

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. S-010]

Servicing of Single Piece and Multi-Piece Rim Wheels

AGENCY: Occupational Safety and Health Administration, Labor.

ACTION: Final rule.

SUMMARY: By this action the Occupational Safety and Health Administration (OSHA) amends the safety standard for the servicing of multi-piece rim wheels, 29 CFR 1910.177, to include requirements for the safe servicing of single piece rim wheels used on trucks, trailers, buses and other large vehicles. A single piece wheel is a unit used to retain the side walls of a tire, to form part of the chamber which contains the pressurized air (if a tubeless tire is utilized), and to provide the means of attachment of the assembly (the rim wheel) to the axle of a vehicle.

Single piece rim wheel accidents occur when the contained, pressurized air is almost instantaneously released by the tire bead either breaking or slipping over the rim flange. This incident is commonly referred to as "the sudden release of the pressurized air." The principal hazards are that the pressurized air, once released, can either pick up and hurl an employee across the workplace, if the employee is in close proximity to the rim wheel and within the trajectory, or the rim wheel can be propelled across the workplace and into an employee. This amended standard, which regulates the servicing of both single piece and multi-piece rim wheels, includes requirements for training of all tire servicing employees; for utilization of industry-accepted procedures which minimize the potential for employee injury; for the use of restraint devices during inflation to retain the components; and for the use of compatible components.

The standard also contains several minor amendments to the provisions of the multi-piece rim wheel servicing standard.

EFFECTIVE DATE: This standard will become effective March 5, 1984.

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SUPPLEMENTARY INFORMATION:**1. Background***A. Standard on Multi-Piece Rim Wheels*

On January 29, 1980, OSHA issued a final standard on servicing multi-piece rim wheels (45 FR 6706) after informal rulemaking under section 6(b) of the Occupational Safety and Health Act (OSH Act). Multi-piece wheels consist of two or more detachable components, one of which is a side or locking ring designed to hold the tire on the wheel when the tire is inflated. Multi-piece wheels are used most frequently with tube type tires on trucks, tractors, trailers, buses, campers and off-highway vehicles. The major hazard in servicing multi-piece rim wheels is the possibility of an employee being struck by a wheel component which has been thrown from a rim wheel during an unintended explosive separation. Further discussion of multi-piece rim wheels can be found in the preamble to the § 1910.177 final rule document (45 FR 6706, January 29, 1980).

The standard as originally promulgated in 1980 contains requirements for training employees who service multi-piece rim wheels; for the use of proper servicing equipment; for the use of compatible components only; and for the use of accepted, safe procedures. During the formulation of that standard, the scope of the regulation was restricted to the servicing of multi-piece rim wheels since the preponderance of the accidents being reported at that time were occurring during the servicing of that type of rim wheel.

B. Single Piece Rim Wheels

Single piece rim wheels are used on virtually all types of motor vehicles, including automobiles, trucks, trailers, buses and off-highway vehicles. Such vehicles rely heavily on the use of tubeless tires because such tires offer superior vehicle mileage due to less rolling resistance and are less likely to overheat. Tubeless tires are most commonly used on single piece wheels. Although some multi-piece wheels may be used with tubeless tires, such use requires an airtight seal between wheel components since the wheel forms part of the chamber containing the pressurized air, and most multi-piece wheels are not designed to be airtight (Exs. 3-11 and 3-20).

Single piece wheels are designed with one side of the wheel narrower than the other side to facilitate the installation of

the tire on the wheel. At present, between 15% and 20% of large vehicles such as trucks, trailers and buses are equipped with radial ply tires and single piece wheels. This percentage is expected to increase to 50% of all large rim wheels by 1990 (Ex. 4).

Although radial ply technology for vehicle tires was first introduced in the mid-1920's, radial ply tubeless tires and single piece wheels for large vehicles were not utilized to any great extent until the early 1970's. This was due to the many problems which are inherent in the design of radial ply tires. The radial ply tire offers less sidewall support and less load carrying capability under severe service conditions than does the bias-ply tire, and is more prone to failure from sidewall scuffing or unusual side forces such as hitting a curb. The initial cost of radial ply tires is higher; however, radial ply tires offer less rolling resistance, thereby increasing the vehicle mileage per gallon of fuel. As the cost of fuel has increased, it has become more cost effective to use radial ply tires, and more and more of the large vehicle users have begun to switch to the use of radial ply tubeless tires. This has resulted in a corresponding increase in the use of single piece wheels.

Because they exhibit limitations under conditions of severe use, single piece rim wheels are favored on long distance, over-the-road vehicles where the loads imposed upon the rim wheels are termed moderate and the primary concern is good mileage. Vehicles which operate on rough terrain, at remote locations, or under heavy loading conditions, have continued to use the tube-type tire and multi-piece rim wheels since vehicle reliability and serviceability under extreme conditions is essential.

C. History of the Amendment for Servicing Single Piece Rim Wheels.

During the development of the standard for the servicing of multi-piece rim wheels (29 CFR 1910.177), the regulation of single piece rim wheel servicing was not considered since the largest number of accidents being reported were occurring when multi-piece rim wheels were being serviced. Additionally, the accidents which were occurring during the servicing of single piece rim wheels were, for the most part, not being reported or were not properly reported. Limited testimony on single piece rim wheel accidents was presented at the 1979 public meeting on the multi-piece rim proposal (Docket S-005, Ex. 5, Pages 23 and 27). Mr. Freivoyel, representing Firestone Tire & Rubber Company, indicated there were

safety implications with the use of single piece rims and tubeless tires. Mr. Besuner of Failure Analysis Associates, a firm hired by the National Wheel and Rim Association (NWRA) to determine the risks of servicing multi-piece rim wheels, stated that their preliminary findings (Ex. 2-3) indicated the on-road accident picture for single piece rim wheels looked as serious as that for multi-piece rim wheel servicing. However, their data were limited to one manufacturer's experiences and could not be presumed to be conclusive. Further, the Failure Analysis Associates' preliminary report did not examine accident data in tire servicing facilities and workplaces. For those reasons, and because of the limited period of industry usage of single piece rim wheels, the hazards of servicing single piece rim wheels were not recognized, and thus were not regulated during the multi-piece rim wheel rulemaking.

Subsequent to OSHA's promulgation of the standard for servicing multi-piece rim wheels, NWRA and Firestone Tire & Rubber Company petitioned OSHA, requesting an amendment to the standard for servicing multi-piece rim wheels, 29 CFR 1910.177, by adding requirements for the safe servicing of single piece rim wheels.

Examination of the industry studies (Ex. 2-3) by OSHA, in response to the petition, indicated an increasing number of accidents occurring during the servicing of single piece rim wheels. Based upon the available data, including that from four of the manufacturers of single piece wheels, OSHA determined that the likelihood of accidents and injuries when servicing single piece rim wheel is comparable to that which existed for the servicing of multi-piece rim wheels before promulgation of the OSHA multi-piece rim wheel servicing standard. A Notice of Proposed Rulemaking (NPRM) for servicing single piece rim wheels was published in the *Federal Register* (47 FR 51159, November 12, 1982). The public comment period of 45 days was extended to January 26, 1983 (47 FR 57739, December 28, 1982). Twenty-nine comments were received in response to the above notices, with most commenters favoring the adoption of the proposed revision to the standard. A number of comments contained recommendations for minor modification of certain provisions of the proposal. There were no requests for a hearing.

A Regulatory Impact Assessment was prepared in accordance with Executive Order 12291 (46 FR 13193, February 17, 1981) and was made available to the public. OSHA determined that the

proposal was not a "major" action which would necessitate further economic impact evaluation and the preparation of a Regulatory Impact Analysis. Opportunity was given for interested persons to comment on the subject matter and contents of the assessment.

Additionally, in accordance with the Regulatory Flexibility Act of 1980 (Pub. L. 96-353, 94 Stat 1164 (5 U.S.C. 601 et seq.)), OSHA assessed the potential economic impact of the proposal on small entities and examined some of the alternatives to it. Based upon that assessment, OSHA certified that the proposal would not have a significant economic effect on a substantial number of small entities. Opportunity was given for interested persons to comment on the subject matter and content of the report.

This final standard on servicing of multi-piece and single piece rim wheels is based on a full consideration of the entire record of the rulemaking proceeding, including the materials relied on in the proposal and all written comments and exhibits received. All materials in the record are available for public review and copying at the OSHA Docket Office, Room S-6212, U.S. Department of Labor, 3rd Street and Constitution Avenue, N.W., Washington, D.C. 20210, telephone (202) 523-7894.

D. The Hazards of Servicing Single Piece Rim Wheels

OSHA has determined that the servicing of single piece rim wheels is hazardous based upon a review of the available accident and injury data. These data include selected product liability litigation records (Ex. 2-7) from cases involving injuries received during the servicing of single piece rim wheels. These records buttress the determination that employees who service single piece rim wheels are exposed to a significant risk of serious injury.

The principal hazard present during the servicing of single piece rim wheels is that the pressurized air contained in the tire may suddenly be released, either by the bead breaking or by the bead slipping over the rim flange. These incidents are caused by mismatching of the wheel and tire, by using damaged components, by failing to restrain the components, by welding on the wheel and/or by improperly mounting the tire on the wheel. The resulting air blast is strong enough to hurl an employee who is in close proximity to the rim wheel, and positioned within the trajectory, violently across the workplace. When the pressurized air is released on the side of the rim wheel against a solid

surface, the flexure of the tire can also propel the rim wheel itself across the workplace and into an employee in its path. The force exerted on the rim flange of a single piece wheel by a pressurized tire is comparable to that of a tire mounted on a multi-piece wheel (e.g., a 10.00 x 20 tire, when inflated to 105 psi creates a force in excess of 40,000 pounds against the rim flange).

