TM 9-2610-200-14

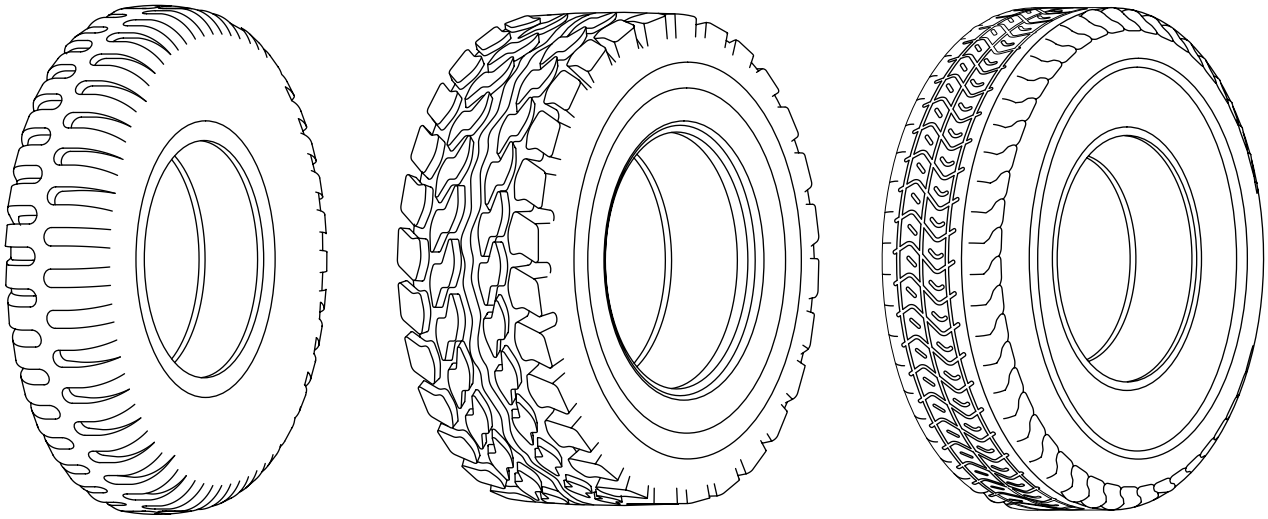
This manual supersedes TM 9-2610-200-14, 1 September 2000

TECHNICAL MANUAL

OPERATOR'S, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

FOR

CARE, MAINTENANCE, REPAIR, AND INSPECTION OF PNEUMATIC TIRES AND INNER TUBES



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HEADQUARTERS, DEPARTMENT OF THE ARMY

SEPTEMBER 2005

WARNING SUMMARY

WARNING

REFER TO SPECIFIC MAINTENANCE PROCEDURES LISTED IN THE VEHICLE MAINTENANCE MANUAL. FAILURE TO COMPLY WITH VEHICLE MAINTENANCE MANUAL INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.

WARNING

WHEEL/RIM COMPONENTS CAN SEPARATE AT ANY TIME AND WITH VERY EXPLOSIVE FORCE. ALWAYS STAY OUT OF THE TRAJECTORY OF COMPONENTS. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH.

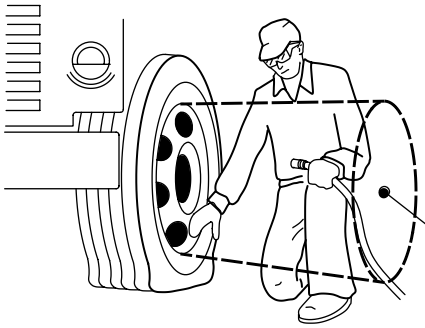

FIGURE 1

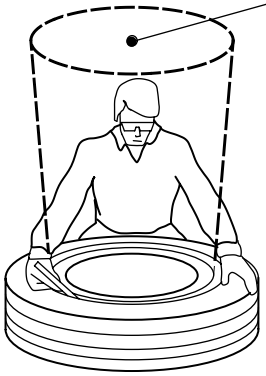

FIGURE 2

WARNING

STAY OUT OF THE TRAJECTORY AS INDICATED BY DASHED AREA

TRAJECTORY

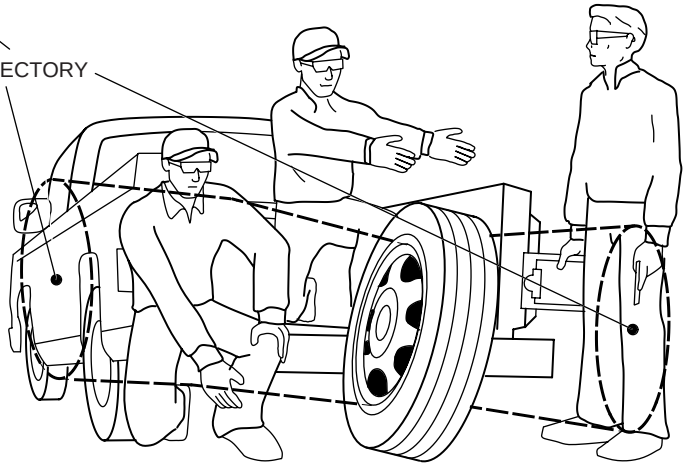

FIGURE 3

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WARNING

OPERATING A VEHICLE WITH AN UNDERINFLATED OR DEFECTIVE TIRE MAY LEAD TO PREMATURE TIRE FAILURE AND MAY CAUSE EQUIPMENT DAMAGE AND SERIOUS INJURY OR DEATH.

WARNING SUMMARY − CONTINUED

WARNING

PRIOR TO DISLODGING TIRE BEADS, LOCKRINGS, OR SIDE RING FLANGES, BE ABSOLUTELY CERTAIN NO AIR PRESSURE REMAINS IN THE TIRE. SERIOUS INJURY OR DEATH COULD RESULT.

WARNING

NEVER INFLATE A WHEEL ASSEMBLY WITH WHEEL LOCKNUTS REMOVED IN AN ATTEMPT TO SEPARATE THE INNER AND OUTER RIM HALVES. THE ASSEMBLY WILL SEPARATE UNDER PRESSURE RESULTING IN SERIOUS INJURY OR DEATH.

WARNING

NEVER RE-INFLATE A TIRE THAT HAS BEEN RUNFLAT OR SERIOUSLY UNDERINFLATED WITHOUT REMOVING AND CHECKING FOR TIRE, TUBE OR RIM DAMAGE.

WARNING

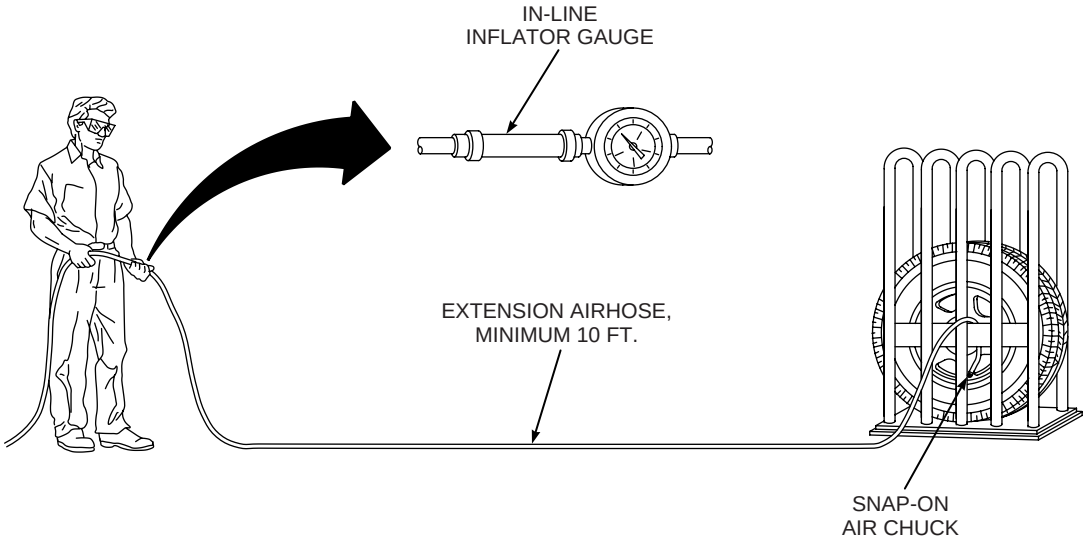
NEVER EXCEED 3 PSI (21 KPA) INFLATION PRIOR TO PLACING TIRE AND WHEEL ASSEMBLY INTO INFLATION SAFETY CAGE OR MOUNTING ON A TIRE CHANGE MACHINE THAT HAS A POSITIVE LOCKDOWN DEVICE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY OR DEATH.

ALWAYS USE AN OSHA APPROVED INFLATION CAGE TO INFLATE TIRES MOUNTED ON MULTIPIECE RIMS, AND TIRE/RIM ASSEMBLIES NOT MOUNTED ON A TIRE CHANGING MACHINE THAT HAS A POSITIVE LOCK DOWN DEVICE DESIGNED TO HOLD THE ASSEMBLY DURING INFLATION. WHEN USING A TIRE CHANGING MACHINE, ALWAYS FOLLOW THE MANUFACTURER'S MOUNTING AND SAFETY INSTRUCTIONS. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH. ALWAYS INFLATE TIRES THAT ARE MOUNTED ON RIMS WITH DEMOUNTABLE SIDE RING FLANGES OR LOCK RINGS IN AN INFLATION SAFETY CAGE OR SERIOUS INJURY OR DEATH COULD RESULT.

WARNING SUMMARY − CONTINUED

WARNING

WHEN INFLATING TIRES IN AN INFLATION SAFETY CAGE, ALWAYS USE AN EXTENSION AIRHOSE (10 FT OR 3.1 MM MINIMUM), SNAP ON CHUCK AND AN IN-LINE PNEUMATIC TIRE INFLATOR-GAUGE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY.



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WARNING

IMPROPERLY SEATED SIDE FLANGES OR LOCK RINGS MAY FLY OFF DURING INFLATION. NEVER ATTEMPT TO SEAT A SIDE RING FLANGE OR LOCKRING DURING INFLATION OR AFTER INFLATION WITH A HAMMER OR OTHER TOOL. SERIOUS INJURY OR DEATH COULD RESULT.

WARNING

NEVER INFLATE TIRES OVER 40 PSI (276 KPA) TO SEAT TIRE BEADS. IF BEADS DO NOT SEAT, DEFLATE, DEMOUNT, AND CHECK THE TIRE/RIM MATCH. MOUNT AND LUBRICATE ACCORDING TO INSTRUCTIONS. SERIOUS INJURY OR

WARNING SUMMARY − CONTINUED

DEATH COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

WARNING

FOR INFORMATION ON ARTIFICIAL RESPIRATION AND FIRST AID, REFER TO FM 21-11.

WARNING

IMPROPER USE OF POWER EQUIPMENT OR USE OF FAULTY OR DAMAGED POWER EQUIPMENT COULD CAUSE SERIOUS INJURY OR DEATH.

WARNING

WHEN INFLATING TIRES MOUNTED ON THE VEHICLE, ALL PERSONNEL MUST REMAIN A MINIMUM OF 10 FT (3.1M) AWAY FROM TIRE AND NOT IN POSSIBLE PATH OF LOCKRING OR RIM FLANGE. SHOULD THEY FLY OFF, SERIOUS INJURY OR DEATH COULD RESULT.

PERSONNEL MUST REMAIN A MINIMUM OF 10 FT (3.1 M) AWAY FROM THE TIRE BEING INFLATED. SERIOUS INJURY OR DEATH COULD RESULT FROM POSSIBLE PROJECTILES.

NEVER PUT HANDS OR FINGERS NEAR RIM FLANGES OR BEAD SEATS WHEN INFLATING TIRES. SERIOUS INJURY COULD RESULT.

NEVER LEAN, STAND, OR REACH OVER A TIRE/RIM ASSEMBLY DURING INFLATION. SERIOUS INJURY OR DEATH COULD RESULT.

WARNING

WHEN USING COMPRESSED AIR, ALWAYS WEAR SAFETY GOGGLES TO PREVENT DIRT AND DEBRIS FROM GOING INTO EYES. COMPRESSED AIRSTREAM MUST BE LESS THAN 30 PSI (207 KPA).

WARNING SUMMARY − CONTINUED

WARNING

NEVER USE WHEEL ASSEMBLIES WITH STUDS THAT ARE DAMAGED, LOOSE, OR HAVE DAMAGED THREADS. DAMAGED STUDS CAN CAUSE IMPROPER ASSEMBLY, WHICH COULD CAUSE INDIVIDUAL FASTENERS TO FAIL. ANY OF THESE SITUATIONS COULD CAUSE SERIOUS INJURY OR DEATH.

NEVER MOUNT A TIRE ON RIM THAT IS DAMAGED OR HAS BEEN REPAIRED BY WELDING OR BRAZING.

NEVER ATTEMPT TO MOUNT A TIRE OF ONE DIAMETER ON A RIM OF A DIFFERENT DIAMETER, OR A TIRE DESIGNED FOR A SPECIFIC WIDTH RIM ON A RIM OF DIFFERENT WIDTH. CAUTION MUST BE EXERCISED TO ENSURE THAT THE CORRECT TIRE IS MOUNTED ON THE APPROPRIATE RIM AND THAT RIMS OF SIMILAR DESIGN AND APPEARANCE ARE NOT MISTAKEN FOR EACH OTHER. ALWAYS REFER TO THE VEHICLE TECHNICAL MANUAL FOR SPECIFIC INFORMATION CONCERNING CORRECT TIRE AND RIM COMBINATIONS. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH.

WARNING

NEVER USE TUBES IN RUNFLAT WHEEL ASSEMBLIES. USE OF A TUBE DEFEATS THE BUILT-IN SAFETY FEATURES AND COULD ALLOW THE WHEEL TO COME APART UNDER PRESSURE, RESULTING IN SERIOUS INJURY OR DEATH.

WARNING

USE VULCANIZING FLUIDS AND CLEANING FLUIDS IN A WELL-VENTILATED AREA. READ ALL WARNINGS AND CAUTIONS ON CONTAINERS. THE PROLONGED INHALATION OF FUMES COULD BE A HEALTH HAZARD.

TM 9-2610-200-14

LIST OF EFFECTIVE PAGES/WORK PACKAGES

NOTE: This manual supersedes TM 9-2610-200-14 dated 1 September 2000.

Dates of issue for revision is:

Original 15 September 2005

TOTAL NUMBER OF PAGES FOR FRONT AND REAR MATTER IS 24 AND TOTAL NUMBER OF WORK PACKAGES IS 14 CONSISTING OF THE FOLLOWING:

Page/WP* No.	Change No.	Page/WP No.	*Change No.
Title	0		
a – e	0		
f Blank	0		
i – v	0		
vi Blank	0		
Chp 1 title page	0		
WP 0001 00 (2 pgs)	0		
WP 0002 00 (36 pgs)	0		
Chp2 title page	0		
WP 0003 00 (18 pgs)	0		
WP 0004 00 (2 pgs)	0		
WP 0005 00 (58 pgs)	0		
WP 0006 00 (28 pgs)	0		
WP 0007 00 (30 pgs)	0		
WP 0008 00 (24 pgs)	0		
WP 0009 00 (2 pgs)	0		
Chp 3 title page	0		
WP 0010 00 (2 pgs)	0		
WP 0011 00 (12 pgs)	0		
WP 0012 00 (4 pgs)	0		
WP 0013 00 (6 pgs)	0		
WP 0014 00 (6 pgs)	0		
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*Zero in this column indicates an original page or work package.

TECHNICAL MANUAL
TM 9-2610-200-14

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 15 September *2005*

TECHNICAL MANUAL

OPERATOR'S, UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL FOR CARE, MAINTENANCE, REPAIR, AND INSPECTION OF PNEUMATIC TIRES AND INNER TUBES

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Submit your letter, DA Form 2028-2 (*Recommended Changes to Equipment Technical Publications*), through the Internet, on the Army Electronic Product Support (AEPS) website. The Internet address is http://aeps.ria.army.mil. If you need a password, scroll down and click on "ACCESS REQUEST FORM". The DA Form 2028 is located in the ONLINE FORMS PROCESSING section of the AEPS. Fill out the form and click on SUBMIT. Using this form on the AEPS will enable us to respond quicker to your comments and better manage the DA Form 2028 program. You may also mail, fax or E-mail your letter, DA Form 2028, or DA Form 2028-2 direct to: Commander, U.S. Army Tank Automotive and Armaments Command, ATTN: AMSTA-LC-CIP-WT, Rock Island, IL 61299-7630. The email address is TACOM-TECH-PUBS@ria.army.mil. The fax number is DSN 793-0726 or Commercial (309) 782-0726.

