locking ring designed to hold the tire on the wheel by interlocking components when the tire is inflated.

Restraining device means an apparatus such as a cage, rack, assemblage of bars and other components that will constrain all rim wheel components during an explosive separation of a multi-piece rim wheel, or during the sudden release of the contained air of a single piece rim wheel.

Rim manual means a publication containing instructions from the manufacturer or other qualified organization for correct mounting, demounting, maintenance, and safety precautions peculiar to the type of wheel being serviced.

Rim wheel means an assemblage of tire, tube and liner (where appropriate), and wheel components.

Service or servicing means the mounting and demounting of rim wheels, and related activities such as inflating, deflating, installing, removing, and handling.

Service area means that part of an employer’s premises used for the servicing of rim wheels, or any other place where an employee services rim wheels.

Single piece rim wheel means the assemblage of single piece rim wheel with the tire and other components.

Single piece wheel means a vehicle wheel consisting of one part, designed to hold the tire on the wheel when the tire is inflated.

Trajectory means any potential path or route that a rim wheel component may travel during an explosive separation, or the sudden release of the pressurized air, or an area at which an airblast from a single piece rim wheel may be released. The trajectory may deviate from paths which are perpendicular to the assembled position of the rim wheel at the time of separation or explosion. (See Appendix A for examples of trajectories.)

Wheel means that portion of a rim wheel which provides the method of attachment of the assembly to the axle of a vehicle and also provides the means to contain the inflated portion of the assembly (i.e., the tire and/or tube).

1910.177(c): Employee training.

1910.177(c)(1): The employer shall provide a program to train all employees who service rim wheels in the hazards involved in servicing those rim wheels and the safety procedures to be followed.

1910.177(c)(1)(i): The employer shall assure that no employee services any rim wheel unless the employee has been trained and instructed in correct procedures of servicing the type of wheel being serviced, and in the safe operating procedures described in paragraphs (f) and (g) of this section.

1910.177(c)(1)(ii): Information to be used in the training program shall include, at a minimum, the applicable data contained in the charts (rim manuals) and the contents of this standard.

1910.177(c)(1)(iii): Where an employer knows or has reason to believe that any of his employees is unable to read and understand the charts or rim manual, the employer shall assure that the employee is instructed concerning the contents of the charts and rim manual in a manner which the employee is able to understand.

1910.177(c)(2): The employer shall assure that each employee demonstrates and maintains the ability to service rim wheels safely, including performance of the following tasks:

1910.177(c)(2)(i): Demounting of tires (including deflation);

1910.177(c)(2)(ii): Inspection and identification of the rim wheel components;

1910.177(c)(2)(iii): Mounting of tires (including inflation with a restraining device or other safeguard required by this section);

1910.177(c)(2)(iv): Use of the restraining device or barrier, and other equipment required by this section;

1910.177(c)(2)(v): Handling of rim wheels;

1910.177(c)(2)(vi): Inflation of the tire when a single piece rim wheel is mounted on a vehicle;

1910.177(c)(2)(vii): An understanding of the necessity of standing outside the trajectory both during inflation of the tire and during inspection of the rim wheel following inflation; and

1910.177(c)(2)(viii): Installation and removal of rim wheels.

1910.177(c)(3): The employer shall evaluate each employee’s ability to perform these tasks and to service rim wheels safely, and shall provide additional training as necessary to assure that each employee maintains his or her proficiency.

1910.177(d): Tire servicing equipment.

1910.177(d)(1): The employer shall furnish a restraining device for inflating tires on multi-piece wheels.

1910.177(d)(2): The employer shall provide a restraining device or barrier for inflating tires on single piece wheels unless the rim wheel will be bolted onto a vehicle during inflation.

1910.177(d)(3): Restraining devices and barriers shall comply with the following requirements:

1910.177(d)(3)(i): Each restraining device or barrier shall have the capacity to withstand the maximum force that would be transferred to it during a rim wheel separation occurring at 150 percent of the maximum tire specification pressure for the type of rim wheel being serviced.

1910.177(d)(3)(ii): Restraining devices and barriers shall be capable of preventing the rim wheel components from being thrown outside or beyond the device or barrier for any rim wheel positioned within or behind the device;

1910.177(d)(3)(iii): Restraining devices and barriers shall be visually inspected prior to each day’s use and after any separation of the rim wheel components or sudden

release of contained air. Any restraining device or barrier exhibiting damage such as the following defects shall be immediately removed from service:

1910.177(d)(3)(iii)(A): Cracks at welds;

1910.177(d)(3)(iii)(B): Cracked or broken components;

1910.177(d)(3)(iii)(C): Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation;

1910.177(d)(3)(iii)(D): Pitting of components due to corrosion; or

1910.177(d)(3)(iii)(E)" Other structural damage which would decrease its effectiveness.

1910.177(d)(3)(iv): Restraining devices or barriers removed from service shall not be returned to service until they are repaired and reinspected. Restraining devices or barriers requiring structural repair such as component replacement or rewelding shall not be returned to service until they are certified by either the manufacturer or a Registered Professional Engineer as meeting the strength requirements of paragraph (d)(3)(i) of this section.

1910.177(d)(4): The employer shall furnish and assure that an air line assembly consisting of the following components be used for inflating tires:

1910.177(d)(4)(i): A clip-on chuck;

1910.177(d)(4)(ii): An in-line valve with a pressure gauge or a presettable regulator; and

1910.177(d)(4)(iii): A sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory.

1910.177(d)(5): Current charts or rim manuals containing instructions for the type of wheels being serviced shall be available in the service area.