As noted above, the force of the pressurized air released from a single piece rim wheel is comparable to that force from a multi-piece rim wheel. The principal differences between accidents involving single piece rim wheels and those involving multi-piece rim wheels center around the reaction to the release of the pressurized air in the tire. In multi-piece rim wheel accidents, the wheel components separate and are released from the rim wheel with violent force. The primary agent of employee injury in multi-piece rim wheel separations is any of the individual components of the wheel, such as the lock ring, which can be propelled toward an employee with explosive force as the wheel components separate. In the single piece rim wheel accident, the air blast itself is another primary agent of injury. The severity of the hazard is related not only to the air pressure but also to the air volume. Employees have been seriously or fatally injured when they were thrown against walls, ceilings, gas pumps or other hard and unyielding objects.

In addition, if the air blast is not released directly toward an employee but against a floor or wall, the unrestrained rim wheel can be hurled across the workplace. Therefore, if the release of air occurs on the side of the wheel that is lying against a solid surface, and the rim wheel is unrestrained, the entire assembly may become a projectile. Such movement is caused primarily by the flexure of the tire as the air escapes. An employee who is standing in the trajectory can be hit by the rim wheel when the air is released. In a test conducted by NWRA (Ex. 2-6) a single piece rim wheel with a weakened bead was pressurized to 110 psi, and the tire was made to fail on the side of the tire resting on the ground. The rim wheel, whose weight was approximately 200 pounds, was thrown approximately 30 feet into the air.

E. Accident Data

Data collection regarding single piece rim wheel accidents presents similar problems to those OSHA experienced in documenting multi-piece rim wheel accidents. Accidents to employees engaged in the servicing of single piece

rim wheels are often either not reported at all, or are categorized under broad classifications such as "falls" or "struck by object." Therefore, the data available to OSHA likely represent only a portion of the total injuries and fatalities.

As noted earlier, NWRA, in support of its petition, submitted a report on single piece rim wheels which was prepared by Failure Analysis Associates (Ex. 2-3). The report contained accident data which was gathered from several sources including National Highway Traffic Safety Administration (NHTSA) reports, manufacturers' files, the California State OSHA program (Cal/OSHA), and consumer litigation against rim manufacturers. In this report, Failure Analysis Associates stated that between 1970 and 1980 there were 112 accidents identified involving single piece rim wheels. Of that number, 91 occurred during single piece rim wheel servicing, and 15 of these accidents resulted in fatalities. Several accidents contained in the Failure Analysis Associates statistics were attributed to on-the-road tire failures such as blowouts (21 accidents) rather than servicing (91 accidents).

These statistics are incomplete as they do not include single piece rim wheel accidents whose causation is the subject of on-going litigation. Further, NWRA suggests that there are several factors which may have limited the number of single piece rim wheel servicing accidents in the past, but which may not have the same effect in the future. Included among these factors is the fact that the principal users of single piece rim wheels have been the larger trucking companies, with better trained and supervised personnel, better equipment, and more careful adherence to established procedures for servicing single piece rim wheels. Additionally, NWRA reports that because there have been some single piece rim wheel failures in more demanding applications (e.g., large loads, and/or heavy service), many of these companies have thus far limited their use of single piece rim wheels to moderate loads and on-highway applications. Finally, as large vehicle single piece rim wheels have only recently come into widespread use, those accidents which would occur due to wheel deterioration have yet to occur. (See Ex. 2-3.)

In NWRA's view, these elements will become less dominant as the use of single piece rim wheels increases, and the accident and injury rates can be expected to increase significantly if OSHA does not regulate the servicing of single piece rim wheels.

In addition to the report submitted by NWRA, OSHA has examined the

records of 25 product liability personal injury suits involving single piece rim wheels which occurred between 1971 and 1981. The sample of 25 case files contained information concerning:

1. The severity of typical injuries resulting from single piece rim wheel servicing accidents;
2. The average age of the victim;
3. The training received by the victim; and
4. The level of experience of the victim.

These records do not provide a complete or exhaustive survey of single piece rim wheel servicing injuries. They do, however, provide a valuable source of information on those injuries, and on the training and tire service experience of the injured persons.

Examination of the reports indicates that the sample contains reports of five deaths, five total disabilities, four permanent disabilities, 10 temporary disabilities, and one injury of unknown severity. Five workers were between the ages of 16 and 20 (two deaths and three total disabilities); nine were between the ages of 21 and 31 (including one death and two total disabilities); two were between the ages of 32 and 40; six were between the ages of 41 and 54 (including two deaths); and the ages of three persons were not reported.

Similarly, the relationships of experience and training of the victims were examined. Five of the victims were reported to have received some training in servicing single piece rim wheels; 13 victims were reported as having received no such training; and there was no report on whether the remaining seven had received training. Examining these reports as to worker experience, six workers had no prior experience; nine had less than one year of experience; eight had more than one year of experience, and two did not state a level of experience.

OSHA has determined, based on the available accident data, that a serious risk of injury exists for the worker who services single piece rim wheels, and that lack of training and experience in proper servicing procedures appears to be a significant factor in many single piece rim wheel servicing accidents.

F. Significant Risk

In *Industrial Union Department, AFL-CIO vs. American Petroleum Institute*, 448 U.S. 607 (1980), the Supreme Court ruled that in promulgating standards under section 6(b) of the OSH Act, OSHA must determine that the hazard being addressed poses a significant risk to employees, and that the standard will significantly reduce or eliminate that risk.

The nature of the job and the workplace exposes many individuals to the hazards of servicing single piece rim wheels. Because the work does not require skilled labor, a long period of service is not characteristic of the workforce. There is high employment turnover, and hence, a large number of workers will be exposed to the risk.

OSHA estimates that slightly over 300,000 employees are potentially engaged in servicing single piece rim wheels. Many of those workers service single piece rim wheels infrequently and/or have not received any training on how to perform the servicing safely. As a result, they may not be fully aware of the inherent hazards of servicing these rim wheels. Because of the workers' relative inexperience, single piece rim wheels present hazards which may not be generally recognized by the persons who service them. Further, many of these employees incorrectly assume that specific hazards are found only with multi-piece rim wheels, and that single piece rim wheels are safe to service.

With respect to the frequency of injury-producing accidents, the NWRA data indicate that there have been 91 servicing injuries between 1970 and 1980 (Ex. 2-3). On a per rim wheel servicing basis, this is about one injury-producing accident per million single piece rim wheel servings. This rate is about the same as the rate which existed for the servicing of multi-piece rim wheels before the promulgation of the multi-piece rim wheel servicing standard (Ex. 2-3).

NWRA has projected that the injury rate may be expected to increase as the use of single piece rim wheels becomes more prevalent. More single piece rim wheels will be serviced by persons who have never handled, or infrequently handle, such rim wheels and/or who have never been trained in the proper procedures. Further as single piece rim wheels are used over a longer period of time, the average single piece wheel will be older than those currently being used. As these wheels age they will deteriorate and can be expected to be involved in more accidents and injuries. Therefore, OSHA believes that these factors are likely to result in higher injury rates in the future if a standard is not promulgated.

As discussed above, a large percentage of users of tubeless tires utilize single piece wheels. One of the benefits of the use of radial tubeless tires is greater fuel efficiency, and thus interstate truck and bus lines have been switching to these tires. The data available to OSHA indicate that the

percentage of all large vehicles which use single piece rim wheels will increase from almost 20 percent in 1991 to about 50 percent in 1990. Therefore it is anticipated that the number of single piece rim wheel servicing will increase proportionately. This translates to about 280 to 350 million single piece rim wheel servings over that period of time (1981-1990). Using this data, and assuming that the rate of injury-producing single piece rim wheel accidents does not change, OSHA estimates that if no standard is promulgated, there will be approximately 280 to 350 fatalities and injuries as a result of single piece rim wheel servicing accidents during the 10-year period of 1981 to 1990. For purposes of this determination, OSHA has assumed no increase in the accident rate in projecting the benefits to be derived by adoption of this proposal. If, instead of remaining constant, the accident rate were to increase for the reasons cited by NWRA, the number of expected fatalities and injuries would increase correspondingly.

As previously mentioned, Failure Analysis Associates reported that 112 single piece rim wheel accidents occurred between 1970 and 1979. These 112 accidents were categorized as having occurred either during maintenance operations (91) or during use (21). Of the 91 maintenance accidents, 15 (16.5%) resulted in a fatality, while the remaining 76 (83.5%) resulted in an employee injury. Using the above percentages, the 280-350 accidents projected to occur between 1981 and 1990 will result in 45 to 56 fatalities and 235 to 294 injuries.

Examination of the 25 litigation records made available to OSHA produced the following findings: there were five fatalities (20%); five accidents resulted in total disability (20%); four resulted in permanent partial disability (16%); 10 resulted in temporary disability (40%); and one was of unknown severity (4%). Of the 10 who were only temporarily disabled, the average time out of work was six months. The single piece rim wheel servicing injuries reported in these litigation records were more severe than the average general industry occupational injuries, which involve an average of about 16 lost workdays (Ex. 2-14).