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*This publication supersedes TM 9-2610-200-14, dated 1 September 2000.

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LIST OF TABLES

HOW TO USE THIS MANUAL

This manual is designated to help Operator, Unit, Direct Support, and General Support Maintenance personnel inspect and classify, care for, maintain, and repair pneumatic tires and inner tubes.

Warning pages are located in the front of this manual. Learn the warnings before performing any maintenance on tires.

This manual is divided into three chapters.

Read all preliminary information found at the beginning of each maintenance task. It has important information and safety instructions you must follow before beginning the task.

The repair and service information contained in this manual does not take precedence over the specific procedures or the Preventive Maintenance Checks and Services (PMCS) requirements listed in the vehicle support maintenance manual.

CHAPTER 1

GENERAL INFORMATION AND

EQUIPMENT DESCRIPTION AND DATA

GENERAL INFORMATION **0001 00**

THIS WORK PACKAGE COVERS:
General Information

SCOPE

These instructions are published for the information and guidance of operator and unit, direct support, and general support maintenance personnel responsible for the inspection, care, and repair of pneumatic tires and inner tubes. The repair and service information contained in this manual dose not take precedence over the specific procedures or the Preventive Maintenance Checks and Services (PMCS) requirements listed in the vehicle support maintenance manual.

WARNING

REFER TO SPECIFIC MAINTENANCE PROCEDURES LISTED IN THE VEHICLE MAINTENANCE MANUAL. FAILURE TO COMPLY WITH VEHICLE MAINTENANCE MANUAL INSTRUCTIONS COULD RESULT IN INJURY OR DEATH.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The *Army Maintenance Management System* (TAMMS).

EQUIPMENT IMPROVEMENT REPORT AND MAINTENANCE DIGEST

The quarterly *Equipment Improvement Report and Maintenance Digest,* TB 43-0001-62 series, contains valuable field information on the equipment covered in this manual. The information in TB 43-0001-62 series is compiled from some of the Equipment Improvement Reports (EIRs) that you prepared. Many of these articles result from comments, suggestions, and improvement recommendations that you submitted to the EIR program. The TB 43-0001-62 series contains information on equipment improvement, minor alterations, proposed Modification Work Orders (MWOs), warranties (if applicable), actions taken on some of your DA Form 2028's (*Recommended Change to Publications and Blank Forms)*, and advance information on proposed changes that may affect this manual. The information will help you perform you job better and will help keep you advised of the latest changes to this manual. Also refer to DA Pam 25-30, *Consolidated Index of Army Publications and Blank Forms,* and Appendix A, References, of this manual.

REPORTING FIELD FAILURES

If field failures occur after acceptance of new, retreaded, or repaired tires, the failure will be reported, as an EIR Category II, on an SF 368 (*Quality Deficiency Report).* Use basic reporting procedures contained in DA Pam 738-750.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs)

If your tires, rims, or tubes need improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on a SF 368 (Quality Deficiency Report). Mail it to us at: Commander, U.S. Army Tank Automotive and Armaments Command, ATTN: AMSTA-LC-CJT, Warren, MI 48397-5000. We'll send you a reply.

DIRECT EXCHANGE

A direct exchange system is necessary to control tire transactions through the supply system. Although the receipt and issue of a tire is a supply action, the inspection and classification is a maintenance responsibility. Only through proper coordination between Maintenance and Supply will a direct exchange system be successful. Tires should not be accepted by Supply for direct exchange unless evidence of inspection and classification by Maintenance is presented.

TRAINING COURSES

To enhance safety, performance and value from tires it is very important that supervisors ensure that any subordinates are trained properly to inspect, repair and service tires. The U.S. Army Tank Automotive and Armaments Command (TACOM) does offer training course through approved contractors. These training courses are tailored for the military and cost a nominal fee, which is the unit's responsibility. To schedule training, contact TACOM at the following address and telephone number:

Commander,
U.S. Army Tank Automotive and Armaments Command,
ATTN: AMSTA-LC-CJT (Team Tire),
Warren, MI 48397-5000
DSN 786-4271
Commercial: (586) 574-4271

WEB SITE ADDRESS (case sensitive): www.tacom.army.mil/immc/Support/Teamtire/home1.htm

END OF WORK PACKAGE

EQUIPMENT DESCRIPTION AND DATA **0002 00**

THIS WORK PACKAGE COVERS:
Equipment Description and Data

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

STANDARD TIRE CONSTRUCTION

1. **Bias Ply.** Bias ply tires are constructed of rayon, nylon, or polyester casing plies in a crisscross pattern wrapped around steel bead wires. The bead wires prevent the tire from opening up and separating from the rim at high speeds. The casing plies give the tire its shape. This construction is used for standard commercial tires. Figure 1 shows an example of a bias ply tire construction.

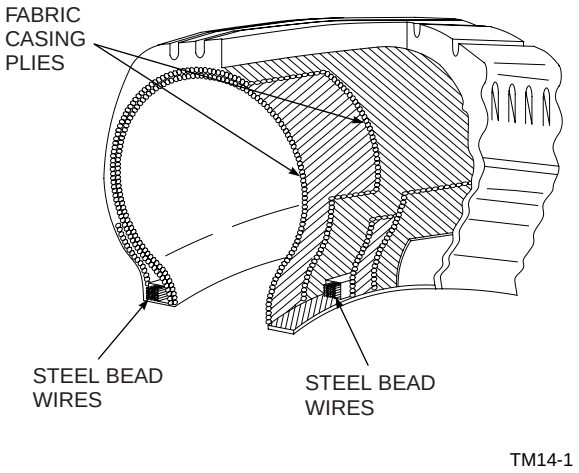


Figure 1. Bias Ply Tire Construction

2. **Belted Bias Ply.** Belted bias ply tires are of the same construction as bias ply tires, but in addition have several layers of tread-reinforcing plies in a crisscross pattern just below the tread area. The tread-reinforcing plies add extra strength to the tire. This construction is used for standard commercial tires. Figure 2 shows an example of a belted bias ply tire.

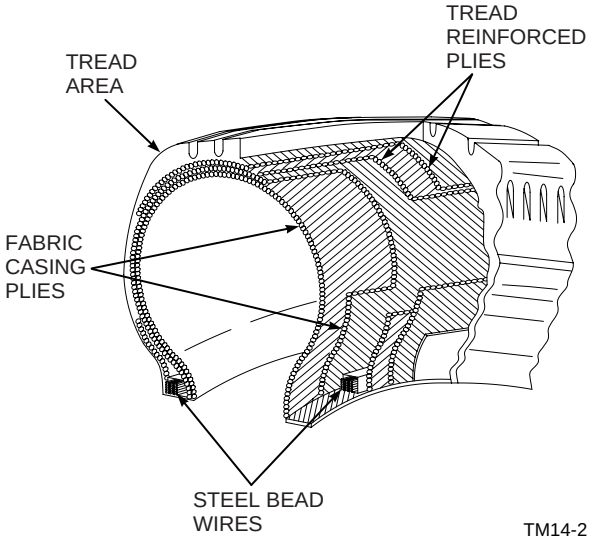


Figure 2. Belted Bias Ply Tire Construction

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES − CONTINUED

STANDARD TIRE CONSTRUCTION − CONTINUED

3. **Radial Tires.** Radial tires are constructed with casing plies perpendicular to the tread direction, and several layers of steel or fabric tread-reinforcing plies just under the tread area. This construction permits flexing of the tire with a minimum of tread distortion, better traction, and a softer ride. Figure 3 shows an example of radial tire construction.

4. **Tube and Tubeless Tires.** Construction of tube and tubeless tires are similar, except tubeless tires have an additional thin bonded rubber lining on the inside surface, and the bead is designed different to form an airtight seal with the rim. The tubeless construction will be marked "tubeless" on the sidewall.

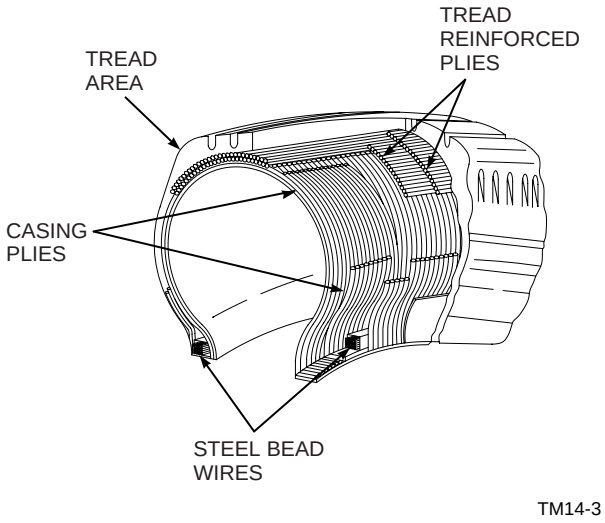


Figure 3. Radial Tire Construction

TIRE AND RIM MEASUREMENT NOMENCLATURE

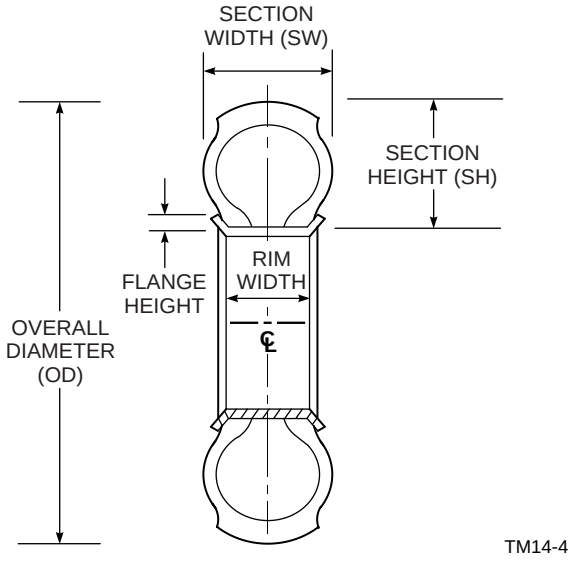
Figure 4 shows the nomenclatures that are used for tire and rim measurements.

NOTE

The Overall Diameter, Section Height and Section Width are measurements taken of a tire that has been inflated properly for a 24-hour period or longer. Section Width does not include protective side ribs, bars, or tire decorations.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE AND RIM MEASUREMENT NOMENCLATURE − CONTINUED



CROSS-SECTION OF TIRE AND RIM

Figure 4. Tire and Rim Measurement Nomenclature

TIRE CATEGORIES AND GROUPS

There are basically five major categories of ground vehicle tires. Within each category there are various groups that identify the specific group of vehicles that the tires would be applied to. Table 1 explains the major tire categories and groups.

EQUIPMENT DESCRIPTION AND DATA – CONTINUED **0002 00**

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE CATEGORIES AND GROUPS − CONTINUED

Table 1. Tire Categories and Groups

TIRE CATEGORIES	TIRE GROUPS
Highway Tires:	**Passenger Car Tires.** Passenger car tires are of standard construction. Most passenger car tires have a regular rib tread but can be a more aggressive lug tread design. Regular rib tread provides adequate traction and long life on highways. Passenger Car tires are usually identified with "P" in the front of the size number designator imprinted on the sidewall of the tire. An example of the size designator number of a passenger tire would be P205/75R15. **Light Truck Tires.** Light truck tires can be variety of tread designs. These tires are used on vehicles such as Pick-up Trucks and some Sports Utility Vehicles and are usually identified with "LT" in the front of the size designator imprinted on the sidewall of the tire. An example of a size designator number of a light truck tire would be LT235/85R16. **Truck and Bus Tires.** Truck and Bus tires can be either a regular rib or lug traction tread design. These tires are used on vehicles such as the semi-trucks, buses and trailers. Truck tires with rib tread are usually used on non-drive axles and trailers. Truck tires with more aggressive, lug tread are usually used on drive axles to provide maximum traction. Examples of a Truck and Bus size designators are 11R22.5 (radial) and 10:00-20 (bias). **Special Application: Off/On Road, Severe Application (ORSA) Tires.** These tires are Special Application, Light Truck tires, which have limited highway use and are designed for use primarily in severe off-road conditions. Some vehicle applications for these tires would be Pick-Up Trucks used by the U. S. Border Patrol and U.S. Forestry Service.
Off-Road/Low Speed Tires:	**Earthmoving Vehicle Tires.** These tires are designed to operate at low speeds, off-road. They include tires used on Dozers, Loaders, Shovels, Scrapers and Graders. **Mining and Logging Tires.** These tires are designed to operate at low speeds in mining operations, logging trails or cross-country. These tires usually have very high load carrying capacities. **Mobile Crane and Forklift Tires.** These tires are designed to operate off-road on Cranes and Forklifts at low speed.
Industrial Tires:	This category includes tires used for industrial, underground mining and skid steer tires. The tires come in a variety of sizes and include tires used on mining cars, warehouse forklifts and cranes, towed industrial or mining type trailers and some aircraft support vehicle tires.
Agricultural Tires:	This category includes tires used on Farming and Agricultural type vehicles and equipment.
Military Tactical Tires:	These tires are Light, Medium or Heavy Truck/Trailer tires, which are designed to be used in severe military tactical environment. Performance capabilities will vary depending on the specific military application. Examples are the HMMWV and HEMTT tires. These tires are designed for tactical use and should not be confused with other commercial tires, which are used on military garrison support vehicles.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – HIGHWAY TIRES

1. **All-Season Tires.** All-Season tires are used primarily on the highway and are designed to perform well during any season. These tires are used on Passenger Cars, Light Trucks and All-Terrain Vehicles only. These tires can provide excellent mileage and good steering and traction on pavement. Figure 5 shows an example of an All-Season tire.

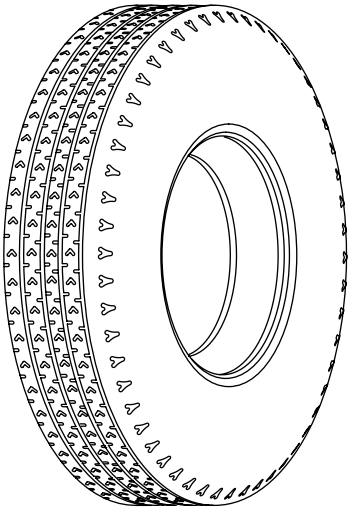


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Figure 5. Typical All-Season Tire

2. **All-Terrain Tires.** All-Terrain tires can be used on the highway but are designed to also to be used off-road on trails or cross-country. All terrain tires provide good off-road performance but less mileage than All-Season or rib tread tires. They have good flotation and high resistance to bruises, cuts, and punctures. Figure 6 shows an example of All-Terrain tires.

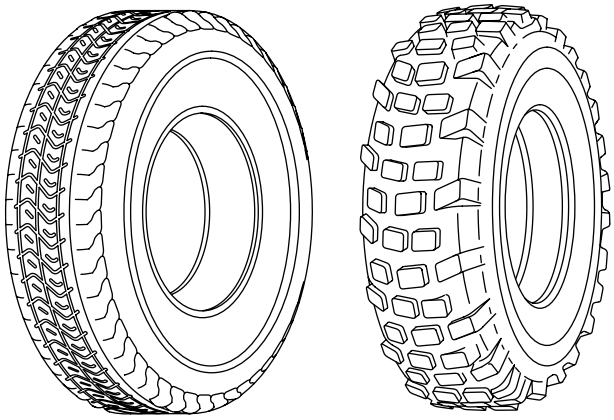

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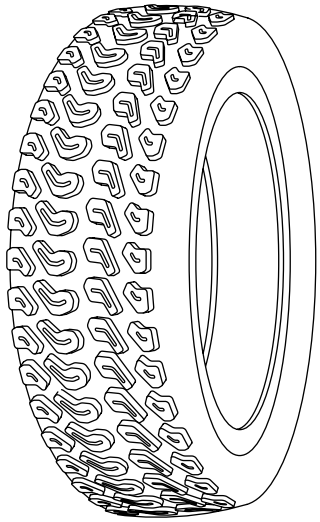
Figure 6. Typical All-Terrain Tires

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – HIGHWAY TIRES − CONTINUED

3. **Mud-and-Snow Tires.** Mud-and-Snow tires are manufactured for passenger cars and light trucks only. The tires are labeled with MUD AND SNOW or any contraction using the letters M and S, (e.g. MS, M/S, M&S, or M+S). These tires have an aggressive lug tread, different tread compound, and internal construction designed for better starting, stopping, and driving in mud and snow. These tires provide more mobility in an off-road environment but less mileage on highway. Figure 7 shows a typical Mud & Snow tire.