1910.177(d)(6): The employer shall furnish and assure that only tools recommended in the rim manual for the type of wheel being serviced are used to service rim wheels.

1910.177(e): Wheel component acceptability.

1910.177(e)(1): Multi-piece wheel components shall not be interchanged except as provided in the charts or in the applicable rim manual.

1910.177(e)(2): Multi-piece wheel components and single piece wheels shall be inspected prior to assembly. Any wheel or wheel component which is bent out of shape, pitted from corrosion, broken, or cracked shall not be used and shall be marked or tagged unserviceable and removed from the service area. Damaged or leaky valves shall be replaced.

1910.177(e)(3): Rim flanges, rim gutters, rings, bead seating surfaces and the bead areas of tires shall be free of any dirt, surface rust, scale or loose or flaked rubber build-up prior to mounting and inflation.

1910.177(e)(4): The size (bead diameter and tire/wheel widths) and type of both the tire and the wheel shall be checked for compatibility prior to assembly of the rim wheel.

1910.177(f):Safe operating procedure - multi-piece rim wheels. The employer shall establish a safe operating procedure for servicing multi-piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

1910.177(f)(1): Tires shall be completely deflated before demounting by removal of the valve core.

1910.177(f)(2): Tires shall be completely deflated by removing the valve core before a rim wheel is removed from the axle in either of the following situations:

1910.177(f)(2)(i): When the tire has been driven underinflated at 80% or less of its recommended pressure, or

1910.177(f)(2)(ii): When there is obvious or suspected damage to the tire or wheel components.

1910.177(f)(3): Rubber lubricant shall be applied to bead and rim mating surfaces during assembly of the wheel and inflation of the tire, unless the tire or wheel manufacturer recommends against it.

1910.177(f)(4): If a tire on a vehicle is underinflated but has more than 80% of the recommended pressure, the tiremay be inflated while the rim wheel is on the vehicle provided remote control inflation equipment is used, and no employees remain in the trajectory during inflation.

1910.177(f)(5): Tires shall be inflated outside a restraining device only to a pressure sufficient to force the tire bead onto the rim ledge and create an airtight seal with the tire and bead.

1910.177(f)(6): Whenever a rim wheel is in a restraining device the employee shall not rest or lean any part of his body or equipment on or against the restraining device.

1910.177(f)(7): After tire inflation, the tire and wheel components shall be inspected while still within the restraining device to make sure that they are properly seated and locked. If further adjustment to the tire or wheel components is necessary, the tire shall be deflated by removal of the valve core before the adjustment is made.

1910.177(f)(8): No attempt shall be made to correct the seating of side and lock rings by hammering, striking or forcing the components while the tire is pressurized.

1910.177(f)(9): Cracked, broken, bent or otherwise damaged rim components shall not be reworked, welded, brazed, or otherwise heated.

1910.177(f)(10): Whenever multi-piece rim wheels are being handled, employees shall stay out of the trajectory unless the employer can demonstrate that performance of the servicing makes the employee's presence in the trajectory necessary.

1910.177(f)(11): No heat shall be applied to a multi-piece wheel or wheel component.

1910.177(g): Safe operating procedure-single piece rim wheels. The employer shall establish a safe operating procedure for servicing single piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

1910.177(g)(1): Tires shall be completely deflated by removal of the valve core before demounting.

1910.177(g)(2): Mounting and demounting of the tire shall be done only from the narrow ledge side of the wheel. Careshall be taken to avoid damaging the tire beads while mounting tires on wheels. Tires shall be mounted only on compatible wheels of matching bead diameter and width.

1910.177(g)(3): Nonflammable rubber lubricant shall be applied to bead and wheel mating surfaces before assembly of the rim wheel, unless the tire or wheel manufacturer recommends against the use of any rubber lubricant.

1910.177(g)(4): If a tire changing machine is used, the tire shall be inflated only to the minimum pressure necessary to force the tire bead onto the rim ledge while on the tire changing machine.

1910.177(g)(5): If a bead expander is used, it shall be removed before the valve core is installed and as soon as the rim wheel becomes airtight (the tire bead slips onto the bead seat).

1910.177(g)(6): Tires may be inflated only when contained within a restraining device, positioned behind a barrier or bolted on the vehicle with the lug nuts fully tightened.

1910.177(g)(7): Tires shall not be inflated when any flat, solid surface is in the trajectory and within one foot of the sidewall.

1910.177(g)(8): Employees shall stay out of the trajectory when inflating a tire.

1910.177(g)(9): Tires shall not be inflated to more than the inflation pressure stamped in the sidewall unless a higher pressure is recommended by the manufacturer.

1910.177(g)(10): Tires shall not be inflated above the maximum pressure recommended by the manufacturer to seat the tire bead firmly against the rim flange.

1910.177(g)(11): No heat shall be applied to a single piece wheel.

1910.177(g)(12): Cracked, broken, bent, or otherwise damaged wheels shall not be reworked, welded, brazed, or otherwise heated.

[39 FR 23502, June 27, 1974, as amended at 52 FR 36026, Sept. 25, 1987; 53 FR 34736, Sept. 8, 1988; 76 FR 24698, May 2, 2011; 76 FR 80739, Dec. 27, 2011]

DISCLAIMER: This informational booklet is intended to provide a generic, non-exhaustive overview of service and maintenance safety for multi-piece wheels and tires. Special training is required per OSHA 29 CFR 1910.177. This publication does not itself alter or determine compliance responsibilities, which are set forth in OSHA standards themselves, and the Occupational Safety and Health Act. Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements, the reader should consult current administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the courts. Material contained in this publication is in the public domain and may be reproduced, fully or partially, without the permission of the Federal Government.

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