OSHA recognizes that there are serious limitations on the use of the litigation data to develop projections of the severity of injuries in the industry. It is clear, for example, that accident data which have been developed from litigation records of manufacturers of single piece wheels are likely to be

skewed towards the more serious injuries and fatalities, as they are the most likely to lead to products liability litigation. Notwithstanding the limitations of such data, OSHA believes the injuries are a good indicator of the hazards of servicing single piece rim wheels.

Additionally, OSHA has noted that the percentage of fatalities reported in the litigation data (20%) closely parallels the percentage reported in the NWRA data (16.5%). Although there is not sufficient information to allow a detailed comparison of their respective data, OSHA has assumed that the injury mix is similar for each of the data bases. For that reason, then, OSHA has assumed that the range of percentages of fatalities, total disabilities, and permanent disabilities found in the litigation data is between 15% and 20% for each category. OSHA has projected these percentages onto an extrapolation of the NWRA data to determine the expected number of fatalities and the different types of injuries. This projection also assumes that the number of accidents reported by NWRA for the period from 1970 to 1980 is an accurate figure, and that the percentage of single piece rim wheels will increase from 20 percent in 1981 to 50 percent in 1990. Based upon these assumptions, OSHA has determined that if no standard is promulgated, 50-67 fatalities, 50-67 total disabilities, 50-67 permanent disabilities, and 137-188 temporary disabilities will occur during the 10-year period.

OSHA's analysis of the causes of the 91 injury-producing servicing accidents reported by NWRA indicates that approximately 90 percent of these accidents occurred while the tire was being inflated, and nearly 5 percent occurred while the rim was being welded. The other 5 percent are divided between those accidents which occurred when an employee was performing other servicing activities such as wheeling a rim wheel around the workplace or installing the rim wheel. This final standard contains the following provisions which, if followed, will prevent nearly all of these types of accidents in the future:

1. The worker must inflate the tire while the rim wheel is restrained, or bolted on the vehicle, and must stay out of the trajectory of the potential explosion;
2. The worker must inspect both the tire and the wheel in order to avoid mismatching them; and
3. The worker must never apply heat to a wheel.

The final standard also requires employers to train employees to ensure that they learn the industry-accepted servicing procedures. OSHA firmly believes that proper training will increase worker understanding of the seriousness of the hazards, and with that understanding will follow the likelihood that workers will comply with these procedures.

Several additional factors were considered by OSHA in developing the final standard. A review of the injury-producing accidents investigated by OSHA since promulgating the multi-piece rim wheel servicing standard indicates that there has been a 70 to 80 percent reduction in multi-piece rim wheel servicing injuries. Secondly, OSHA has been informed that after the promulgation of the Cal/OSHA standard in 1970, which covers the servicing of both multi-piece and single piece rim wheels, the number of single piece rim wheel servicing injuries fell from one per year between 1970 and 1975 to a total of one between 1976 and 1980, a reduction of approximately 80% (Ex. 2-3, pg. 26). Thus, OSHA concludes that the standard being published today will prevent injuries when it is followed, and that compliance by employer and employee is predictable. For purposes of its regulatory analysis, OSHA predicts that this standard would reduce injuries by approximately 75 percent.

Based on the available data, OSHA concludes that workers face a significant risk of serious injury or death when servicing large vehicle single piece rim wheels, and that promulgation of this standard will significantly reduce that risk.

2. Summary and Explanation of the Amended Standard

The following section discusses the individual requirements of the standard for servicing multi-piece and single piece rim wheels, including an analysis of the record evidence and the major issues raised during the rulemaking proceeding.

This amended standard sets requirements for training all employees who service large vehicle rim wheels; for the use of accepted safe practices and procedures; for the use of restraining devices, barriers or other safeguards; and for the use of other essential equipment. These and other portions of the standard, including those on the criteria for interchangeability of rim wheel components, have been revised and clarified from the proposal as described in detail below.

The language of the standard essentially follows that of the proposal except for revisions based on OSHA's

review of the entire rulemaking record, including the written comments and data submitted during the comment period.

Virtually all persons who participated in the rulemaking by submitting comments agreed with OSHA's determination that the principal causes of accidents which occur during the servicing of single piece and multi-piece rim wheels could be eliminated by proper training of employees; availability and utilization of restraints, necessary tools and equipment; and adherence to accepted safe procedures.

However, two commenters questioned the need for the standard based upon the accident rate (the number of accidents per million tire changes). One of those commenters (Ex. 3-2) stated ". . . in over 163 years of total experience of our management staff working with the single piece rim wheel, there has never been an injury." The other commenter (Ex. 3-13) objected to the issuance of a standard on the basis of statistics from a specialized industry, and supported by what he considered speculation that the risks will increase as more small firms enter the marketplace.

Although an employer may not have experienced an accident in his workplace, this could be attributed to any one or a combination of factors. For example, employees may have the requisite knowledge and experience, the employer may enforce the use of those procedures which minimize the potential for an accident, or the lack of accidents may just be good fortune. As discussed above, single piece rim wheel servicing accidents occurred when unsafe procedures were utilized usually by inexperienced and untrained personnel. Adherence to the provisions of this standard, which stress safe procedures and training, will decrease the potential for a rim wheel separation and the resulting fatality or injury.

OSHA recognizes that tire and wheel servicing may be considered a specialized operation. However, the servicing of single piece rim wheels is not a specialized industry because the servicing of such wheels occurs across industry lines. Considering the number of large vehicles utilized for movement of persons and goods by motor vehicle throughout almost all industry, and the correspondingly high number of individual rim wheel servicings, OSHA concludes that it is necessary to regulate the servicing of single piece rim wheels.

1. Scope—paragraph (a). The multi-piece rim wheel standard is amended so that the servicing of single piece rim wheels and multi-piece rim wheels are incorporated into one standard. This

incorporation allows the employer and employee to find those requirements for compliance in one text. This standard is intended to provide protection to employees engaged in the servicing of all rim wheels used on trucks, tractors, trailers, buses and other large vehicles. It applies to the servicing of these large vehicle rim wheels, whether they are serviced at the employer's place of business or at a remote location.

The proposal provided coverage of servicing operations in general industry and maritime employment. At the time of the proposal, OSHA did not believe that significant risk had been demonstrated for single piece rim wheel servicing in either construction or agriculture. The record of this rulemaking has provided no additional information on this point. Should additional data become available in the future on construction or agricultural injuries from servicing of single piece rim wheels, OSHA will consider whether further rulemaking activities are warranted.

Subsequent to the proposal, OSHA has issued a Final Rule on Marine Terminals (48 FR 30886) which does not address single piece rim wheels. It is planned to include coverage of single piece rim wheels for maritime employment by further rulemaking.

The proposed standard would have covered the servicing of multi-piece and single piece rim wheels used on trucks, trailers, buses and off-road machinery. The scope paragraph of the proposal excluded rim wheels on automobiles and light duty trucks or vans using automobile tires. However, single piece rim wheels were defined according to size in the definition paragraph. One commenter (Ex. 3-17) pointed out that approximately 15% of all new automobiles utilize a spare tire with a 16-inch bead which would be covered by the proposed standard if adopted. This commenter further pointed out that some 1984 cars have been designed to utilize 16-inch wheels.

One commenter (Ex. 3-18) contended that the proposed exclusion of automobile tire servicing was not justified because the hazard of the sudden release of the pressurized air is greater than indicated in the preamble of the proposal. It was suggested by two commenters that OSHA amend the scope to cover all single piece rim wheels (Ex. 3-16 and 3-18). Other commenters suggested that the meaning of automobile tires (Ex. 3-10), light truck vs. truck, off-road machines, etc., be clarified (Exs. 3-7 and 3-11).

Upon its review of the rulemaking record, OSHA has determined that there is insufficient evidence of a significant

hazard during the servicing of automobile type rim wheels. For this reason, the servicing of automobile rim wheels will not be included in the final standard. Similarly, since the hazard of low pressure, light duty truck tires is essentially the same as for automobile type tires, their servicing is also excluded. OSHA has decided to use the commonly accepted term pick-up or van rather than the more general term light duty truck to define that class of vehicles. The action taken at this time does not preclude the initiation of further rulemaking at a later date if sufficient additional data becomes available to justify the need for the regulation of automobile and light duty truck tire servicing.

This final standard applies to the servicing of all rim wheels used on large vehicles such as trucks, tractors, trailers, buses and off-road machines, except those utilizing automobile or truck tires designated "LT".

2. Definitions—paragraph (b). The definitions adopted in this final standard are generally those which are commonly used in the tire and wheel industries; however, some of the definitions have been modified to accommodate the regulatory nature of this standard and to minimize the potential for misunderstanding as indicated below. It was suggested that the definition of single piece wheels not be based on rim size (Exs. 3-18, 3-20 and 3-29). A single piece wheel was defined in the proposal as "a vehicle wheel or rim . . . with a diameter of 14.5 inches or more and a bead seat angle of 15°, or a diameter greater than 15 inches and a bead seat angle of 5°."

Several commenters noted that the scope paragraph of the standard and the definition of single piece rim wheels were inconsistent (Exs. 3-7, 3-10, 3-16, 3-17, 3-18 and 3-19), as the scope excluded automobile tires while the definition included some automobile tires by designating wheel size limits. Others recommended expanding the definition to include inflation pressures because such pressures were more related to hazards of servicing than the rim size (Exs. 3-10 and 3-27). OSHA has concluded after reviewing the suggested language that the definition of single piece wheels should not be based on rim size. Likewise it is difficult to define a single piece rim wheel according to the inflation pressure because the severity of the hazard is dependent upon the volume of the contained air as well as its pressure. Therefore OSHA has revised the definition of a single piece rim wheel to be any rim wheel utilizing a one-piece wheel.