TM14-108

Figure 7. Typical Mud and Snow Tire

4. **On/Off Highway Tires.** On/Off Highway tires are heavy duty, rugged tires for vehicles used extensively on dirt and gravel roads. Available in both steer and drive axle versions, these tires provide good traction in mud and snow and offer exceptional bruise, cut, and puncture resistance. On/off highway tires are superior to all-terrain tires in these areas, but are less effective when used cross-country. Distance and/or speed limitations may apply. Figure 8 shows a typical On/Off Highway tire.

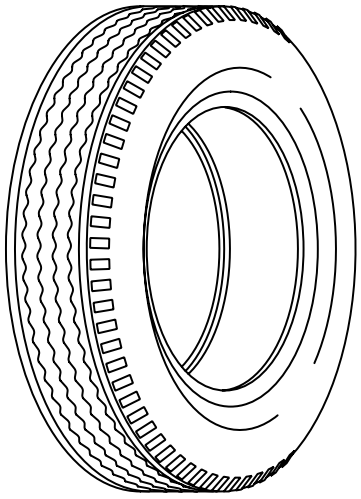
EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – HIGHWAY TIRES − CONTINUED

TM14-5

Figure 8. Typical On/Off Highway Tire

5. **Regular Rib Tread Tires.** Rib tread tires are of standard construction and may be used on Passenger Car, Light Truck and Truck/Bus applications. These tires have non-aggressive, rib tread pattern. They are designed primarily for highway use and provide excellent mileage and steering qualities and moderate traction performance on pavement. Figure 9 shows an example of a Regular Rib Tread tire.



TM14-6

Figure 9. Typical Regular Rib Tread Tire

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – HIGHWAY TIRES − CONTINUED

6. **Snow Tread.** Some newer manufactured tires are marked similar to Mud and Snow with at least one sidewall with the letters "M" and "S" (e.g., MS, M/S, M&S, M+S, etc.) plus have a pictograph of a mountain with a snowflake. These tires with the pictograph are designed for severe snow conditions only. An example of the mountain/snowflake is shown in Figure 10. If you need more information on tires designed for severe snow conditions refer to Rubber Manufacturers Association, Tire Information Service Bulletin, Volume 37, Number 2, February 1999 and titled "RMA Definition for Passenger and Light Truck Tires for Use in Severe Snow Conditions." This Service Bulletin may be ordered from the Rubber Manufacturers Association, c/o Mail Room, PO Box 3147, Medina, OH 44258-3147.

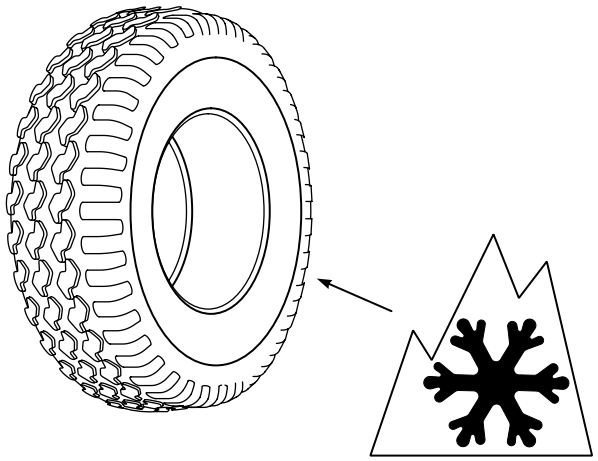
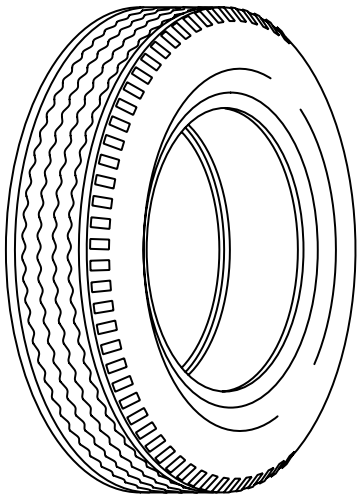


Figure 10. Typical Snow Tread Tire with Snowflake Pictograph

7. **Trailer Tires.** These tires are designed for use on trailers only and are available in a variety of sizes and load carrying capacities. Low platform trailer tires used by the military and some commercial applications are usually designed to carry a very heavy load. Most trailer tires are designed for highway use and have a regular rib tread to reduce rolling resistance when towed. Figure 11 shows an example of a typical Trailer or Truck Steer Tire.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – HIGHWAY TIRES − CONTINUED

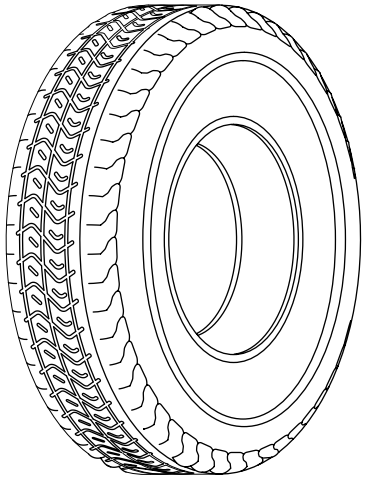


TM14-6

Figure 11. Typical Trailer or Truck/Bus Front Steer Tire

8. **Truck/Bus Front Steer Tires.** Truck/Bus front tires are usually medium size, standard construction, and rib treads like those used on medium and heavy commercial trucks. A rib tread tire design is used on front axles of trucks for ease of steering when traction is not important. Figure 11 shows an example of a typical Truck/Bus Front Steer tire.

9. **Truck/Bus Drive Axle Tires.** Truck/Bus rear tires are usually standard construction with more aggressive lug treads. The lug tread design provides important driving traction for drive axles. Figure 12 shows a typical Truck/Bus Drive Axle tire.



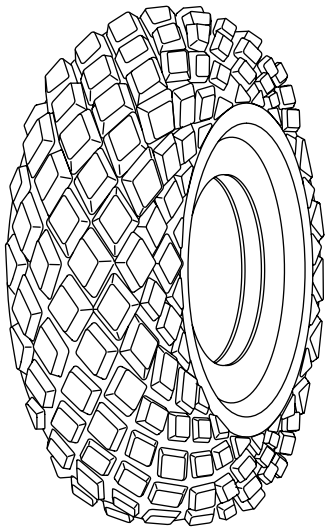
TM14-109

Figure 12. Typical Truck/Bus Drive Axle Tire

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – OFF ROAD/LOW SPEED TIRES

1. **Earthmover Tires.** Earthmover tires are large tires of standard construction like those used on commercial vehicles for off-road service. This tread is considered non-directional, similar to the tread on rock service tires. The earthmover tread may also be directional, similar to grader tires. Figure 13 is an example of a typical Earthmover, Non-Directional Tread tire.



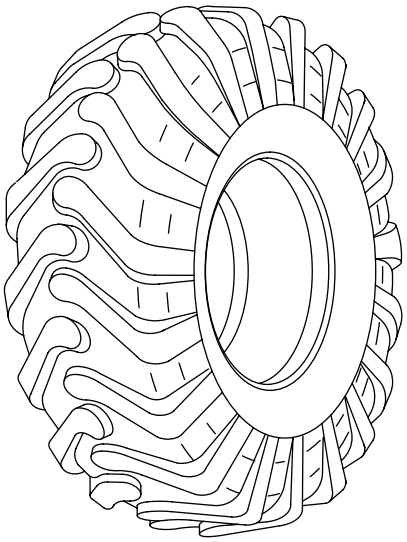
TM14-110

Figure 13. Typical Earthmover, Non-Directional Tread Tire

2. **Grader Tires.** Grader tires are similar to earthmover tires except they are designed for lower inflation pressures and for service involving extreme angular ground contact. The aggressive directional tread provides good traction in mud and snow and in soft soils. Tires with directional tread may only be mounted one way. The point of the V design must contact the ground first when traction is required. Figure 14 shows a typical Grader, Directional Tread tire.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

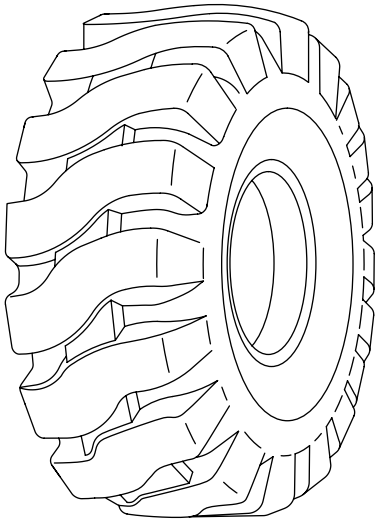
TIRE TREAD TYPES – OFF ROAD/LOW SPEED TIRES − CONTINUED



TM14-111

Figure 14. Typical Grader, Directional Tread Tire

3. **Rock Service Tires.** Rock service tires are large size tires of standard construction used on commercial vehicles for off-road service and on unpaved roads. These tires are characterized by narrow voids so that loose rock cannot be caught and tear the tread lugs loose from the tire body. This tread design is used on tires for service on rough terrain. Figure 15 shows a typical Rock Service tire.



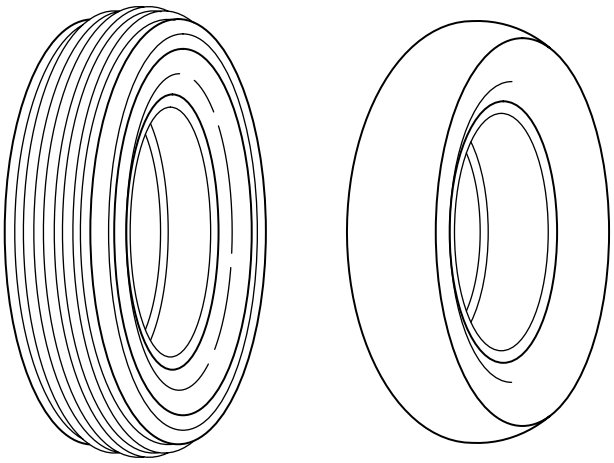
TM14-112

Figure 15. Typical Rock Service Tire

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – INDUSTRIAL AND AGRICULTURAL TIRES

1. **Implement Tires.** Implement tires are similar to tractor front tires except they are designed for towed vehicles. The smooth tread is used when neither steering nor traction are important. Figure 16 shows examples of typical Implement tires.



TM14-113

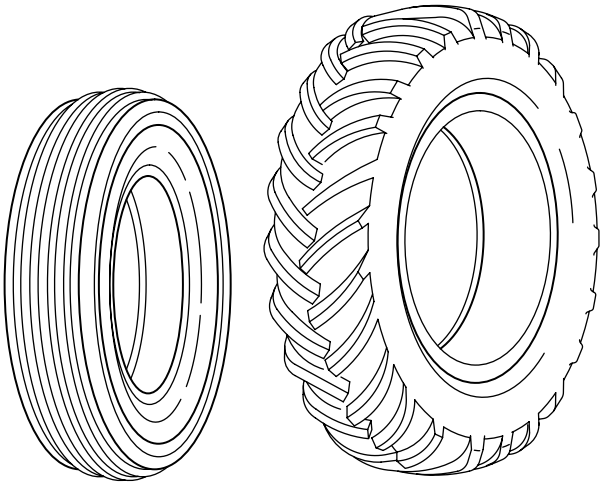
Figure 16. Typical Implement Tires

2. **Straight Side Industrial Tires.** Straight side industrial tires are of standard construction and are similar to truck and bus rib tires in appearance except they are generally smaller. Figure 17 shows an example of a Straight Side Industrial tire.

3. **Tractor Tires.** Tractor front tires are rib tires and are smaller than tractor rear drive axle tires. A rib tread design is used on the front axle for easy steering when traction is unimportant. Tractor rear tires are usually much larger than the front tires. The aggressive directional tread design has large voids to provide maximum traction in soft soils. Figure 17 shows typical tractor front and rear tires.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – INDUSTRIAL AND AGRICULTURAL TIRES − CONTINUED

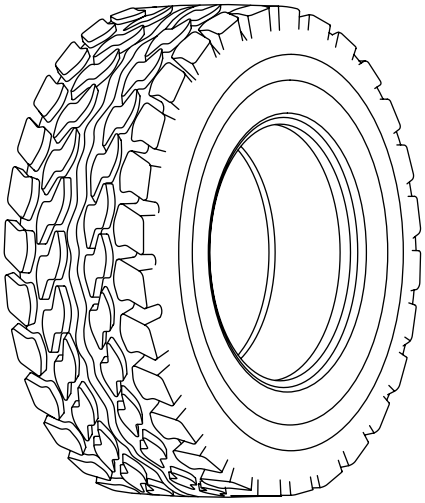


TM14-114

Figure 17. Typical Tractor Front and Rear Tires

TIRE TREAD TYPES – MILITARY TACTICAL TIRES

1. **HMMWV Tires.** The HMMWV tire is non-directional, All-Terrain tread. It provides good traction in either mud or snow, on dirt or temporary roads, and cross-country. They are also practical for hard-surfaced roads. They are available as bias or radial construction. Because radial tires run cooler than bias constructed tires and provide increased sidewall and tread deflection of radial tires, HMMWV radials will provide longer tread life and better sand and snow mobility than HMMWV bias tires. Figure 18 shows a typical HMMWV tire.



TM14-115

Figure 18. Typical HMMWV Tire

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – MILITARY TACTICAL TIRES − CONTINUED

2. **HEMTT Tires.** As with many military tires, the HEMTT tire is available with various tire designs, tire brands and from various manufacturers. These tires provide good traction in either mud or snow, on dirt or temporary roads, and cross-country. They are also practical for hard-surfaced roads. Even though some HEMTT tires brands appear to be directional, they are in fact non-directional and tests have proven them to work well in either direction. Figure 19 shows a typical HEMMT tire.

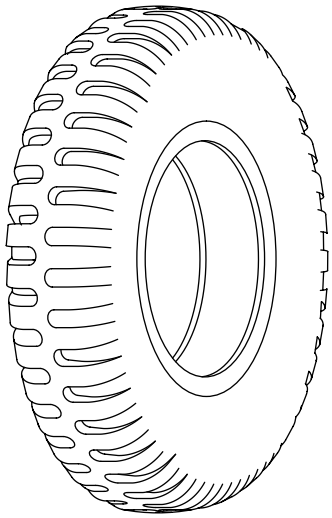
TM14-116

Figure 19. Typical HEMTT Tire

3. **Military Non-Directional, Cross Country (NDCC) Tires.** Military non-directional, cross-country tires give good traction in mud or snow, on dirt or temporary roads, and cross-country. They are also practical for hard-surfaced roads. These tires have non-directional cross-country or mud-and-snow tread design with bar-type lugs. Nondirectional tread indicates that the tread pattern is equally effective in either direction of rotation. On some NDCC tires the direction of tread is the same no matter which way the tire is mounted. However some of the newer model NDCC tires tread gives the appearance of being directional as their treads point in different directions when mounted differently. Even though these newer NDCC tires appear directional they are not with regards to performance as the tread pattern is equally effective in either direction of rotation. Figure 20 shows a typical NDCC tire.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

TIRE TREAD TYPES – MILITARY TACTICAL TIRES − CONTINUED



TM14-117

Figure 20. Typical NDCC Tire

RIM AND WHEEL COMPONENTS

NOTE

Sometimes the terms "wheel" and "rim," are used interchangeably even though there are major differences. A wheel is not a rim and a rim is not a wheel. The following definitions will help you understand the differences between these components.

1. **Wheel.** Wheels are either "disc wheel" types or "spoke wheel" types. A disc wheel, which is common in military vehicles, is a combination of a disc and rim as shown in Figure 21. The disc is permanently attached (usually welded) to the rim and attaches to the vehicle hub with studs and nuts. A spoke wheel does not have a rim permanently attached and consists of a hub and either 3, 5, or 6 spokes with clamps that attach to demountable type rims.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

RIM AND WHEEL COMPONENTS − CONTINUED

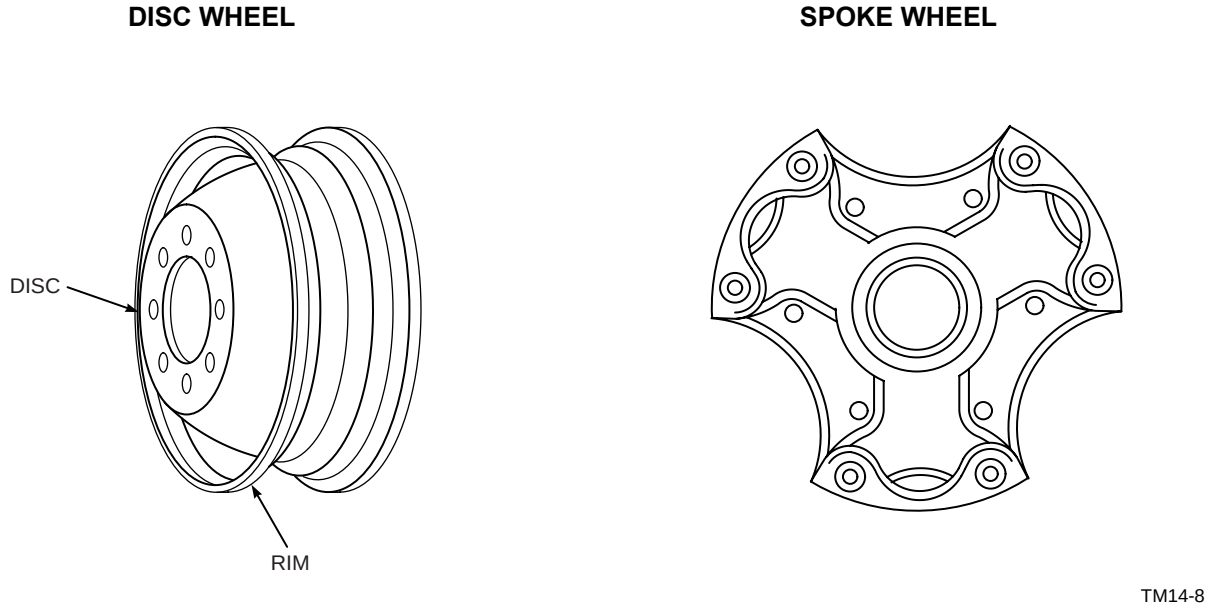


Figure 21. Typical Disc and Spoke Wheel

2. **Rim.** The rim is the part that supports the tire. By definition, the rim does not include the disc portion of the wheel that mounts to the vehicle. The rim is either single piece (usually for tubeless tires) or multi-piece for tube-type tires. Multi-piece rims, depending on the type, will have a continuous base assembly and a side ring or a side and lockring. A single piece rim is a continuous, one-piece assembly without side or lockrings. Figure 22 shows a typical rim.

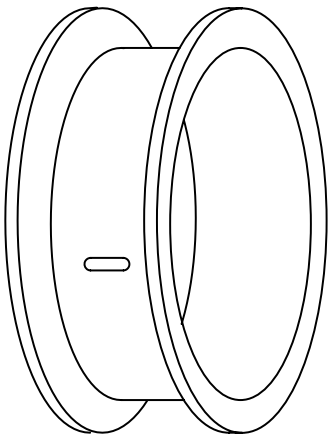


Figure 22. Typical Rim

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

RIM TYPES AND VARIATIONS

1. **General to Multi-Piece Rims, with Lockrings or Siderings.** Any time a tire is changed, or during regular inspections, the rim components should be inspected for cracks, breaks, or excessive rust. When mounting rim/wheel combinations with a split lockring or sidering make sure the gap is aligned 180 degrees from the valve. Positioning the gap at 180 degrees will minimize distortion. During manufacturing there is a piece of metal taken out of the rim where the valve goes which creates a natural weak point. The gap is a weak point and a pressure point also. If the components were incorrectly lined up, the wheel could distort. There is no maximum lockring/sidering gap for two and three piece assemblies. However, there are minimum gap tolerances. For two-piece rims with a lockring/sidering, the gap, when assembled, should not be less than 3/8 inch. The ends on the lockring/sidering on three-piece assemblies, such as on the HEMTT vehicle, should not touch when assembled.

2. **Drop-Center Rims.** Drop-center rims are one piece and are permanently fastened to the wheel disc. The important feature is a well that permits mounting and demounting of the tire. Bead seats are tapered to match corresponding tapers on tire beads. Drop-center rims are commonly used on smaller vehicles, such as passenger cars and light trucks, but occasionally may be used on larger, heavier vehicles also (e.g. military M747 Heavy Equipment Trailer uses a drop-center rim).

3. **Drop-Center Rim with Safety Ridge.** Some drop-center rims are constructed with an added safety ridge at the edge of the bead ledges. If a tire goes flat, the ridge will prevent the tire bead from slipping into the well. (Slipping into the well might cause the tire to separate from the wheel sooner.) Figure 23 shows typical drop-center rim and drop-center rim with safety ridge.

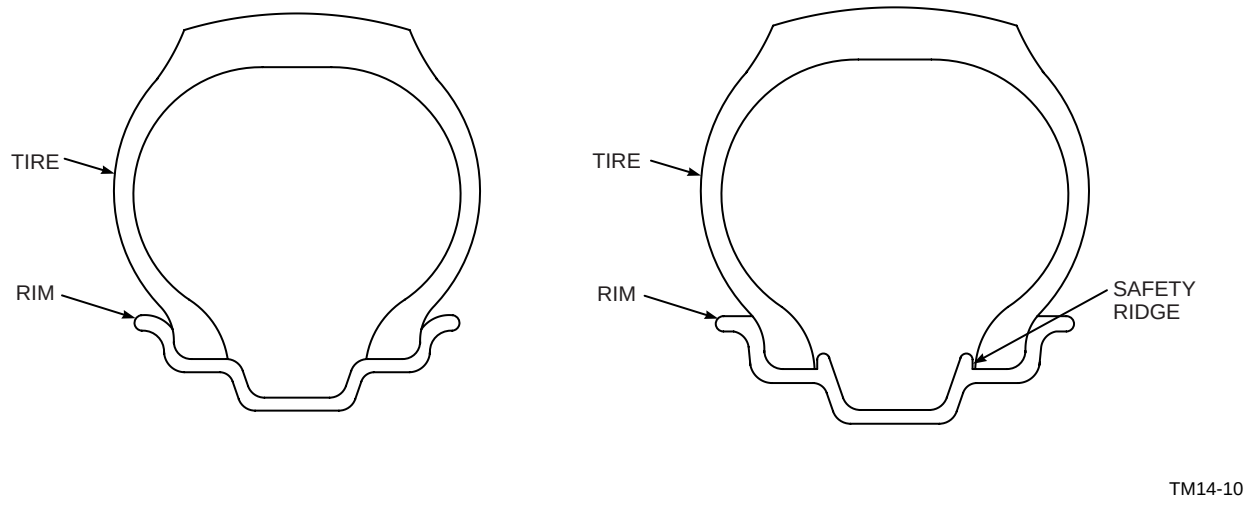


Figure 23. Typical Drop-Center Rim and Drop-Center Rim with Safety Ridge

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

RIM TYPES AND VARIATIONS – CONTINUED

4. **Semidrop-Center Rims with Removable Side Flange or Lockring.** Semidrop-center rims have shallow wells and beveled bead seats to fit the taper of the tire beads. They have demountable flanges or lockrings that fit in the gutter on the outside edge of the rim. One of the bead seats bears on a non-removable flange and the other bead seats on a removable side flange. Figure 24 shows typical semidrop-center rims.

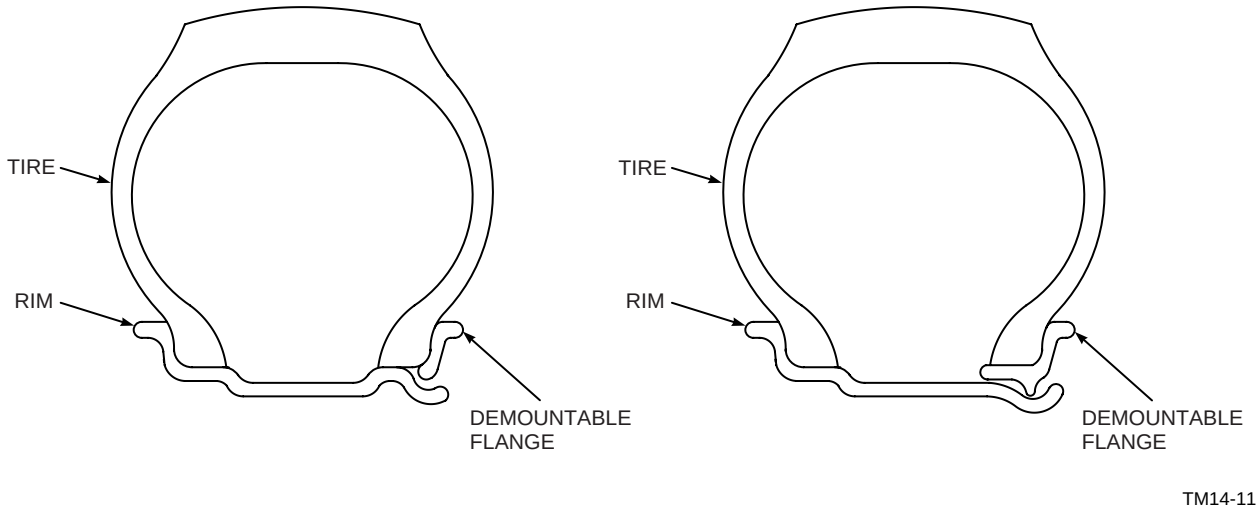


Figure 24. Semidrop-Center Rims with Removable Side Flange or Lockring

5. **Flat-Base Rim with Removable Side Flanges and/or Lockrings.** Flat-base rims have no well and are manufactured in a variety of designs that are of two- or three-piece construction. One of the bead seats bears on a non-removable rim flange and the other bead seats on a removable side flange and/or lockring. Figure 25 shows a typical flat-base rim.

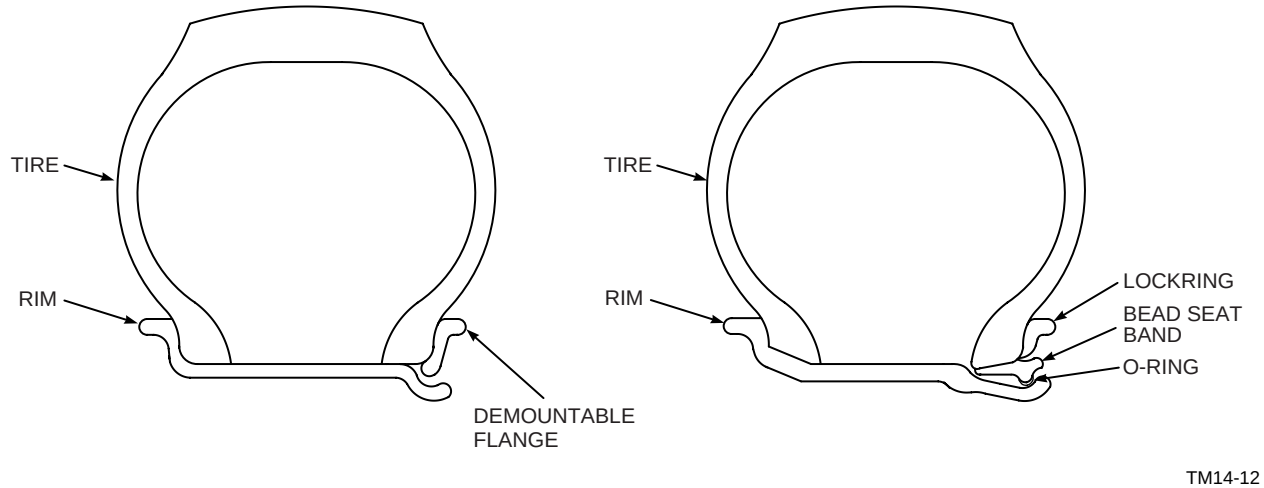


Figure 25. Typical Flat-Base Rim

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

RIM TYPES AND VARIATIONS – CONTINUED

6. **Advanced Flat-Based Rim.** Advanced rims are replacing older flat-base rims on recently manufactured vehicles. The distinguishing characteristic that advance rims provide is the 5 degree tapered bead seats on both sides of the rim. Figure 26 shows a typical flat-base advanced rim.

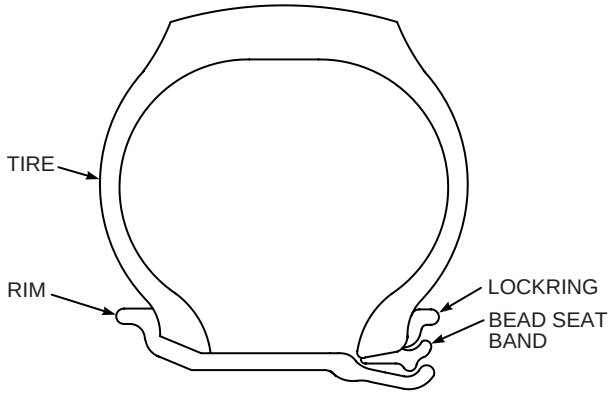


Figure 26. Typical Flat-Base Advanced Rim

7. **Earthmover Rims.** Earthmover rims are used for extremely large tires. These rims may be characterized by four demountable pieces, which include an inner rim base with non-demountable flange, outer rim flange, bead seat band and a lockring. The rim base has a non-demountable rim flange and 5 degree tapered bead seat. The outer flange and lockring secure the outer bead seat band to the rim and tire. Between the rim base and bead seat band, a groove is provided for a rubber, preformed packing that seal the rim and retains air. To prevent slippage between components some rims may come with components that have a notch, driver lug and/or welded-on lug that lock the components together. The rim manufacturer may also knurl bead seat surfaces to further prevent slippage. Figure 27 shows a typical large earthmover rim.

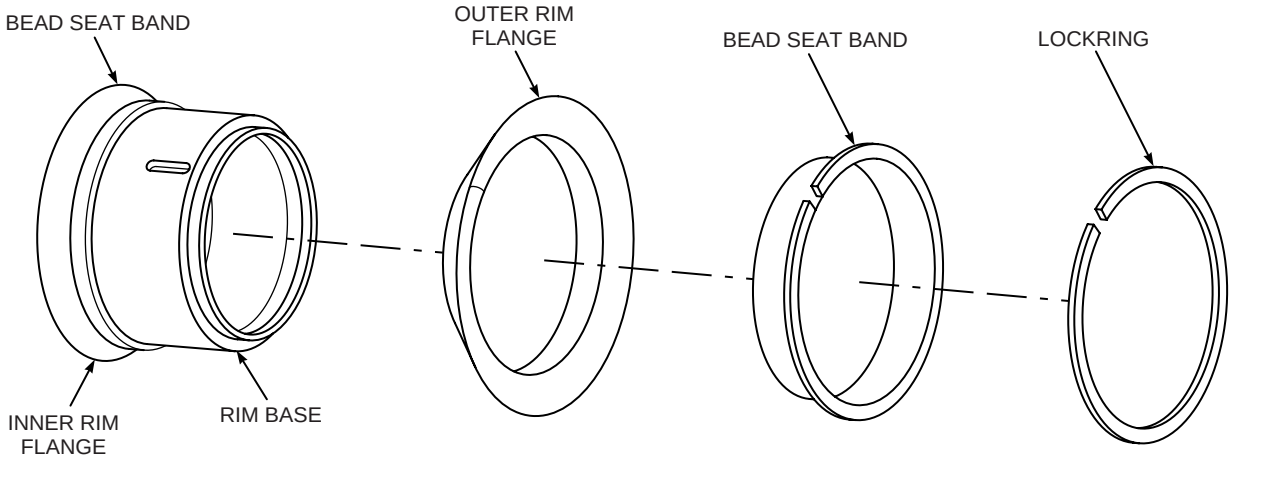


Figure 27. Typical Large Earthmover Rim

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

RIM TYPES AND VARIATIONS – CONTINUED

8. **Grader Rims.** Grader rims are similar to three-piece flat-base rims except the rim bead seat diameters are slightly less than those established for truck rims. For this reason, only grader tires should be mounted on grader rims. Modern grader tires are tubeless with rubber packing between the outer flange and rim base to prevent leakage. Figure 28 shows a typical three-piece grader rim.