The proposal required the use of a barrier or restraining device during the inflation of single piece rim wheels, and a restraining device during inflation of multi-piece rim wheels. The final rule maintains the current requirement for the use of restraining devices in the servicing of multi-piece rim wheels. However, the proposed modification of this provision, to allow the use of devices or equipment which were not specifically designed for use as restraining devices, has also been adopted. As was noted in the proposal, OSHA believes that it is not necessary to specify that a particular type of device be used to protect servicing employees from multi-piece rim wheel explosions. The comments received in response to the proposal were strongly in favor of providing additional flexibility for the employer in this regard. However, as the record of the previous rulemaking proceeding on multi-piece rim wheels made perfectly clear, there is a recognized need for some piece of equipment or device to be used to restrain multi-piece rim components.

Several commenters (Ex. 3-5, 3-6A, 3-18, 3-20, and 3-23) contended that because the strength requirements of barriers and restraining devices were the same, either of these two methods of protection should be permitted for multi-piece rims as well as single-piece rims. However, OSHA declines to extend the use of barriers to multi-piece rims. The testing and accident data on single-piece rim accidents, relied upon in the proposal, led the Agency to determine that a barrier would provide sufficient protection to employees engaged in single-piece rim wheel servicing, provided that they also stayed outside the trajectory. No such supportive data was submitted to the record to support an extension of this method to multi-piece rim wheels. To the contrary, OSHA, concluded, based on its full and complete rulemaking record on servicing of multi-piece rim wheels in 1980, that a cage, arrangement of bars, or comparable mechanism was needed to provide adequate protection for multi-piece rim wheel servicing. No new information has been developed since that time to convince the Agency to change its previous conclusions at this point. The parallel strength requirements provided for restraining devices and barriers in the present rulemaking are intended only to provide a comparable margin of safety for employees in all servicing operations. It should be noted, in this regard, that restraining devices used for multi-piece rim wheels are considered to be an acceptable means of

restraint for single-piece rim wheels, as well.

The differences between a restraining device and a barrier also occur in the definitions. A restraining device is a commonly used term for a generic device utilizing bars, pipes, and/or other metallic components to form a restraint which is also referred to as a "safety cage." (See the charts or rim manuals for a picture of a typical restraining device in use.)

In the proposed amendment, OSHA defined a barrier as a fence, wall or other structure which is used to contain the rim wheel components in the event that there is a sudden release of the pressurized air of a single piece rim wheel.

Although OSHA recognizes that a barrier could serve a dual purpose (contain rim wheel components and deflect the pressurized air) it was not OSHA's intent to require that a barrier would have to deflect the blast of air from a single piece rim wheel separation. Since the path of travel of the shock wave of the pressurized air is essentially perpendicular to the plane of the wheel, OSHA determined that requiring the employee stay outside the trajectory during inflation provides sufficient protection.

Three commenters (Exs. 3-5, 3-14, and 3-23) recommended including in the definition of a barrier that its purpose is to deflect the pressurized air as it is released from a single piece rim wheel. One of these commenters (Ex. 3-5) pointed out that air is not a solid and requires different means to manage it. In a test conducted by NWRA (Ex. 2-6), the shock wave of the compressed air was found to move generally perpendicular to the plane of the rim wheel with negligible effect outside the trajectory. As employees are required to remain outside the trajectory during tire inflation, to require that the barrier deflect the shock wave outside the trajectory might result in deflecting it towards the employee and, thus, would not necessarily increase employee safety.

3. Training—paragraph (c). This standard requires every employee who services large vehicle rim wheels to be trained by the employer in the proper techniques and practices applicable to the type of wheel being serviced. Training is required because many rim wheel servicing mechanics do not understand the potential dangers of servicing these rim wheels. A large number of the new employees service large vehicle rim wheels with no prior experience and/or training due to the large turnover of employees. Likewise

the need for training is substantiated by a review of the accident cases in which the accident was caused by non-adherence to the industry-accepted procedures which are incorporated in this standard (see Item F, Significant Risk, above). OSHA considers that training, in conjunction with the use of a restraining device or barrier and the proper air line accessories, can contribute significantly to a reduction of accidents.

This standard does not specify the details of the training program, but simply requires the development and maintenance of employee proficiency in given elements of servicing. A mechanic's level of proficiency must be established by demonstration of his or her familiarity with and ability to use the information contained in the charts, rim manuals and this standard.

The training provisions of the standard are stated in performance language, allowing the employer flexibility in complying with the requirement for training. The responsibility of providing adequate training and evaluating the employee's proficiency rests with the employer.

OSHA has considered the fact that some employees may need relatively little training and practical experience to grasp the proper methods, techniques and practices, and would need little or no periodic refresher training. Others may require additional initial training and periodic refresher training to develop and retain their knowledge of safe methods and procedures.

In the final standard, the training requirement has been written to assure that an employee receives appropriate training to enable safe performance of the tasks which are involved in servicing both single piece and multi-piece rim wheels. In addition to the initial training required, this final standard places a continuing obligation on the employer to evaluate the capability of each employee and assure that the employee maintains competence at servicing rim wheels. This not only insures that the initial training is effective, but also provides a means of determining the need for remedial or refresher training.

4. Tire Servicing Equipment—paragraph (d). A majority of the rim wheel servicing accidents occur while the tire is being inflated. The unintended separation of a multi-piece rim wheel, or the sudden release of the pressurized air contained in a single piece rim wheel, is the primary cause of the occupational accidents involving these rim wheels. Accordingly, a significant reduction of injuries can be attained through use of a

restraint, such as a restraining device or barrier, to contain the rim wheel components and protect employees from lethal airborne rim wheel components.

In the standard on servicing multi-piece rim wheels, OSHA required that restraining devices must be specifically designed to restrain rim wheel components. This provision was intended to ensure that employees would not use devices or components of equipment which were inadequate to perform that function. In the proposed amendment to the standard, OSHA proposed deletion of the "specifically designed" requirement. OSHA reasoned that any device or piece of equipment which was not originally designed or intended to be used as a restraint, could be used as a restraining device if it was capable of protecting the employee as prescribed in the proposal.

The final rule is written to ensure that restraining devices and barriers meet minimum strength requirements. Several commenters (Ex. 3-3, 3-16, and 3-19) suggested that some pieces of equipment might erroneously be considered as restraining devices and stressed that OSHA should clarify such instances. This would preclude an employee from utilizing a makeshift restraint from some inefficient material; for example, an employee using an old rusty chain to restrain a rim wheel by wrapping the chain around the rim wheel. The standard specifically defines what constitutes a barrier and a restraining device, and sets forth performance criteria which must be met.

Due to the magnitude of the forces associated with a rim wheel separation, it is necessary to specify strength requirements for restraining devices and barriers. Since the forces associated with an unintended separation of a multi-piece rim wheel and the sudden release of the contained air in a single piece rim wheel are of the same magnitude, the design factor (the ratio of the working load limit to the ultimate strength of the device) for restraints used for servicing both type rim wheels should be the same. OSHA proposed that the generally accepted minimum design factor of 1.5 for machinery, which was adopted for restraining devices, should also be applied to barriers since the restraining device and barrier serve the same purpose and their use is interchangeable for single piece rim wheels.

The proposal required that when servicing single piece rim wheels, the employer shall provide a restraining device or barrier, except when a single piece rim wheel is bolted to the vehicle during inflation. One commenter (Ex. 3-11), addressing the use of restraining

devices, noted that there is a design difference between a vehicle for use on highways and off-road machines. Because of the unique characteristics of off-road machines, the commenter suggested that separate paragraphs be used to address these differences. This commenter pointed out that some off-road machines have wheels which are an integral part of the machine's axle and cannot be removed, making the use of a restraint impractical. This commenter suggested that a barrier could be used, provided a barrier is defined as the machine itself and/or the service vehicle, and the employee stays out of the trajectory during inflation of the tire.

Since a barrier is defined in this final standard as an object or structure placed in the potential trajectory of a rim wheel to contain the rim wheel components in the event of the sudden release of the contained air of a single piece rim wheel, the use of the service vehicle or the machine itself is permissible provided the strength requirements of this standard are met. The above commenter also suggested that multi-piece rim wheels which are not an integral part of the vehicle axle could be inflated safely while bolted onto the vehicle with the lug nuts. OSHA disagrees. Unlike the single piece wheel, which is only one piece, the components of a multi-piece wheel (e.g., the locking rings and the side rings) cannot be restrained simply by bolting the multi-piece rim wheel to the axle. Therefore, in the event of an explosive separation the rim wheel components could still ricochet around the workplace even if the wheel were bolted to the axle. Requiring the employee to stand out of the trajectory without restraining a multi-piece rim wheel does not offer adequate protection to the employee.

Accordingly, the final rule does not allow bolting to the axle as an exception to the use of a restraining device for inflation of a multi-piece rim wheel. However, paragraph (d)(2) does allow an employer to bolt a single piece rim wheel to an axle as a means of complying with the restraint requirements of the standard, because that practice would effectively restrain that type of wheel.