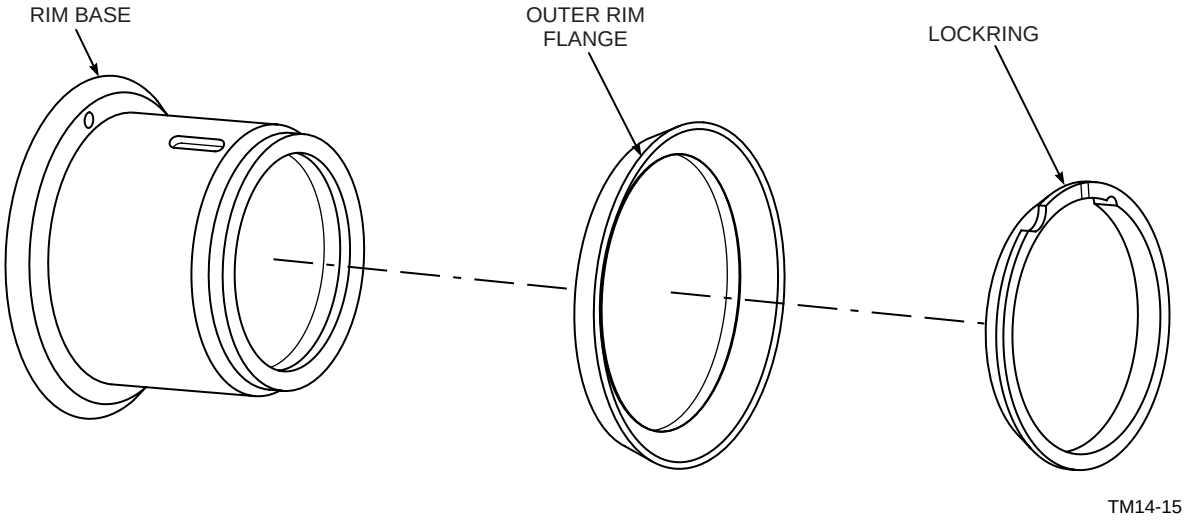


Figure 28. Typical Three-Piece Grader Rim

9. **Rim Variations.** There are many variations of the previously described rims. A semidrop-center rim may have both bead seats on the main part of the rim base, or the bead seat may be on the removable flange. The flat-base rim may have a three-piece construction. Removable rims flanges may be mounted or demounted from the rim base with several nuts and studs instead of locked in place with a lockring. Consult the vehicle Technical Manual for specific descriptions and instructions on wheel/tire maintenance, as the rims described, only represent general construction characteristics of rims.

TUBES AND FLAPS

1. **Tube Description.** Standard tubes are circular rubber containers that fit inside the tire and hold the air that supports the vehicle. Though strong enough to withstand only a few pounds of pressure when not confined, the tube bears extremely high pressures when enclosed in a tire and wheel assembly. Tubes are made of comparatively soft rubber and can be easily chafed, pinched, punctured, or otherwise damaged. Standard tubes are generally made of a synthetic rubber called butyl, which has air retention properties superior to natural rubber.

2. **Flap Description.** Flaps are circular in shape and fit inside a tire assembly between the tube and rim. The flap is made of a thicker, more durable synthetic rubber and protects the tube from being chafed, pinched, punctured, or otherwise damaged from rim components.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

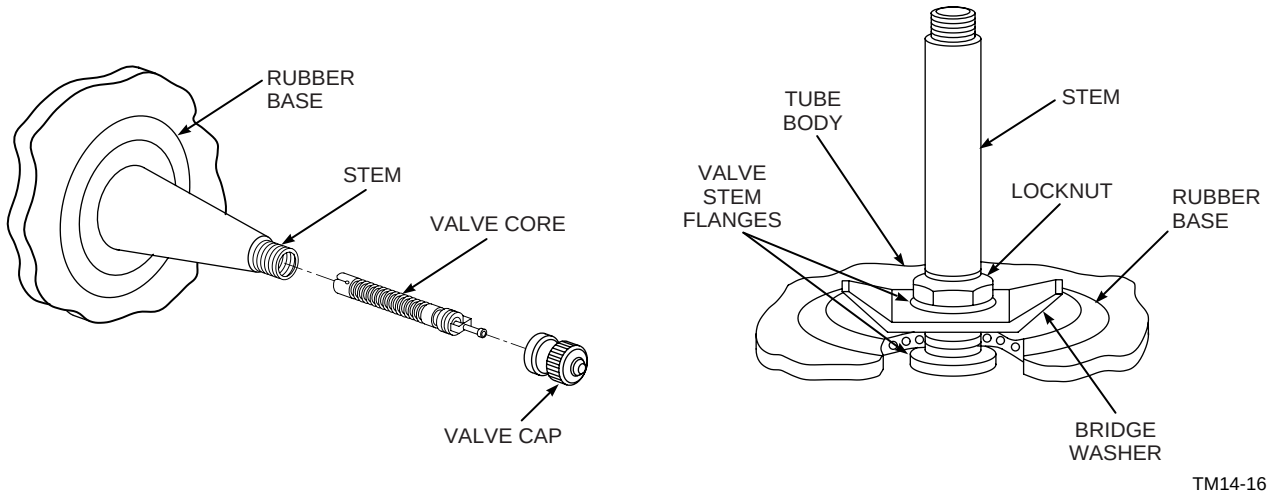
TUBES AND FLAPS – CONTINUED

3. **Tube Applications.** All tubeless tires are required to be marked on the sidewall as "tubeless." Never use tubes in a tire and rim assembly that is designated or marked tubeless. Tubeless rims are designed to be airtight without a tube. Tubeless tires are built with an additional inner liner on the inner cavity of the tire and adding a tube to a tubeless tire and rim assembly may cause the tire to run hotter (because of the extra rubber mass).

VALVE STEMS

1. **Valve Stem Description.** Valve stems are either cured to or mounted on tubes or rim bases for tubeless tires. Valve stems are used to admit or discharge air pressure from the tube or tubeless tire cavity. The valve stem consists of a metal stem, a removable core that acts as a check valve, and a valve cap. Construction is generally brass or brass with a rubber coating.

2. **Tube Cured-On Valve Stems.** Cured-on valve stems are non-removable and have a rubber base that is vulcanized on the outer surface of the tube. There are two types of Cured-on stems: the non-bendable all-metal stem and the rubber-covered stem, which is bendable when the stem is longer than 3 inches (7.6 cm). Rubber covered stems have a rubber base vulcanized to the outer surface of the tube and a rubber coated stem. All-metal stems have a rubber base vulcanized to the outer surface of the tube and a bridge washer fastened to the base of the valve stem by a hex locknut. Figure 29 is an example of a cured-on valve stem.



CURED-ON RUBBER COVERED VALVE STEM **CURED-ON ALL METAL VALVE STEM**

Figure 29. Typical Cured-On Valve Stems

EQUIPMENT DESCRIPTION AND DATA – CONTINUED **0002 00**

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

VALVE STEMS – CONTINUED

2. **Tube, Cured-In Valve Stems.** Cured-in valve stems are similar to cured-on valve stems except that the rubber base is inverted and vulcanized to the inner surface of the tube. The rubber base may also be vulcanized directly into the rubber body of the tube.

3. **Tube, Spud-Mounted Valve Stems.** Spud-mounted valve stems are constructed in two parts. They are readily identified by absence of a bridge washer and hex nut. Older versions of spud-mounted valve stems are made airtight at the base through a clamping action between the spud base and stem base. Newer versions of these valve stems have a cured-in spud; who's outside thread accepts a valve stem replacement with a preformed packing. Figure 30 shows a typical spud-mounted valve stem.

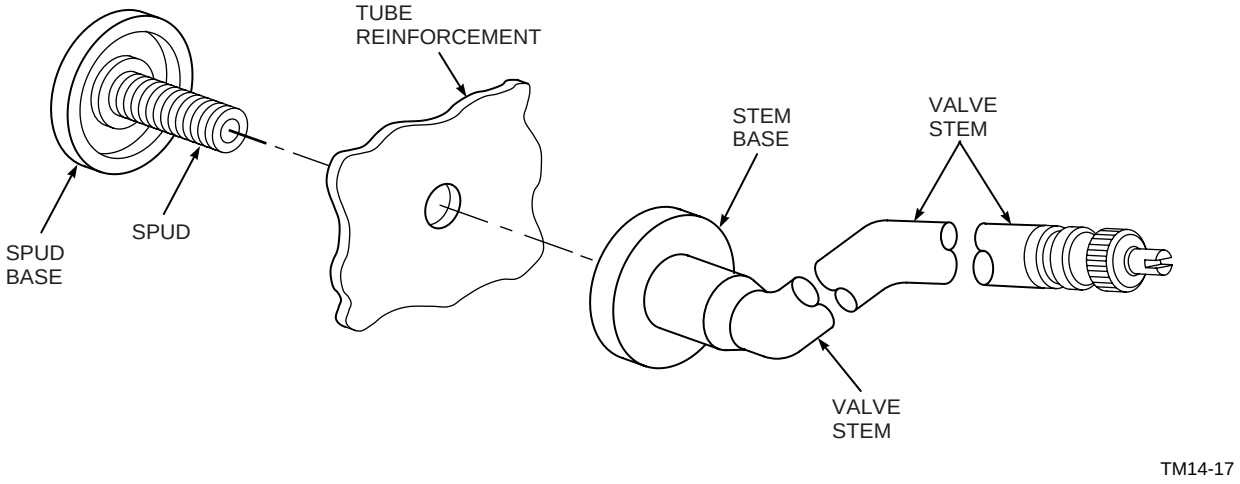


Figure 30. Spud-Mounted Valve Stem

4. **Tube, Clamp-In Valve Stem.** Clamp-in valve stems for tubes are no longer used except on some motorcycle and bicycle applications. These valve stems are airtight at the base through clamping action of the bridge washer and hex nut. Some of these valves stems are threaded the full length of the stem to accept a second nut, called a rim nut that holds the valve stem firmly in place on the rim. The bridge washer is installed with its ends lengthwise to the tube. Figure 31 shows a typical clamp-in valve stem.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

VALVE STEMS – CONTINUED

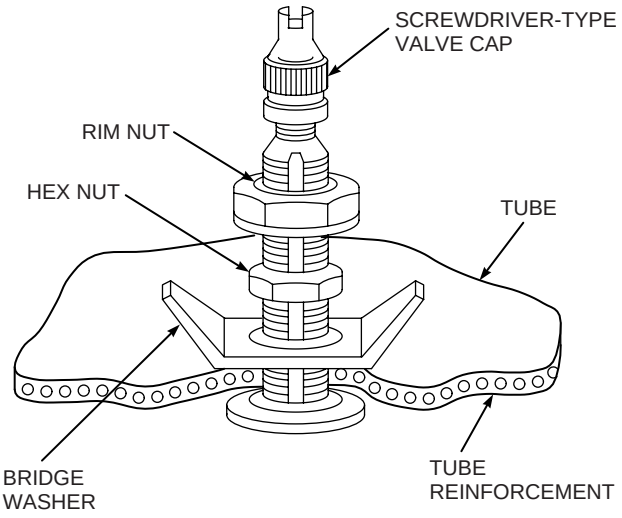


Figure 31. Typical Clamp-In Valve Stem

5. **Rim Mounted, Tubeless Tire, Clamp-In Valve Stems.** Clamp-in tubeless tire valve stems are used primarily on passenger cars and light trucks. This valve stem is mounted on tubeless tire rims through a circular hole of controlled dimension. The valve stem is airtight at the base through the clamping action of the ring washer and hex nut.

6. **Rim Mounted, Tubeless Tire, Clamp-In, Double-Bent Valve Stems.** Clamp-in, double-bent tubeless tire valve stems have an extra low vertical height. They are attached to the rim by tightening the hex nut against the rim. This ensures an airtight seal at the base of the valve stem.

7. **Rim Mounted, Air-Liquid, Tubeless Tire, Clamp-In, Valve Stems.** Clamp-in, air-liquid tubeless tire valve stems are used with tubeless tires that require liquid for traction. The valve stem is all metal and mounted on the rim through a circular hole of controlled dimension. The valve stem is sealed at the base through the clamping action of the ring washer and the hex nut.

8. **Rim Mounted, Large Bore, Tubeless Tire, Clamp-In, Valve Stems.** Clamp-in, large bore tubeless tire valve stems are available in three types: straight type, swivel type, and non-swivel type. Large-bore valve stems are used on rims for very large earthmover tires. They permit rapid inflation and deflation of tires. The rubber washer forms an airtight seal when the mounting hex nut is tightened.

9. **Rim Mounted, Tubeless Tire, Snap-In, Valve Stems.** Snap-in tubeless tire valve stems are used extensively with passenger cars and light trucks. This type of valve stem is mounted on tubeless tire rims through a circular hole of controlled dimension. The valve stem is encased in a heavy, pear shaped rubber cover. The base of the valve stem is shaped like a mushroom head and below the threaded shank there is a slight ridge. When the valve stem is properly installed, the edge of the rim valve hole will be between the mushroom head and the ridge forming an airtight seal. Figure 32 shows a typical rim mounted, tubeless tire, snap-in valve stem.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

VALVE STEMS – CONTINUED

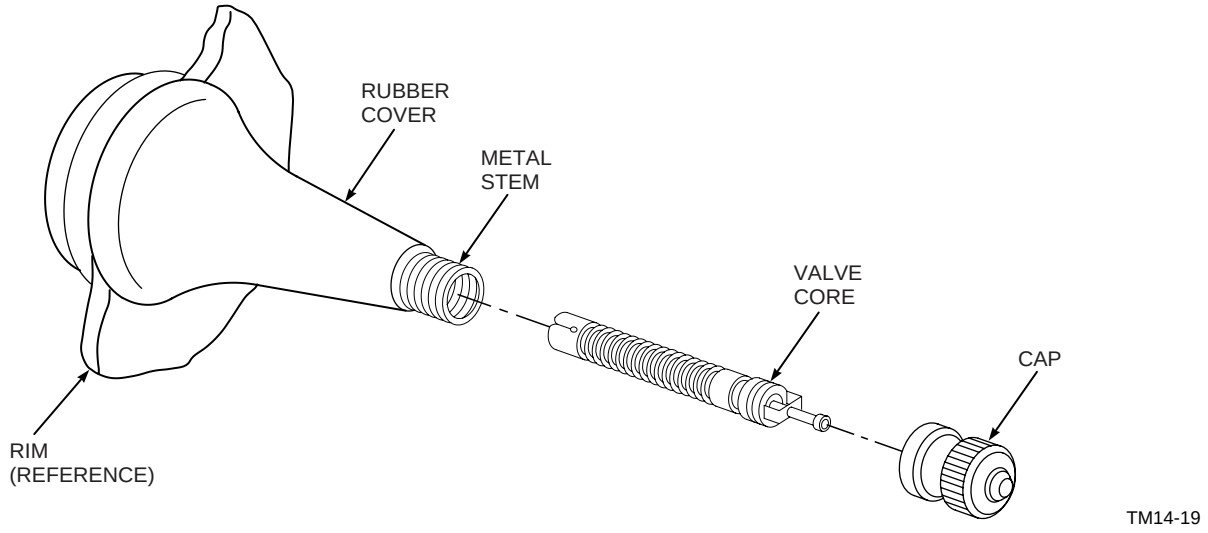


Figure 32. Typical Snap-In Tubeless Tire Valve Stem

VALVE STEM COMPONENTS

1. **Valve Cores.** The valve core is assembled into the valve stem body and permits air, under pressure, to enter but prevents it from escaping. There are two types of valve cores and two sizes of each type. The two types are the visible spring type and the concealed spring type, and they are interchangeable. Two sizes are provided for the standard bore and the large bore valve stems. The core shell has a rubber washer that provides an airtight seal against the tapered seal inside the stem. Directly below the shell is a cup that contains a rubber seat that, in the closed position, is forced against the bottom of the shell forming an airtight seal. The pin on top of the valve core, when pushed down, forces the cup away from the shell permitting air to flow. Figure 33 shows typical valve cores.

EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES – CONTINUED

VALVE STEM COMPONENTS − CONTINUED

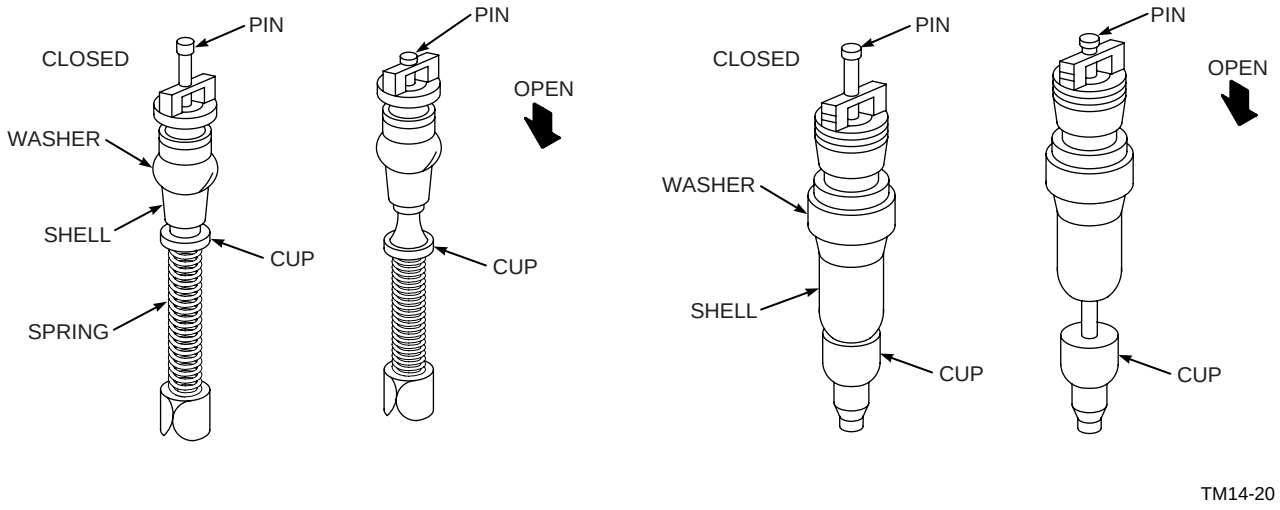


Figure 33. Typical Valve Cores

2. **Valve Caps.** The valve cap is installed onto the end of the valve stem, furnishing a second airtight seal. The cap also protects the threads on the end of the stem and keeps dirt and moisture out of the valve body. The screwdriver type cap (NSN 2640-00-060-3550) has a forked tip that may be used to install or remove the valve core. The plain cap (NSN 2640-00-255-9346) is generally used on rubber cover valves and has a skirt that contacts the rubber cover on the valve stem. Screwdriver and plain caps are interchangeable. The plastic cap (NSN 2640-01-098-2029) is used on all vehicles that service aircraft or are dispatched on flight lines. Each of these caps should be finger-tightened only. Figure 34 shows the three types of valve caps.

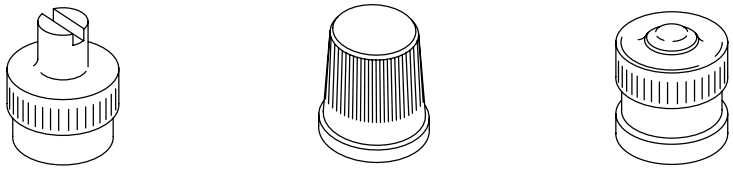


Figure 34. Typical Valve Caps

TIRE MARKINGS AND CODES

GENERAL

Tire identification and code markings are generally in raised letters and numbers on the sidewall of the tire as shown in Figure 35. On most tires, the manufacturer's name, tire brand name, tire size, load capacity and date of manufacture (contained in the DOT code) are imprinted on the sidewall. Each of these markings is explained in the following paragraphs.

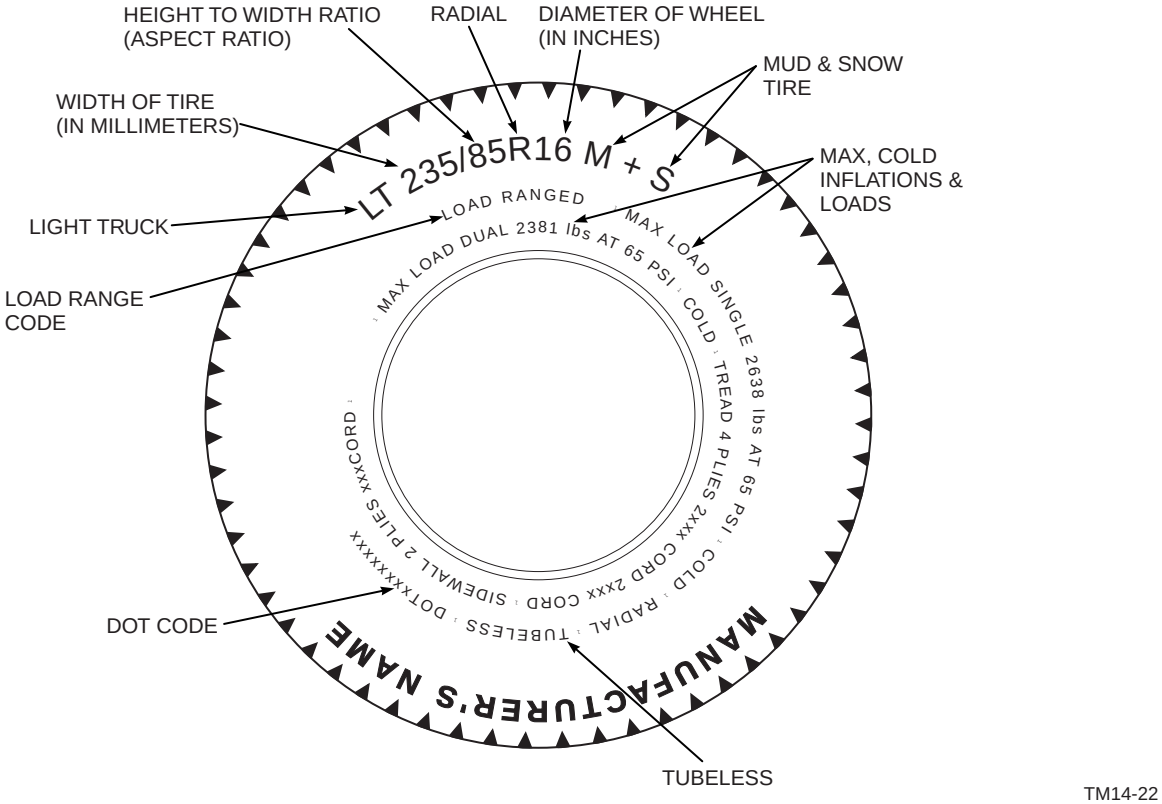


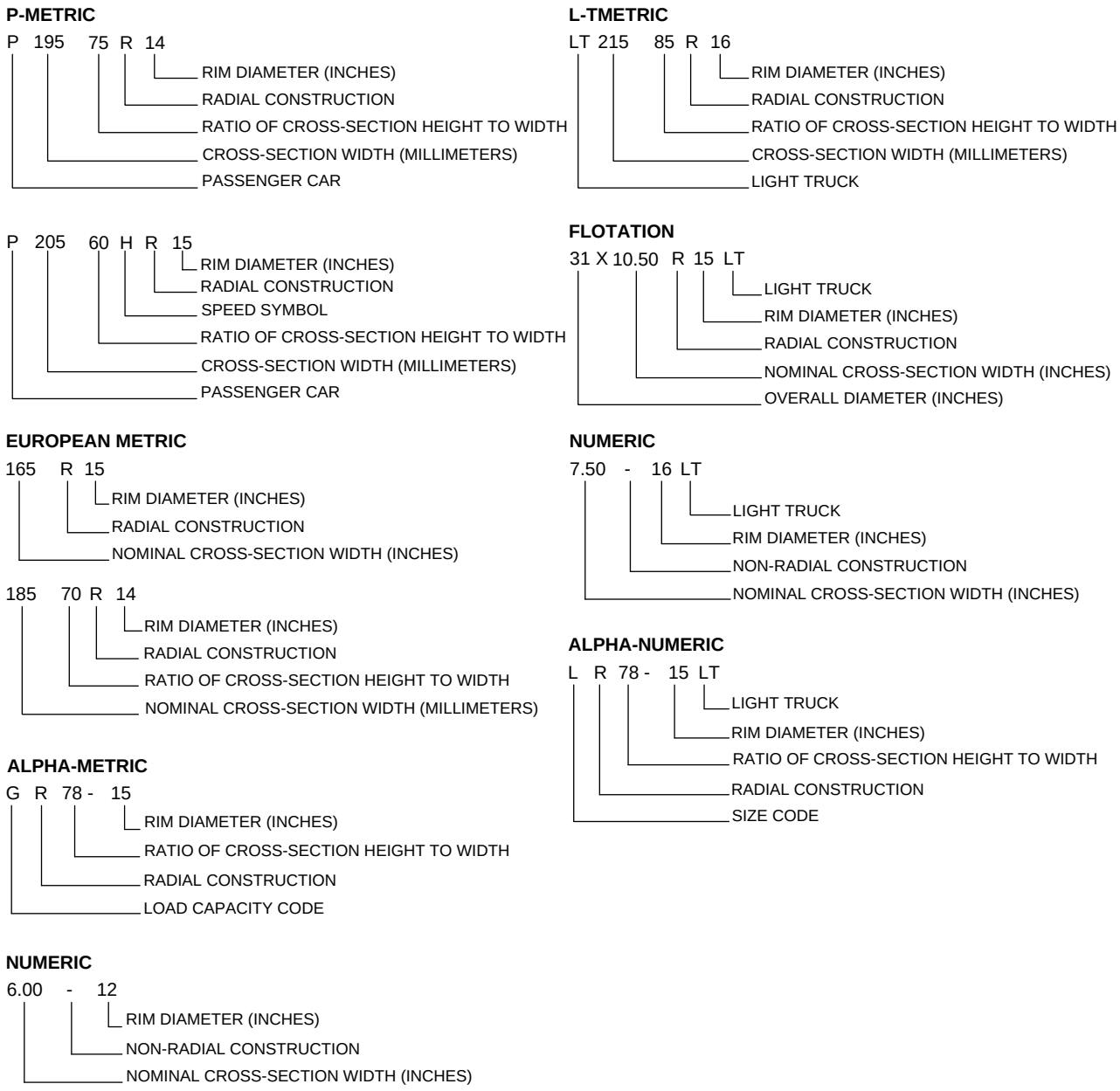
Figure 35. Tire Identification and Code Markings

TIRE SIZE DESIGNATIONS

Tire size designations will vary depending on the application and where and when a tire is manufactured. Presently the most common size designation systems in use are: P-Metric, European Metric, LT Metric, Alpha-Numeric, Numeric, and Flotation. Examples of each of these systems with definitions are shown in Figure 36.

TIRE MARKINGS AND CODES − CONTINUED

TIRE SIZE DESIGNATIONS − CONTINUED



TM14-23

Figure 36. Tire Size Designations

TIRE MARKINGS AND CODES − CONTINUED

TIRE SIZE CONVERSION

1. Most tires received through the military supply system are specific sizes for specific vehicle applications. However, Table 2 does show some common passenger car tire sizes that are compatible and may be mixed. For example, P185/80R13 is equivalent to BR78-13, BR70-13, and 6.50-13 radial ply tires.

2. Table 2 lists substitute passenger car tires that do not require any inflation adjustment from the requirements specified in vehicle manuals, vehicle placards, or data plates. However, when converting tire sizes from one type to another, tire construction must be considered. Radial, belted bias, and bias constructed tires should not be mixed on the same vehicle. Consideration must also be given to the tread design. For example, do not mix mud-and-snow tires with regular highway tread tires.

3. Mixing various tire sizes for other vehicle applications (e.g. Light and Medium Trucks) should be avoided and is not recommended unless specified in the vehicle technical manual. Truck suspensions and drive trains are usually designed with a specific tire size and design. A mix of various truck tire sizes or designs can have degrading and sometimes catastrophic effects on the traction, cornering and handling characteristics, and performance of the vehicle.

TIRE MARKINGS AND CODES − CONTINUED

TIRE SIZE CONVERSION − CONTINUED

Table 2. Tire Size Conversions

ALPHA-NUMERIC AND METRIC					NUMERIC
P-METRIC	P-METRIC	78 SERIES	70 SERIES	EUROPEAN METRIC	UNITED STATES
P155/80R13	P165/75R13 P175/70R13	AR78-13		175/70R13	
P165/80R13	P175/75R13 P185/70R13 P195/65R13 P195/60R13 P215/50R13	BR78-13 AR78-13	BR70-13 AR70-13	185/70R13	6.50-13
P175/80R13 P185/80R13	P185/75R13 P195/70R13 P215/60R13 P235/50R13 P205/70R13	CR78-13	CR70-13 DR70-13 ER70-13 AR70-13		7.00-13
P165/75R13	P165/80R13 P175/70R13 P195/60R13 P215/50R13	AR78-13		185/70R13 165R13	
P175/75R13	P175/80R13 P185/70R13 P195/65R13 P205/60R13	BR78-13			6.50-13
P175/70R13	P165/80R13 P175/75R13 P195/60R13 P215/50R13	AR78-13		185/70R13	
P185/70R13	P175/80R13 P185/75R13 P195/65R13 P205/60R13	BR78-13		185/70R13	6.50-13
P195/70R13 P205/70R13	P185/80R13 P215/60R13 P235/50R13				
P175/75R14	P185/70R14	CR78-14	BR70-14	195/70R14 175R14	6.45-14
P185/75R14	P185/80R14 P195/70R14 P205/65R14 P215/60R14	DR78-14 ER78-14	DR70-14	185R14	6.95-14
P195/75R14	P205/70R14 P225/60R14 P245/50R14	ER78-14	ER70-14		7.35-14

TIRE MARKINGS AND CODES − CONTINUED

TIRE SIZE CONVERSION − CONTINUED

Table 2. Tire Size Conversions - Continued

ALPHA-NUMERIC AND METRIC					NUMERIC
P-METRIC	P-METRIC	78 SERIES	70 SERIES	EUROPEAN METRIC	UNITED STATES
P2O5/75R14	P215/70R14 P235/60R14 P265/50R14	FR78-14	FR70-14		7.75-14
P215/75R14	P225/70R14 P245/60R14 P225/55R14	HR78-14 GR78-14	GR70-14		8.25-14
P225/75R14 P185/7OR14 P195/7OR14	P235/70R14 P185/75R14 P185/80R14 P195/75R14 P205/65R14 P215/60R14	JR78-14 CR78-14 DR78-14	JR70-14	19S/70R14 19S/70R14	8.85-14
P2O5/7OR14	P205/75R14 P225/60R14 P245/50R14	FR78-14		20S/70R14	7.75-14
P195/6OR14	P185/70R14 P205/65R14			18S/70R14	
P215/6OR14	P205/70R14 P245/50R14				
P195/75R15	P215/70R15 P215/65R15 P245/50R15	FR78-15	FR70-15		7.75-15
P2O5/75R15	P215/70R15 P235/60R15 P265/50R15	GR78-15	GR70-15		8.25-15
P215/75R15	P225/70R15 P245/60R15 P255/55R15 P275/50R15	HR78-15	HR70-15		8.55-15
P225/75R15	P235/70R15 P225/60R15	LR78-15	HR78-15		9.00-15
P235/75R15	P245/70R15 P255/65R15 P275/60R15 P295/50R15				9.00-15
P215/7OR15	P215/75R15 P235/60R15 P255/55R15 P265/50R15	GR78-15			8.25-15
P225/70R15	P225/75R15 P245/60R15 P275/50R15	HR78-15			8.55-15
P215/75R15	P205/75R15 P215/70R15 P235/60R15 P265/50R15		GR70-15		8.25-15
P255/60R215	P235/70R15 P255/65R15 P295/50R15		LR70-15		9.00-15