Paragraph (d)(3)(i) proposed the same strength requirements for barriers as for restraining devices. The multi-piece rim wheel servicing standard required that a restraining device be capable of withstanding the maximum force occurring at 150% of the maximum tire specification pressure. A few comments contained arguments that the requirement of 150% of recommended

tire pressure does not ensure a restraining device of adequate strength to protect employees from rim wheel separation. It was stated that a tire with a 32 psi maximum inflated pressure would only require a restraining device capable of restraining the rim wheel components if the separation occurred at 48 psi (Ex. 3-16). This commenter contended that typical tire servicing businesses have air compressors in the range of 140 to 175 psi and therefore a tire could easily be inflated above the 48 psi capability of the restraint. Likewise another commenter (Ex. 3-18) noted that "A 750-16 8-ply rated tire, for example, would not be adequately restrained above 97.5 psi, yet this tire could be inadvertently inflated to 150 psi and above with the compressor inflation delivery systems commonly available." This same commenter suggested the final requirement be phrased to require that each restraining device or barrier be capable of withstanding the maximum force of a rim wheel separation or sudden release of the air occurring at a tire pressure equal to the pressure limit of the available inflation delivery system (air supply).

Even though overinflation has been a contributory factor in some accidents, OSHA does not accept the above contentions. The Agency has determined that the strength requirements of this standard are correct for two reasons. First, although any rim wheel can be rapidly overinflated to the maximum pressure of the air delivery system, the operating procedures required in this final standard prohibit inflating a tire to a pressure exceeding the manufacturer's recommendation. In addition, requiring the utilization of a restraint which would meet the strength requirements necessary to contain a rim wheel with the tire inflated to the pressure of the air system is not feasible, as such design requirements would make these restraints extraordinarily large, unwieldy, and expensive.

In paragraph (d)(3)(iii), OSHA proposed to preclude a barrier or restraining device from having a flat, solid surface (such as the bed of a tire changing machine) against which a rim wheel could lie or lean during inflation. This rule was proposed because a series of tests conducted by NWRRA (Ex. 2-6) showed that when a single piece rim wheel lay unrestrained on the ground it was propelled over 30 feet into the air, after the air was suddenly released on the side closest to the ground. Contrary to the opinion of one commenter (Ex. 3-16), the rim wheel movement was not caused by the jet effect of the escaping

air, but was due primarily to the flexure of the sidewalls of the tire. In reviewing this proposed provision, OSHA has become aware that the protection provided by proposed paragraph (d)(3)(iii) was also provided in paragraph (g)(7), which prohibits tires from being inflated when a flat solid surface is in the trajectory and within one foot of the tire's sidewall. OSHA realizes that this resulted in unnecessary duplication. In addition, in referring to the bed of a tire changing machine in proposed paragraph (d)(3)(iii), OSHA did not intend to imply that a tire changing machine is a restraint. Although the wheel could be attached to a tire changing machine, a manufacturer of tire changing machines indicated that a tire changing machine is not a restraining device as it does not meet the necessary strength requirements, and should not be used as such (Ex. 3-16). Further, paragraph (g)(4) limits the amount a tire may be inflated while on a tire restraining machine. Therefore, OSHA has deleted the proposed (d)(3)(iii) in the final standard to reflect these concerns. Paragraph (g)(7) accomplishes OSHA's intent as it assures that employees do not lay a rim wheel against a barrier or any other solid flat surface during inflation.

In the proposed amendment of paragraph (d)(3)(v), OSHA required the employer to obtain certification by the manufacturer or a registered professional engineer to service. Seven commenter (Exs. 3-5, 3-6, 3-9, 3-13, 3-14, 3-18, and 3-23) questioned the necessity of a registered professional engineer to certify that a restraining device or barrier, which has been removed from service, can be returned to service. These commenters contended that since the determination of whether or not a restraining device or barrier is damaged is left to the employer, the decision as to the device's capability of meeting strength requirements should be left to qualified service people. One commenter (Ex. 3-18) noted that the employer is ultimately responsible for employee safety under the Occupational Safety and Health Act; therefore, such a decision should be made by the employer. Finally, one commenter suggested that where the employer is also the manufacturer, particularly when a barrier is in use, the employer is competent to assess the capabilities of the device.

When a barrier or restraining device becomes unserviceable, the problems such as cracks at welds or excessive corrosion can usually be detected by visual inspection. For these reasons, paragraphs (d)(3)(iii) and (iv) provide

that the employer must assure that a restraining device or barrier would meet the strength requirements if the restraint has been removed from service; but a restraint must still be certified by a manufacturer or professional engineer following structural repair such as component replacement or rewelding.

OSHA proposed that a hose assembly with a clip-on chuck; a sufficient length of hose to allow the employee to remain outside the trajectory during tire inflation; and an inline pressure gauge or a presettable regulator, be used when inflating rim wheels. Several commenters (Exs. 3-5, 3-6, 3-18 and 3-23) disagreed with the terminology of this proposal, preferring to call the tire filling apparatus an "air line assembly." One commenter (Ex. 3-18) suggested the inclusion of a requirement for both an inline valve and presettable regulator, a nomenclature change from hose assembly to air line, and a clarification of what constitutes a sufficient length of hose when a presettable regulator is utilized. Concern was also expressed that readers would assume OSHA required the regulator to be a part of the hose. OSHA does not agree that a requirement for an inline valve plus a presettable regulator is necessary, and has adopted the proposed language to allow the employer flexibility in choosing the type of air line assembly to be used for inflation of tires. The recommended change in terminology to "an air line assembly" has been adopted in the final rule.

5. Wheel component acceptability-paragraph (e). The current standard for servicing multi-piece rim wheels requires that rim wheel components be compatible and serviceable. Mating surfaces of tires and wheels are required to be free of foreign material when assembled. It was proposed to add a specific provision for both multi-piece and single piece rim wheels, to require the checking of the wheel and tire for compatibility. Tire and wheel mismatching was identified as a major cause of the accidents which have occurred during the servicing of both multi-piece rim wheels and single piece rim wheels. Several accidents have been reported as the result of an employee attempting to mount a tire on a wheel whose bead diameter is too large for the tire, such as a 16-inch tire being installed on a 16½-inch wheel. The opposite situation is equally hazardous, e.g., when a tire of larger diameter is installed on a wheel of smaller diameter, as the tire bead will not firmly seat into the rim gutter and can slip over the rim flange, particularly when the tire is being inflated. The final rule requires

that the wheel and tire be checked to assure that they are compatible.

In the proposed amendment to the standard on servicing multi-piece rim wheels, OSHA raised the issue as to whether the present charts which cover multi-piece rim wheels should be revised to include the servicing of single piece rim wheels. Because the majority of servicing accidents were linked to improper procedure and/or mismatching components, the requirement for charts was to assure that a handy, easily accessible means to confirm the correct procedure and/or components for servicing rim wheels was available to the employee. The response of commenters varied from suggesting deletion of all chart references to incorporating additional charts for single piece rim wheels (Exs. 3-4, 3-5, 3-6, 3-10, 3-13, 3-14, 3-18, 3-20, and 3-23).

In the final standard, charts are defined as the U.S. Department of Transportation posters or any other publication containing, at a minimum, the same instructions, precautions and other information. A review of the rim manuals available to OSHA (Docket S-005, Ex. 2-5) indicates that the rim manuals contain, at least, the same instructions, precautions and other information as the charts. OSHA believes, therefore, that it is not necessary to revise the charts because the information is available in the rim manuals. Since the goal of the regulation requiring charts was to make the necessary information available to the employee providing the rim wheel servicing, OSHA has decided not to publish a separate chart for servicing single piece rim wheels, but, has changed the definition of charts to permit the use of rim manuals to comply with the provision requiring charts in a service area.

OSHA considers the availability of the information contained on the charts and the rim manuals to be essential in the workplace, not only to assist the employee in performing the job safely but also to aid the employer in training and supervision. Therefore, OSHA continues to require that charts or rim manuals be available at the workplace when servicing rim wheels.

Five commenters (Exs. 3-6, 3-10, 3-20 and 3-21) made suggestions regarding the requirements of paragraph (e)(2). This paragraph set requirements for inspection prior to assembly and required that unserviceable wheels be rendered unusable and discarded. Four commenters (Exs. 3-6, 3-10, 3-20 and 3-21) suggested the inclusion of the words "or wheel components" in the criteria

for rejection of wheels. One commenter (Ex. 3-21) suggested that it was inadvisable to render unusable and discard an unserviceable wheel or its components, particularly when that wheel or component could have been in use when a rim wheel incident occurred, and may be required as evidence in litigation.

Additionally one of these commenters pointed out that the requirement in paragraph (e)(4) for a matching bead diameter was incomplete, as a wheel and tire with different widths were equally unsafe (Ex. 3-8). It was recommended that the wording of (e)(4) be changed to read "matching size" instead of "matching bead diameter."

OSHA has considered the comments regarding the proposed requirement to render unserviceable wheels or wheel components unusable. The intent of this regulation was to assure that an employee would not attempt to reuse an unserviceable part. Rendering the part unusable is certainly one method to guard against reuse of those parts. However, OSHA does not believe that such action is necessary to prevent reuse of unserviceable wheel components in all cases.

In an effort to maintain the intent of the requirement and yet allow the employer more flexibility, the final standard will continue to prohibit the use of an unserviceable part, but will not require that the part be rendered unusable. Instead, the employer must assure that the unserviceable part is not used and is designated as unserviceable and placed or stored away from serviceable parts.

Based on the above comments, OSHA has modified paragraph (e)(2) to include the terminology "or rim component", and paragraph (e)(4) to specify the need to match both wheel bead diameter and width with the allowable values for the tire.

6. Safe operating procedures—multi-piece rim wheels—paragraph (f). In the standard for servicing multi-piece wheels, OSHA requires the utilization of certain procedures which are generally recognized in the tire servicing industry as those procedures which are essential to ensure that the servicing is done safely. These procedures include deflating the tire before demounting or removing the rim wheel when there is known or suspected damage to the wheel. The standard requires the use of rubber lubricant, the use of a restraining device during inflation, and inspection of the rim wheel following inflation and before removal from the restraining device. Certain work practices are prohibited, including hammering, striking or forcing the components to get

them seated properly, and the reworking of damaged wheel components. Additionally, employees are required to remain outside the trajectory during tire inflation. Although there are several minor changes in this paragraph, this final rule does not change the above mentioned elements of the standard in any major way.

In the proposed amendment, OSHA proposed to allow the heating of lug nuts to facilitate their removal from the vehicle's axle studs after the tire was completely deflated. Four commenters (Exs. 3-6A, 3-18, 3-20 and 3-23) objected to the application of heat to any metallic wheel component, including the lug nuts. These parties objected to any application of heat to a wheel, as it would have a detrimental effect on the strength, yield modulus and other properties of the metal. OSHA agrees that the application of heat may adversely affect the design and function of wheel components. There are alternative methods of releasing frozen lug nuts that are in general use in the industry, such as the use of penetrating oil or graphite solution. Therefore, the final standard has been revised to prohibit the use of heat on any wheel component.

Comments were also received regarding the use of rubber lubricant as required in paragraph (f)(3). One commenter (Ex. 3-11) recommended that the use of rubber lubricant on off-road machine rim wheels be required only "as needed." This commenter, an off-road machine manufacturer, stated,

Excessive rubber lubricant can cause tire slippage on the wheel and corrosion with the tire. Since the requirement really has nothing to do with safe assembly procedures, but is only a matter of convenience, it's (sic) use should not be mandatory and probably should not be in the rule.

Contrary to the claims of this commenter, available literature, such as the Goodyear Off-Highway Rim Manual (Docket S-005, Ex. 2-25, Attachment 5), indicated the need to use rubber lubricant to allow the tire bead to be slipped over the rim flange during assembly of the rim wheel with a minimum of potential for the tire bead to be cut or otherwise damaged. Damaging the tire bead during rim wheel assembly can cause premature failure of the tire at a pressure far below the maximum operating pressure of the tire. This failure could cause the type of injuries of OSHA intends to prevent. If there is some reason not to use rubber lubricant on a particular type rim wheel, either the tire or wheel manufacturer will recommend that it not be used. For the above reasons, OSHA will continue to

require the use of rubber lubricant unless the tire and/or wheel manufacturer recommends it not be used.

One commenter (Ex. 3-11) recommended that vehicle tires on multi-piece wheels be allowed to be reinflated while remaining on the vehicle if the tire contained more than 80% of the recommended pressure or was less than 20 psi below the rated tire pressure. This commenter contended that low pressure tires (those with 20 to 40 psi maximum inflating pressures) could be run with very low pressures without damaging the wheel or tire. Adoption of the 20 psi parameter could allow the low pressure tires to be run from zero to 50% of their rated capacity and still be reinflated while the rim wheel remained on the vehicle. OSHA has no evidence that any tire could be run while this severely underinflated without causing damage to the tire. OSHA requires that tires must be inflated while protected by a restraining device; therefore, requiring removal of the rim wheel is necessary to reinflate the tire because a multi-piece rim wheel cannot be restrained while on the vehicle.

7. Safe operating practices—single piece rim wheels—paragraph (g). In paragraph (g), OSHA proposed the utilization of safety procedures which have been used in those segments of the tire servicing industry which have the lowest accident rate (Ex. 2-3 and Docket S-005, Ex. 2-1). OSHA has determined that adherence to these procedures reduces the hazards of servicing single piece rim wheels. Many procedures are necessary for servicing both multi-piece and single piece rim wheels. When the servicing procedures differ, such as the requirement for mounting and demounting the tire only on the narrow ledge side of the single piece wheel, or the requirements relating to the use of the tire changing machine, these procedures have been specified as applying to one or the other type of wheel.

In paragraph (g)(1), OSHA proposed to require that the tire be completely deflated by removal of the valve core before demounting. One commenter (Ex. 3-18) recommended that the valve core be fully inserted before inflating the tire. This commenter did not specify whether the valve core was to be in place prior to the employee inflating the tire enough to force the tire bead up onto the bead seat or before final inflation. The usual procedure used in the servicing of tubeless tires is to attach the air chuck to the valve without the valve core being in place following assembly, but before

the cone of the tire changing machine is loosened. The employee then tries to manipulate both tire beads onto the bead seats by using a bead expander or by manually manipulating the tire while blowing air into the tire. As soon as the tire bead slips onto the bead seat, the chuck is removed, the air escapes, the valve core is inserted and the center spindle of the changing machine is loosened. The tire is then inflated to the correct pressure. The presence or absence of the valve core does not significantly affect pressure build-up or bead hang-up; therefore, the change suggested by the commenter is not necessary and is not included in the final rule.

Paragraph (g)(2) proposed that mounting and demounting of the tire be done only from the narrow ledge side of the wheel; that care be taken to avoid damage to tire beads while mounting tires on wheels; and that tires be mounted only on compatible wheels of matching bead diameter. As noted earlier, one commenter (Ex. 3-18) pointed out that the tire and wheel width must also be compatible. Since a mismatch of a wheel and tire can occur either with the bead diameters or the tire and wheel widths, OSHA has amended the final standard to require that tire and wheel bead diameter and width be compatible.

OSHA proposed to require the use of rubber lubricant when assembling a single piece rim wheel (paragraph (g)(3)). As discussed above in the discussion of paragraph (f)(3), OSHA will require the use of rubber lubricant unless the wheel or tire manufacturer advises against its use. One commenter (Ex. 3-6) recommended that rubber lubricant used during the assembly of single piece rim wheels not contain any flammable substances. Since the point at which a substance will spontaneously ignite is decreased as the partial pressure of oxygen in the air increases (as the air is compressed), this is a necessary addition to the standard, particularly for the servicing of tubeless tires. Therefore, the final rule will require that rubber lubricants used on single piece rim wheels not be flammable.

In paragraph (g)(4), OSHA proposed to allow the use of a tire changing machine during inflation only to seat the tire bead, and only during inflation of the tire to no more than 10 psi. Seven commenters (Exs. 3-5, 3-6, 3-16, 3-18, 3-19, 3-21 and 3-24) responded to this proposed servicing requirement. Five commenters recommended increasing the maximum pressure to 40 psi, while one commenter suggested deleting the

requirement as being design restrictive. In the standard on servicing multi-piece rim wheels (44 FR 6706, January 29, 1980), OSHA required that the minimum amount of air (3 psig) be used to force the tire bead onto the bead seat rather than to fully seat the bead. Because several informal reports after the promulgation of the multi-piece rim wheel standard indicated that the pressure of 3 psig was difficult to determine, OSHA proposed an increase in pressure up to 10 psi. This increase accomplished OSHA's intent without significantly increasing the hazards of inflation. However, one commenter (Ex. 3-6) pointed out, and OSHA agrees, that it is not necessary to seat the bead fully before the rim wheel is handled. It is only necessary to use enough pressure to force the tire bead onto the bead seat and provide an airtight seal to allow placement of the rim wheel into or behind a restraint or onto a vehicle. Therefore, the standard will only allow the use of the minimum amount of air to force the tire bead onto the seat before placing the rim wheel in a restraining device or behind a barrier.

Paragraph (g)(5) was proposed to allow the use of a bead expander only to seat the beads of a tire. Five commenters (Exs. 3-6, 3-13, 3-14, 3-18 and 3-21) addressed the proposed requirement. Four of the commenters recommended maximum tire inflation pressures from 3 to 40 psi before removal of tire expander. One commenter (Ex. 3-6) recommended that a bead expander be removed as soon as the air seal is obtained. Based upon the same rationale as discussed for the adoption of paragraph (g)(4) above, OSHA believes that a bead expander should be removed as soon as the air seal is obtained (the tire bead is forced onto the rim ledge).

In paragraph (g)(6), OSHA proposed to allow tires on single piece wheels to be inflated above 10 psi only while contained in a restraining device, positioned behind a barrier, or bolted on a vehicle with the lug nuts fully tightened. Although the provision has been changed, the intent remains the same. The words "shall only be fully inflated" have been substituted for the words "may be inflated above 10 psi only." This change is consistent with the changes made in the rest of the paragraph. This restriction would also preclude the use of a tire changing machine as a restraining device as paragraph (g)(4) limits the amount a tire may be inflated while on a tire changing machine.

Paragraph (g)(7) was proposed to prohibit the placement of a rim wheel

during inflation so that a flat, solid surface is in the trajectory and within one foot of the sidewall. Seven commenters (Exs. 3-5, 3-6, 3-8, 3-14, 3-18, 3-19 and 3-22) advised changing the requirement. Most felt that the requirement was impractical. One objection was that the prohibition precluded storage of tires. OSHA intended this requirement to apply only when the tire on a single piece wheel was being inflated. Even though a restraining device or barrier is being used, a rim wheel or its components which become airborne in the event of the sudden release of the air could be propelled about the workplace if the part ricocheted off a surface. Prohibiting the placement of a rim wheel within a foot of a flat, solid surface during inflation will ensure that the rim wheel will not become airborne. The requirement has been amended to reflect OSHA's intent.