TIRE MARKINGS AND CODES − CONTINUED

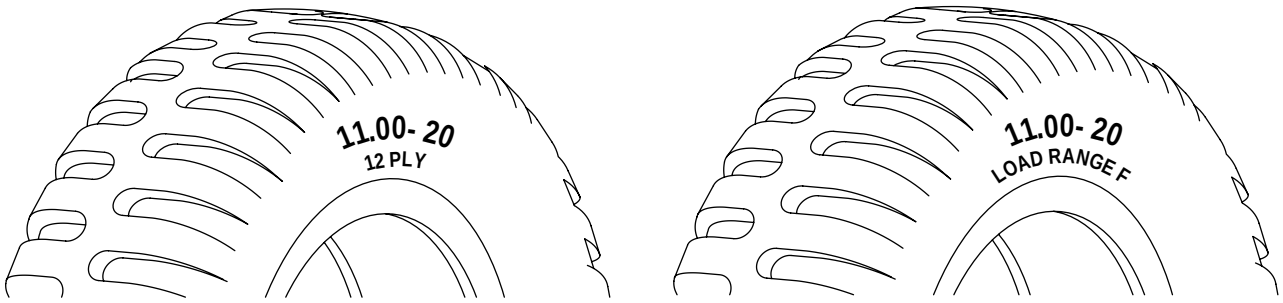
TIRE SIZE CONVERSION − CONTINUED

PLY RATING AND LOAD RANGE

Methods of indicating ply rating, or the strength of a tire, are either with a ply rating or load range imprinted on the tire sidewall. The ply rating number and/or load range character are designations of the tire strength and do not necessarily indicate the actual number of cord plies. A tire with a 12 ply rating or F load range may actually have less than 12 cord plies but would be of equal strength to a tire with 12 cord plies. In the example, Figure 37, 12 ply or F load range indicates a ply rating of 12. The load range letters A through N represent the ply rating in even numbers 2 through 24 respectively (see Table 3).

Table 3. Ply Rating vs. Load Range

NUMERIC PLY RATING	LOAD RANGE
2	A
4	B
6	C
8	D
10	E
12	F
14	G
16	H
18	J
20	L
22	M
24	N



TM14-24

Figure 37. Ply Rating and Load Range

TIRE MARKINGS AND CODES − CONTINUED

DOT CODES AND DATE OF MANUFACTURE FOR NEW AND RETREADED TIRES

Manufacturers and retreaders **are required** to imprint a DOT (Department of Transportation) code for **new highway type tires, or a Retread Code for highway type retreads**, on one sidewall of all tires sold or used in the United States. **Off Highway tires** (e.g. Construction, Industrial and Agricultural) **do not** require DOT or Retread codes. The DOT or Retread code consists of a combination of letters and numerals, which identify the manufacturer/retreader plant, tire size, optional manufacturing or retreading symbols and date of manufacture or retread. For tires manufactured before July 2, 2000, the date of manufacture or retread is indicated in the last group of three digits of the DOT or Retread code and consists of the numerical week and the last digit of the year. Figure 38 shows examples of DOT or Retread coding. In the first example below, a date code of 042 means the tire was manufactured or retreaded in the 4th week of 1992 (or 1982, 1972 etc.). Newer tires will have a four-digit date code that includes the decade. In the second example below a date code of 0402 means the tire was manufactured/retreaded in the 4th week of 2002. The third example shows a newer retread code and the date code indicates that the tire was retreaded in the 8th week of 2006.

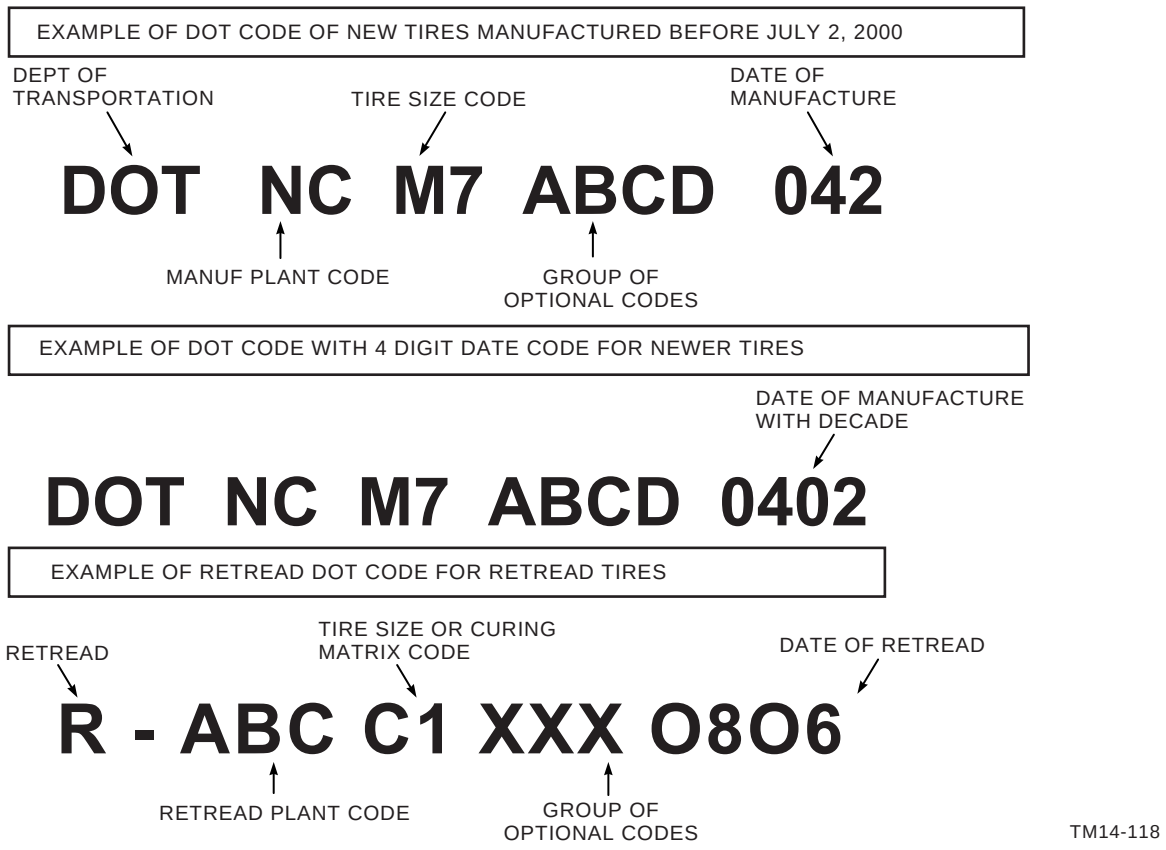


Figure 38. DOT Codes and Date of Manufacture for New and Retread Tires

TIRE MARKINGS AND CODES − CONTINUED

BALANCE MARK

Some tire manufacturers of Passenger Car, Light Truck and Medium Truck highway tires mark their tires with a small ink dot, approximately 1/4 inch (6.4 mm) in diameter, near the bead. This dot is usually a light color (yellow, blue or red) that indicates the lightest area of the tire. To provide optimum balance this ink dot should be aligned with the valve stem when mounting the tire. Figure 39 is an example of a balance mark.

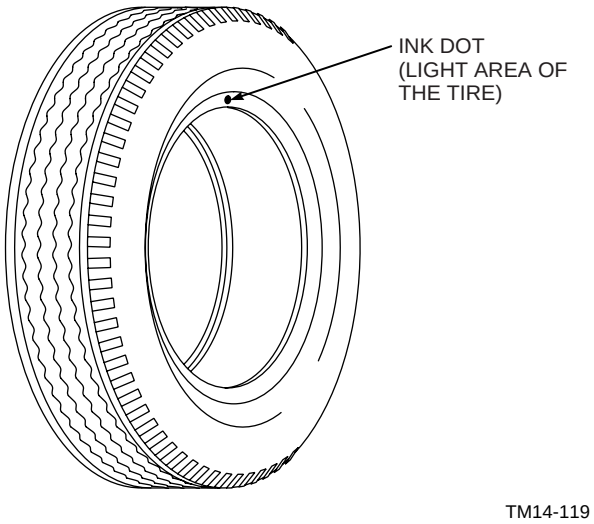


Figure 39. Balance Mark Location

MATERIAL CODES

These material codes may be marked on older tires. Newer tires no longer require these markings.

1. **Rayon Cord.** Tires with rayon cord are identified with the word RAYON or the letter R on the sidewall.
2. **Nylon Cord.** Tires with nylon cord are identified with the word NYLON or the letter N on the sidewall.
3. **Natural Rubber.** Tires utilizing natural rubber are identified with the letters NR on the sidewall.
4. **Synthetic Rubber.** Tires utilizing synthetic rubber are identified with the letter S on the sidewall.
5. **Tubeless Tires.** Tubeless tires are identified by the word TUBELESS on the sidewall.
6. **Ozone Resistant.** Some tires are constructed of ozone resistant material may be identified with the word OZONE or the letters OZ or O on the sidewall.

TIRE MARKINGS AND CODES − CONTINUED

SPECIAL PURPOSE CODES

These special purpose codes may be marked on older tires but are no longer required for newer tires.

1. **Military Tires.** Some Military tactical tires may be identified with the word MILITARY on the sidewall.

2. **Off-Road, Construction Equipment Tire Codes.** Tire manufacturers use the codes shown in Table 4 to identify the various off-road tire applications and use. These codes are usually imprinted on the sidewall of off-road tires.

Table 4. Off-Road Tire Codes

CODE	TREAD TYPE	SERVICE
E-1	Rib	
E-2	Traction	E = Earthmover
E.3	Rock	
E-4	Rock Deep Tread	
E-7	Flotation	
G-1	Rib	
G-2	Traction	G = Grader
G-3	Rock	
G-4	Rock Deep Tread	
L-2	Traction	
L.3	Rock	
L-4	Rock Deep Tread	L = Loaders & Dozers
L-5	Rock Extra Deep Tread	
L-3S	Smooth	
L-4S	Smooth Deep Tread	
L-5S	Smooth Extra Deep Tread	

NOTE
Combination tread designs are indicated by a combination of the appropriate code numbers. Example: L-5/L-5S

TIRE MARKINGS AND CODES − CONTINUED

SPECIAL PURPOSE CODES − CONTINUED

1. **DOT Quality Grades for Passenger Car Tires.** The Federal Governments Uniform Tire Quality Grading Standard applies to passenger tires only (but excludes deep tread, winter type snow tires, temporary use spare tires, and tires with nominal rim diameters of twelve inches or less). Tires subject to the standard are required to be graded by the manufacturers on the performance factors of tread wear, traction, and temperature. The grades are molded on the tire sidewall, as shown in the following example and explained in the following paragraphs.

Example:	
TREADWEAR	160
TRACTION	AA*
TEMPERATURE	C

   a. TREAD WEAR. The tread wear grade is a comparative rating based on the wear rate of the tire. For example, a tire graded 150 would wear one and a half (1-1/2) times as well on the government course as a tire graded 100. The relative performance of tires depends upon the actual conditions of their use, however, and may depart significantly from the norm due to variations in use, maintenance, climate and differences in road characteristics.

WARNING

THE TRACTION GRADE ASSIGNED TO THIS TIRE IS BASED ON BRAKING (STRAIGHT AHEAD) TRACTION TESTS AND DOES NOT INCLUDE CORNERING (TURNING TRACTION).

   b. TRACTION. The traction grades, from highest to lowest, are AA, A, B, and C, and they represent the tire's ability to stop on wet pavement. A tire marked C may have poor traction performance.

WARNING

THE TEMPERATURE GRADE FOR THIS TIRE IS ESTABLISHED FOR A TIRE THAT IS PROPERLY INFLATED AND NOT OVERLOADED. EXCESSIVE SPEED, UNDER-INFLATION, OR EXCESSIVE LOADING, CAN CAUSE HEAT BUILDUP AND POSSIBLE TIRE FAILURE.

   c. TEMPERATURE. The temperature grades are A (the highest), B, and C, representing the tire's resistance to the generation of heat and its ability to dissipate heat. Sustained high temperature can cause the material of the tire to degenerate and reduce tire life, and excessive temperature can lead to sudden tire failure. The grade C corresponds to a level of performance that all passenger car tires must meet under the Federal Motor Vehicle Safety Standard No.109. Grades B and A represent higher levels of performance.

END OF WORK PACKAGE

CHAPTER 2

CARE, MAINTENANCE AND INSPECTION

GENERAL INFORMATION **0003 00**

THIS WORK PACKAGE COVERS:
General Information

COMMON TOOLS AND EQUIPMENT

For authorized common tools and equipment, refer to Modified Table of Organization and Equipment (MTOE) applicable to your unit.

SPECIAL TOOLS: TEST, MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT

For authorized special tools and support equipment, refer to WP0013 00 of this manual.

INFLATION SAFETY

WARNING

ALWAYS INFLATE TIRES THAT ARE MOUNTED ON RIMS WITH DEMOUNTABLE SIDE RING FLANGES OR LOCKRINGS IN AN OSHA APPROVED INFLATION SAFETY CAGE OR SERIOUS INJURY OR DEATH COULD RESULT.

IMPROPERLY SEATED SIDE RING FLANGES OR LOCKRINGS MAY FLY OFF DURING INFLATION. NEVER ATTEMPT TO SEAT SIDE RING FLANGES OR LOCKRINGS DURING INFLATION OR AFTER INFLATION. SERIOUS INJURY OR DEATH COULD RESULT.

NEVER INFLATE TIRES OVER 40 PSI (276 KPA) TO SEAT TIRE BEADS. IF BEADS DO NOT SEAT, DEFLATE, DEMOUNT, AND CHECK THE TIRE/RIM MATCH. MOUNT AND LUBRICATE ACCORDING TO INSTRUCTIONS. SERIOUS INJURY OR DEATH COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

PERSONNEL MUST REMAIN A MINIMUM OF 10 FT (3.05 M) AWAY FROM THE TIRE BEING INFLATED. SERIOUS INJURY OR DEATH COULD RESULT FROM POSSIBLE PROJECTILES.

WHEN INFLATING TIRES IN AN INFLATION SAFETY CAGE, ALWAYS USE AN EXTENSION AIRHOSE AND A PNEUMATIC TIRE INFLATOR-GAUGE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY.

1. **Inflation Safety Cages and Restraining Devices**

   a. Field fabrication of safety inflation cages is not recommended and should not be used to inflate tires unless they have been certified during construction by a qualified engineer to meet United States Occupational Safety and Health Administration (OSHA) standard 29 CFR, Part 1910.177 (see WP0013 00). Most commercially manufactured safety inflation cages are certified by the manufacturer to meet OHSA standard 29 CFR, Part 1910.177.. Before using any inflation safety cage verify that the construction of the cage is certified by the manufacturer to meet OSHA standards.

   b. Inspection of Safety Cages. 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 damages such as the following defects shall be immediately removed from service.

      - Cracks at welds;
      - Cracked or broken components;

INFLATION SAFETY – CONTINUED

1. Inflation Safety Cages and Restraining Devices − Continued

- Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation;
- Pitting of components due to corrosion;
- Other structural damage that would decrease its effectiveness.