OSHA proposed paragraph (g)(8) to require that tires not be inflated above their recommended tire pressure. Seven comments (Exs. 3-5, 3-6, 3-11, 3-14, 3-18, 3-20 and 3-21) were submitted seeking clarification of the requirement. A majority of the commenters pointed out that there are a variety of recommended operating pressures for various rim wheel applications. The U.S. Department of Transportation regulation, FMVSS 119 (49 CFR 571), requires a stamping on each tire indicating a maximum load at a recommended tire pressure. OSHA believes that overinflation can enhance the potential for accidents. Recognizing that some manufacturers' accompanying literature recommended inflating tires above the pressure stamped on the tire sidewalls in certain circumstances, the final rule restricts the inflation of tires during servicing to the tire pressure stamped on the sidewall unless the tire manufacturer recommends a higher pressure.

As OSHA discussed in the preamble to the proposal, employees must remain outside of the trajectory during tire inflation. In the final standard, the requirement remains as proposed; requiring an employee to remain outside the trajectory during inflation in conjunction with the other safe servicing procedures will prevent an employee from being struck by an airborne rim wheel component.

Paragraph (g)(10) proposed to require that if the tire beads do not fully seat by the time the tire is inflated to its recommended pressure, the rim wheel must be disassembled and the cause determined. Although five commenters (Exs. 3-6, 3-16, 3-18, 3-19, and 3-20)

recommended a maximum inflation to no more than 40 psi to seat the bead (force the tire bead against the rim flange), one commenter (Ex. 3-11) pointed out that some tires used in specialized applications require different bead seating pressures. OSHA recognizes such situations and, therefore, the final rule requires inflation to no more than the tire or wheel manufacturer's recommendation for seating the bead of the rim wheel being serviced.

In paragraph (g)(11), OSHA proposed to prohibit the use of heat except to free bound lug nuts. As noted in the discussion of paragraph (f)(11) above, OSHA is prohibiting the use of heat on a rim wheel for any purpose.

The proposed paragraph (g)(12) prohibited the use of heat to repair unserviceable wheels and referred to heating of lug nuts. Based on the rationale used to support the decision on paragraphs (f)(11) and (g)(11) above, OSHA maintains its prohibition on the use of heat on all wheels.

Two commenters (Ex. 3-6 and 3-23) recommended the inclusion of a new appendix giving examples of acceptable restraining devices and barriers. The choice of the type of restraint, the materials from which it is constructed and how it will be used are based upon factors such as: the type of rim wheels to be serviced (the size and type of components); the frequency of use of the restraint; and the environmental conditions under which the restraint will be used and stored. Based upon the number of variables which must be considered in designing and making a restraining device or barrier, OSHA has decided that an Appendix containing specifications, diagrams or descriptions of restraining devices might appear to give an endorsement to particular types or designs of devices. In addition, such an Appendix might appear to restrict innovation in development of future designs. It should be noted, however, that pictures of various restraining devices in use are shown on the charts and in the rim manuals, either of which is required to be available at the worksite.

3. Regulatory Impact Assessment

In accordance with Executive Order No. 12291 (46 FR 13193, February 17, 1981), OSHA has assessed the potential economic impact of this standard. Based on the Executive Order criteria, OSHA has determined that this amendment is not a "major" action and OSHA has prepared a Regulatory Impact Assessment of the amendment.

OSHA's determination that the amendment will not have a major

impact is based primarily upon three studies. The first study is a June 1973 report by Centaur Management Consultants, Inc., for OSHA entitled "Economic Impact Statement/Assessment for Multi-piece Rim Assemblies" (Docket S-005, Ex. 2-33). The second study is a March 1981 report by Dr. Roger L. McCarthy and Mr. James R. Finnegan of Failure Analysis Associates for the National Wheel and Rim Association (NWRA) entitled, "Large Vehicle Wheel Servicing: Reduction of Risk Through Implementation of an OSHA Standard Governing Multi-Piece and Single Piece Rims" (Docket S-010, Ex. 3). The third study is a March 1981 report by Dr. Thomas Gale Moore of the Hoover Institute for the NWRA entitled "An Economic Evaluation of Proposed OSHA Single Piece Rim Standard" (Docket S-010, Ex. 4).

Most, if not all facilities which will service single piece rim wheels currently service multi-piece rim wheels. As a result, OSHA concludes that the promulgation of a single piece rim wheel servicing standard will result in no additional capital costs because the equipment which must currently be provided for compliance with the multi-piece rim wheel servicing standard will also meet the equipment requirements for single piece rim wheel servicing.

OSHA estimates that the total number of large vehicle rim wheels to be serviced will generally be constant over the next ten years. OSHA expects that the number of single piece rim wheels serviced will increase as the number of multi-piece rim wheels serviced decreases. As a result, equipment currently used to service multi-piece rim wheels will be shifted to servicing single piece rim wheels and no additional equipment will need to be purchased in order to comply with the single piece rim wheel servicing standard.

However, there will be initial and continuing training costs imposed by the employee training requirements of the standard. These costs, in 1981 dollars, are estimated to be, at most, \$2.515 million in the first year and about \$0.908 million (growing at a yearly rate of 1.6%) in each succeeding year. This maximum cost is calculated under the assumption that all employees (including supervisors) will require training at overtime wages during the first year that the standard is effective. The estimate also assumes a 50 percent turnover rate for nonsupervisory employees, and a 33 percent turnover rate for supervisors in subsequent years. As a result, it is assumed that employers will be required to train a new nonsupervisory employee every year and a supervisor every two

years. Assuming 15 minutes of additional training, the present value (discounted to 1981 by 10%) of this training cost is estimated at \$8.3 million over the 1981 to 1990 period. As noted above, OSHA believes that this is an upper bound estimate of the training cost involved.

In addition, the standard will have some negative effects on productivity because it will require that tires on single piece wheels be inflated at a distance from the employee. This cost is estimated to be, at most, \$750,000 in 1981 dollars increasing to \$2.05 million in 1990. The productivity impacts are estimated on the high cost assumptions that no employees currently follow this safe servicing procedure, and that there are no positive productivity offsets, such as fewer days lost from work. Over the 10-year period 1981 to 1990, the present value (discounted to 1981 by 10%) of this "worst case" cost estimate is \$8.35 million in 1981 dollars.

This makes the present value of the total costs, assuming the 10% discount rate over the 10-year period 1981-1990, approximately \$16.47 million in 1981 dollars. This amounts to approximately \$16 per facility per year.

OSHA has also examined the likely effects which the amendment will have on the prices charged for servicing large vehicle tires, employment, critical materials, and market structure. The rate at which employers change from multi-piece rims and tube-type tires to the more fuel-efficient single piece rims and radial truck tires will not be affected. No significant impacts on any of those areas are expected to result from compliance with the standard.

The population at risk is approximately 322,000 persons who are employed in 102,000 workplaces in ten industry sectors. As discussed earlier in the section entitled "Significant Risk", these workers will benefit from a safer workplace as a result of the standard.

The major benefit of compliance with this standard is a significant reduction in the number of fatalities and total and permanent disabilities, which are the result of accidents which occur during the servicing of single piece rim wheels. As previously noted, at least 91 injury-causing accidents involving the servicing of single piece rim wheels occurred between 1970 and 1980. The current injury rate in single piece rim wheel servicing of one in every million tire changes is about the same as the injury rate which existed in multi-piece rim wheel servicing before the promulgation of the OSHA standard governing the servicing of multi-piece rim wheels.

The percentage of vehicles which utilize single piece rim wheels is expected to increase from 20 percent in 1980 to about 50 percent in 1990. This increase is largely due to greater fuel efficiency of radial tires which require, for the most part, the use of single piece wheels. Assuming this increased use, if the current accident rate does not change and if no standard is promulgated, OSHA estimates that there will be approximately 280 to 350 accidents; 50 to 67 fatalities; 50 to 67 total disabilities; 50 to 67 permanent disabilities; and 137 to 188 temporary disabilities over the 10-year period of 1981 to 1990.

OSHA's analysis of the available accident data indicates that the provisions of this standard, if followed, would have prevented nearly all of the reported accidents. In addition, OSHA has concluded that compliance with this standard will involve minimal costs to employers and that the promulgation of the standard will result in high levels of compliance. Accordingly, a corresponding large reduction in the number of deaths and injuries should follow. For purposes of the analysis, OSHA has assumed a 75 percent reduction.

It should be noted that OSHA does not endorse any particular estimate of the value of employee lives, and has not used such an estimate in determining the content and application of the final rule. However, the following discussion and calculations of the economic costs of rim wheel accidents may be illustrative of the potential benefits of OSHA's standard.

One measure of the potential benefits of the standard is the dollar amount that society would be "willing to pay" to prevent these accidents. Depending upon the methodology used, OSHA estimated that this willingness-to-pay estimate would be between \$40.70 million and \$72.05 million.

As another method of estimating the potential benefits of the amendment, OSHA examined the estimated lifetime earnings loss due to death or injury, the costs of long-term care for the totally disabled, and the medical costs of treating the injuries. Using the available injury data, OSHA estimated the present value in 1981 of the preventable economic losses to workers for the 10-year period 1981 to 1990 to be between \$21.71 and \$31.72 million. These are low cost values because the estimate of forgone wages was based upon the assumption that the injured workers would have remained repairmen and would not have advanced to higher income jobs. The estimated monetary benefits of the standard also do not

include followup treatment for permanent or temporary disabilities. They also do not include intangible benefits like the social value of the worker's life, or the value of the prevented pain and suffering. In addition, they do not include any potential secondary benefits from the reduction of on-the-road truck accidents caused by rim wheel failures due to improper servicing of single piece rim wheels.

On this basis, OSHA concludes that this standard will reduce the number of worker deaths and disabilities, will provide net benefits to society, and will not adversely affect any sector of the economy.

4. Regulatory Flexibility Certification

In accordance with the Regulatory Flexibility Act of 1980 (Pub. L. 96-353, 94 Stat. 1164 (5 U.S.C. 601 et seq.)), OSHA has assessed the potential economic impact of this standard on small entities and has examined some of the alternatives to it. Based on this assessment, OSHA hereby certifies that the standard will not have a significant economic effect on a substantial number of small entities. For purposes of the Regulatory Flexibility Certification, OSHA defines a small tire servicing entity as one which employs fewer than 20 people.

The Centaur study (Docket S-005, Ex. 2) indicates that nearly all of the garages and service stations which service large vehicle tires for the general public are included in this definition of small business, and that this proposal may affect as many as 100,000 small firms. However, even using the "worst case" basis for estimating the cost of compliance, the promulgation of this standard will cost the typical small garage (one supervisor and two employees) about \$32.50 the first year and between \$13 and \$16 per year each succeeding year. The sources of these costs are the required employee training and the increase in tire servicing time. There are some very small economies of scale in training. However, the fact that firms must train new employees as they are hired largely precludes training many employees at the same time. This is especially true in this industry which is characterized by high labor turnover. Consequently, large employers will not garner any significant economies of scale in training and these costs will be largely proportional to the number of employees trained. Similarly, the increased time needed to service each rim wheel is independent of the number of rim wheels serviced. As the smaller firm would service fewer rim wheels, OSHA believes that the minimal cost of

compliance will not significantly affect small entities and will not create any competitive disadvantages for small entities. Copies of the Regulatory Impact Assessment and Regulatory Flexibility Analysis are available for inspection and copying at the OSHA Docket Office, Docket No. S-010, Room S-6212, U.S. Department of Labor, Washington, D.C. 20210. (202) 523-7894.

5. State Plan Applicability

The 24 States with their own OSHA-approved occupational safety and health plans must adopt a comparable standard within six months of this publication date. These States are: Alaska, Arizona, California, Connecticut (for state and local government employees only), Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington, and Wyoming. Until such time as a State standard is promulgated, Federal OSHA will provide interim enforcement assistance, as appropriate, in these States.

6. Effective Date

Based on the information in the Regulatory Impact Assessment, and in the Regulatory Flexibility Certificate, it is anticipated that the affected employers will have difficulty in complying with the provisions of this standard. There is no need for an extended delay for employers to implement the provisions of the standard. Therefore, the effective date of this standard is March 5, 1984.

The standard currently found in § 1910.177 will remain in effect until the standard contained in this document is effective.

List of Subjects in 29 CFR Part 1910

Protective equipment, Safety, Signs and Symbols.

Authority: This Document was prepared under the direction of Thorne G. Auchter, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, Third Street and Constitution Avenue, N.W., Washington, D.C. 20210.

Accordingly, pursuant to section 6(b) of the Occupational Safety and Health Act of 1970 (84 Stat. 1593; 29 U.S.C. 655), Secretary of Labor's Order No. 9-83 (48 FR 35736), and 29 CFR Part 1911, § 1910.177 of 29 CFR is amended as set forth below.

Signed at Washington, D.C., this 30th day of January 1984.

Thorne G. Auchter,
Assistant Secretary of Labor.

PART 1910—[AMENDED]

Section 1910.177 is amended by revising the title to read, "Servicing multi-piece and single piece rim wheels," by revising paragraphs (a), (b), (c)(1), (c)(1)(i), (c)(1)(ii), (c)(2), (c)(2)(ii), (c)(2)(iii), (c)(2)(iv), (c)(2)(v), (c)(2)(vii), (c)(3), (d)(2), (d)(3), (d)(4), (d)(5), (e), introductory text of (f), (f)(2), (f)(3), and (f)(4), and by adding new paragraphs (c)(2)(iii), (d)(6), (f)(11) and (g). As amended, §1910.177 reads as follows:

§ 1910.177. Servicing multi-piece and single piece rim wheels.

(a) *Scope.* (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".

(2) This section does not apply to employers and places of employment regulated under the Construction Safety Standards, 29 CFR Part 1926; the Agriculture Standards, 29 CFR Part 1928; or the Maritime Standards, 29 CFR 1915-1918.

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

(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 United States Department of Transportation, National Highway Traffic Safety Administration (NHTSA) publications entitled "Safety Precautions for Mounting and Demounting Tube-Type Truck/Bus Tires" and "Multi-Piece Rim Wheel Matching Chart," or any other publications such as rim manuals containing, at a minimum, the same instructions, safety precautions and other information contained on those charts that are applicable to the types of rim wheels being serviced.

"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).

(c) *Employee training.* (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.

(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.

(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.

(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.

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

(i) Demounting of tires (including deflation);

(ii) Inspection and identification of the rim wheel components;

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

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

(v) Handling of rim wheels;

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

(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

(viii) Installation and removal of rim wheels.

(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.

(d) *Tire servicing equipment.* (1) The employer shall furnish a restraining device for inflating tires on multi-piece wheels.

(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.

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

(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.

(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;

(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:

(A) Cracks at welds;
 (B) Cracked or broken components;
 (C) Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation;
 (D) Pitting of components due to corrosion; or

(E) Other structural damage which would decrease its effectiveness.

(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.

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

(i) A clip-on chuck;
 (ii) An in-line valve with a pressure gauge or a presettable regulator; and
 (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.

(5) Current charts (rim manuals) containing instructions for the types of wheels being serviced shall be available in the service area.

(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.

(e) *Wheel component acceptability.*
 (1) Multi-piece wheel components shall not be interchanged except as provided

in the charts or in the applicable rim manual.

(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.

(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.

(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.

(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:

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

(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:

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

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

(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.

(4) If a tire on a vehicle is underinflated but has more than 80% of the recommended pressure, the tire may 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.

(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.

(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.

(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.

(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.

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

(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.

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

(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:

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

(2) Mounting and demounting of the tire shall be done only from the narrow ledge side of the wheel. Care shall 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.

(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.

(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.

(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).

(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.

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

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

(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.

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

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

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

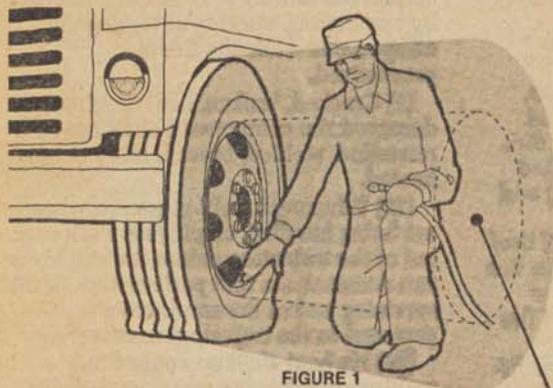


FIGURE 1



FIGURE 2

TRAJECTORY

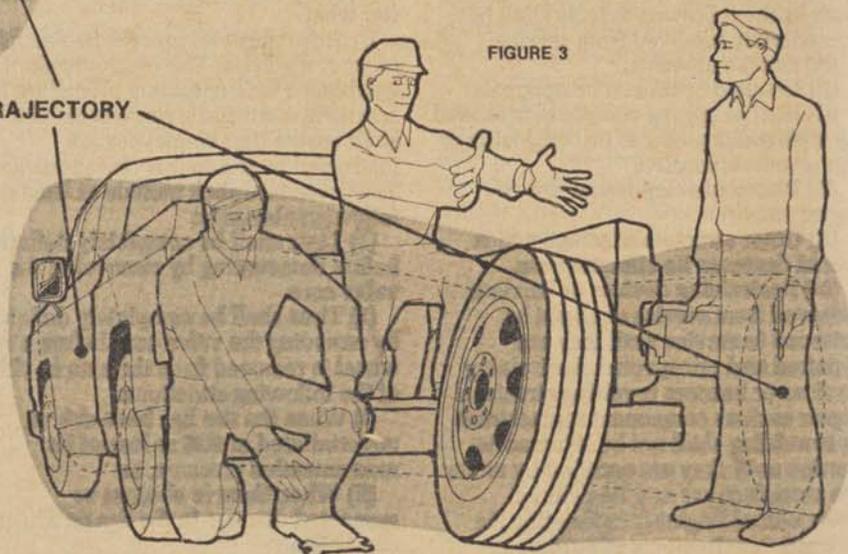


FIGURE 3

APPENDIX A TRAJECTORY

WARNING

STAY OUT OF
THE TRAJECTORY AS
INDICATED BY SHADED AREA

Note: Under some circumstances,
the trajectory may deviate
from its expected path

Appendix B—Ordering Information for NHTSA Charts

OSHA has reprinted the NHTSA Charts as part of a continuing campaign to alert rim wheel servicing personnel of the industry accepted procedures for servicing multi-piece rim wheels.

Reprints of the charts are available through the Occupational Safety and Health

Administration (OSHA) Area Offices. The address and telephone number of the nearest OSHA Area Office can be obtained by looking in the local telephone directory under U.S. Government, U.S. Department of Labor, Occupational Safety and Health Administration. Single copies are available without charge.

Individuals, establishments and other organizations desiring multiple copies of these charts may order them from the Publications Office, U.S. Department of Labor, Room N4101, Washington, D.C. 20210. Telephone: (202) 523-9667.

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