Refer to WP0013 00, OSHA Standard 29 CFR 1910.177 for additional information concerning restraining devices and barriers.

c. Tire safety inflation cages should be free standing and a minimum of 3 feet (0.9 m) away from any object. Never permanently mount a safety cage to the floor or near a wall. Mounting an inflation cage to the floor or near a wall prohibits expected deformation of the bottom plate and equal dissipation of energy released in the event of tire explosion. Permanently mounting an inflation cage to the floor or near a wall could result in failure of one or more of the bars, release of rim components or shrapnel and/or an unwanted concentration of energy.

d. When using a safety cage to inflate tires, the operator should ensure that all persons stay out of the trajectory during inflation.

e. Do not place hands, feet, or any other body part into the safety inflation cage during inflation and until the rim/tire assembly has been inspected to ensure all components have properly seated and locked in place.

f. Tire inflation will be controlled from a minimum of 10 ft (3.05 m) away using an extension air hose, an in-line pneumatic tire inflator-gauge and snap-on air chuck (refer to Figure 1). For specific tire inflation procedures, refer to the applicable procedures for the type of tire being inflated and to the appropriate vehicle TM .

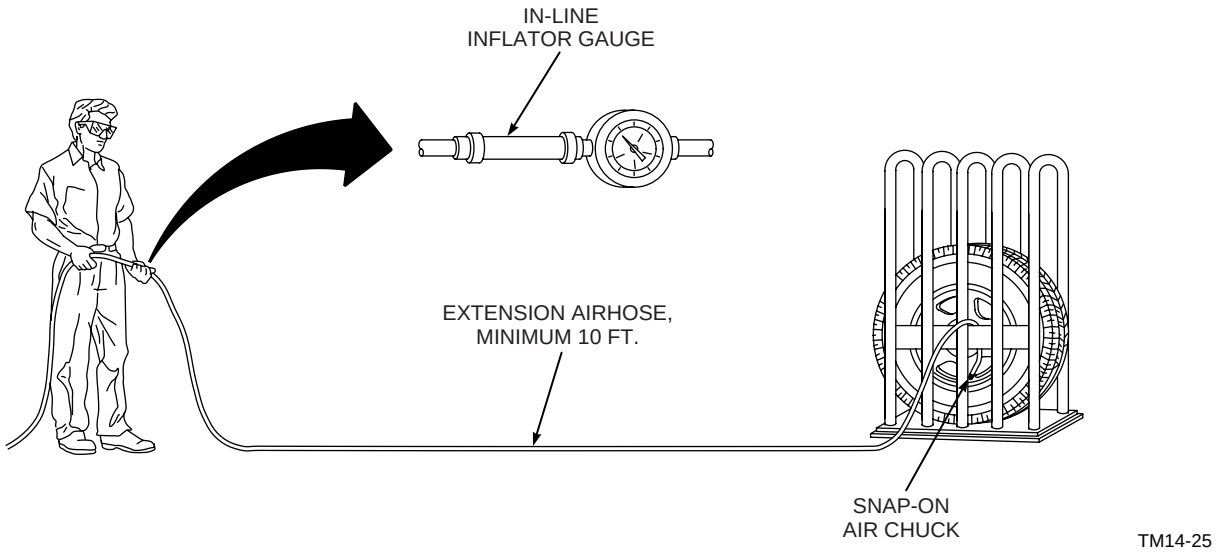


Figure 1. Typical Setup Using Inflation Safety Cage

INFLATION SAFETY − CONTINUED

2. Inflation Safety, Multi-Piece Rims with Demountable Lockrings or Side Flanges

a. A safety inflation cage must be used for inflating all tires that are mounted on multi-piece rims with demountable lockrings or side flanges. When a tire is being partially inflated to seat the bead, without using a safety inflation cage, inflate only to a pressure great enough to seat the flange and tire bead onto the rim ledge (this is approximately 3 psi (20.7 kpa)).

b. Remove the valve core to completely deflate tires before demounting them.

c. Remove the valve core to completely deflate the tire before taking the rim/wheel off the axle when inflation pressure is 80% or less of the recommended tire pressure, or when there is damage to the tire or rim/wheel components. Tires with over 80% of the recommended pressure may be inflated on a vehicle if a clip-on air chuck is used.

d. Never inflate tires on the floor or within any other solid surface that is within three feet of the tire's sidewall.

e. All persons must stay out of the trajectory when tires are being inflated.

f. Tires must not be inflated to more than the inflation pressure molded on the tire sidewall or the maximum pressure of the rim/wheel unless a higher pressure is recommended by the manufacturer or indicated in the vehicle Technical Manual.

WARNING

DO NOT EXCEED 5 PSI (34.5 KPA) MAXIMUM INFLATION PRESSURE OUTSIDE THE SAFETY CAGE TO SEAT THE BEADS.

g. With the valve core removed, install the clip-on air chuck (Inflation Hose NSN 4910-00-441-8685). Before inflating the tire, make sure the side ring is properly seated.

h. Never attempt to correct the seating of side flanges or lockrings while the tire is inflated.

i. With the valve core still removed, place the tire/wheel assembly into an inflation cage. Install clip-on air chuck making sure the valve stem is not positioned behind a bar and is easily accessible. While remaining outside the trajectory, inflate the tire to 20 psi (137.9 kpa) and check the tire beads and side rings for proper seating. Do not put any part of your body between the sidewall of the tire and the bars of the safety cage.

j. Never inflate beyond 40 psi (276 kpa) to seat the tire beads. If the beads are not seated at 40 psi (276 kpa), STOP! Deflate and determine the problem. If tire beads and rim components are properly seated, inflate the tire with the valve core still removed to the recommended inflation pressure as stated in the system TM. While tire is still in the safety cage, deflate the tire completely using the bleeder valve found on inflation hose (NSN 4910-00-441-8685). Keep tire in safety cage and reinstall the valve core. Attach the 10-foot (3.05 m) inflation hose clip-on chuck and inflate the tire to the recommended inflation pressure. Always stand out of trajectory while inflating tire.

2. Inflation Safety, Multi-Piece Rims with Demountable Lockrings or Side Flanges − Continued

k. Even after inflation and inspection for properly seated components, stand clear whenever handling multi-piece rims/wheels. With the necessary exception to mount the assembly on the vehicle, try to remain out of the wheel and air blast trajectory as much as possible until the assembly has been mounted on the vehicle and operated (refer to Figure 2).

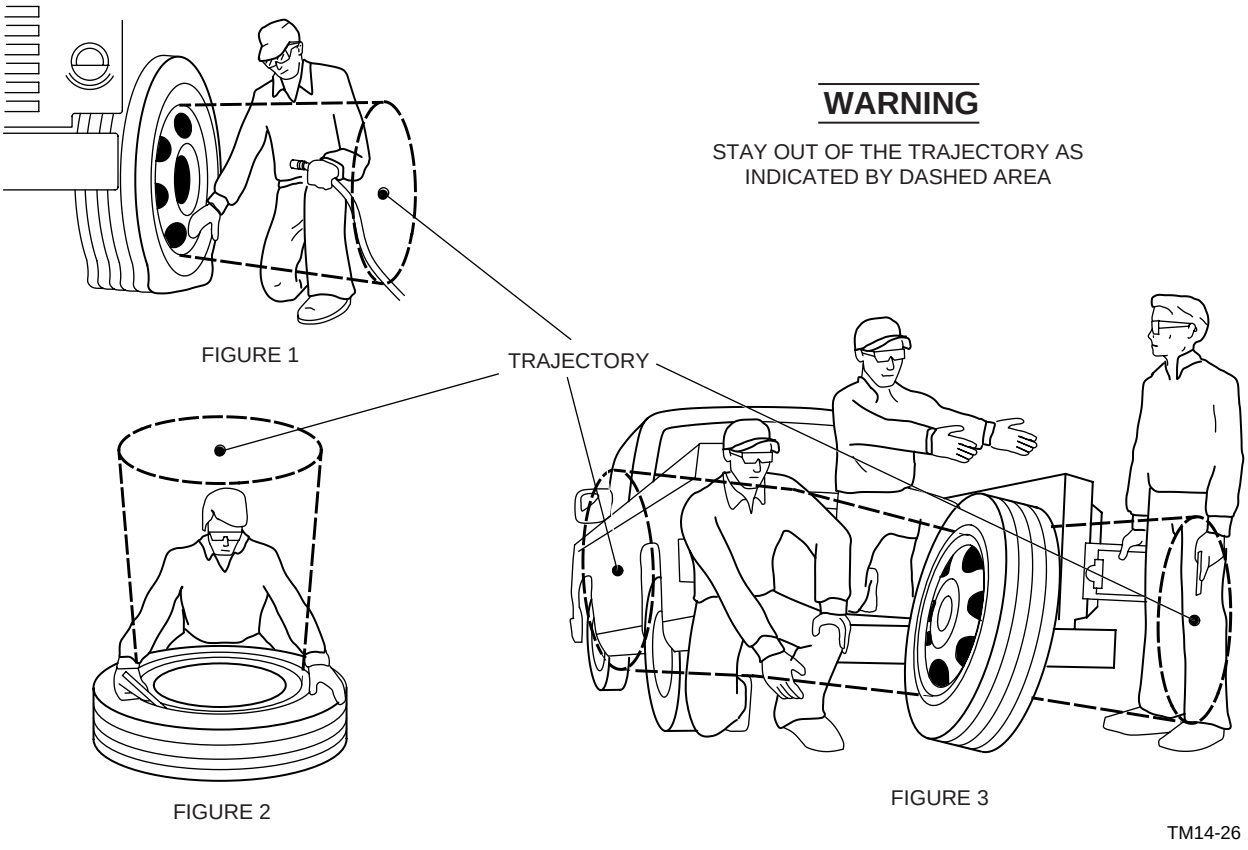


Figure 2. Trajectory Areas

INFLATION SAFETY − CONTINUED

3. Inflation Safety, Single-Piece Rims

a. To inflate tires of single-piece rims, use a safety inflation cage or bolt the wheel assembly on the vehicle, with lug nuts fully tightened. If a safety inflation cage or the vehicle are not available for inflating tires on smaller single-piece rims (i.e. Passenger Car and Light Truck Tires) a positive wheel lock down device may be used instead. A positive wheel lock down device is defined as a device where the rim is bolted down securely with nuts (i.e. a tire change machine with screw on flange that locks the rim to the machine). For single-piece medium truck tires or larger, do not use a positive wheel lock down device for inflation, only use a tire inflation safety cage or bolt the wheel assembly securely to the vehicle.

b. Remove the valve core to completely deflate tires before demounting them.

c. Only inflate the tire to the minimum pressure necessary to force the tire bead onto the rim ledge while on the tire changing machine. Typically it will take less than 10 psi (68.9 kpa) to seat the bead on a single piece rim. If more air pressure is needed, never inflate above 40 psi 276 kpa) to seat the tire bead. If the beads are not seated against the rim flange at 40 psi (276 kpa), STOP! Deflate the tire, and determine the problem.

d. Never inflate tires on the floor or within any other solid surface that is within three feet of the tire's sidewall.

e. All persons must stay out of the trajectory when tires are being inflated.

f. When inflating tires in a positive wheel lock down device, always use 10 foot (3.05 m) inflation hose (NSN 4910-00-441-8685) with clip-on air chuck, and stand out of trajectory while inflating tire.

g. Tires must not be inflated to more than the inflation pressure molded on the tire sidewall or the maximum pressure of the rim/wheel unless a higher pressure is recommended by the manufacturer or indicated in the vehicle Technical Manual.

WARNING

DO NOT EXCEED 5 PSI (34.5 KPA) MAXIMUM INFLATION PRESSURE OUTSIDE THE SAFETY CAGE TO SEAT THE BEADS.

h. With the valve core removed, install the clip-on air chuck (Inflation Hose NSN 4910-00-441-8685).

i. With the valve core still removed, place the tire/wheel assembly into an inflation cage. Install a clip-on air chuck making sure the valve stem is not positioned behind a bar and is easily accessible. While remaining outside the trajectory, inflate the tire to 20 psi (176.9 kpa) and then check the tire beads for proper seating. Do not put any part of your body between the sidewall of the tire and the bars of the safety cage.

INFLATION SAFETY − CONTINUED

3. Inflation Safety, Single-Piece Rims − Continued

j. Never inflate beyond 40 psi (276 kpa) to seat the tire beads. If the beads are not seated at 40 psi (276 kpa), STOP! Deflate the tire, and determine the problem. If tire beads and rim components are properly seated, inflate the tire with the valve core still removed to the recommended inflation pressure as stated in the system TM. While tire is still in the safety cage, deflate the tire completely using the bleeder valve found on inflation hose (NSN 4910-00-441-8685). Keep tire in safety cage and reinstall the valve core. Attach the 10 foot (3.05 m) inflation hose clip-on chuck and inflate the tire to the recommended inflation pressure. Always stand out of trajectory while inflating tire.

MULTI-PIECE RIMS/WHEEL GENERAL MAINTENANCE PROCEDURES

1. Tires are to be mounted only on compatible rims/wheels having matching bead diameter and approved width.
2. Apply a nonflammable rubber lubricant on the bead and rim/wheel mating surfaces before tire and rim/wheel assembly.
3. Never rework, weld, braze, or otherwise heat cracked, broken, or damaged rim/wheel components.
4. If you cannot identify the rim, lockrings, or other rim components by size and type, they must be scrapped.
5. Never apply heat to a multi-piece rim/wheel or rim/wheel component.
6. Current safety and matching charts or vehicle technical manuals containing instructions for the type of wheels being serviced must be available in the service area.
7. When mounting demountable rim/wheel combinations with a split rim, make sure the gap is aligned 180 degrees from the valve. Positioning the gap at 180 degrees will minimize distortion. During manufacturing there is a piece of metal taken out of the wheel where the valve goes which creates a natural weak point. The gap is also a weak point and a pressure point. If the components were incorrectly lined up, the wheel could distort.
8. There is no maximum lockring gap for two and three piece assemblies. However, there are minimum gap tolerances. Two-piece rims with a lockring, the gap, when assembled should not be less than 3/8 inch (9.5 mm). The ends on the lockring on three-piece assemblies, such as on the HEMTT vehicle, should not touch when assembled.

SINGLE-PIECE RIMS/WHEELS GENERAL MAINTENANCE PROCEDURES

1. Mounting and demounting of tires must be done only from the narrow ledge side of steel rims/wheels. (Aluminum wheels are symmetrical and tires can be mounted from either side.)
2. Apply a nonflammable rubber lubricant on the tire bead and rim/wheel mating surfaces before tire and rim/wheel assembly.
3. Current safety and matching charts or vehicle technical manuals containing instructions for the types of wheels being serviced must be available in the service area.
4. Never apply heat to a single-piece rim/wheel.
5. Cracked, broken, bent, or otherwise damaged rims/wheels must not be reworked, welded, brazed, or otherwise heated, but must be properly scrapped.
6. Apply rubber lubricant in the bead seat areas to ease demounting. Care must be taken to avoid damaging the tire beads.
7. Tires are to be mounted only on compatible rims/wheels having matching bead diameter and approved width.

REFERENCE INFORMATION FOR SAFE MAINTENANCE PROCEDURES FOR DEMOUNTING, MOUNTING, AND INFLATING TIRES

The "Safety Precautions for Mounting and Demounting Tube-Type Truck/Bus Tires Chart" and the "Multi-Piece Rim/Wheel Matching Chart" can be obtained from any of the following sources:

U.S. Department of Labor
OSHA Publication Office
200 Constitution Ave., N.W.
Room N3101
20310
(202) 523-9667

The Rubber Manufacturers Association (RMA)
c/o Mail Room Inc., PO Box 3147, Medina, OH
44256-3147
or by contacting the RMA Main Office Washington, D. C.
at 1-800-325-5095

TUBE AND FLAP USAGE

1. When installing new tires, always use new tubes and new flaps. Used tubes are larger than new tubes due to service growth. This extra dimension may result in buckles or creases, which lead to leaks and eventual failure. Never use a buckled or creased tube or flap in any tire as the edges may cut the tube, causing leaks.
2. Flaps must be used in all tube type multi-piece rims, or rims with valve slots. If a flap is not used, the tube will chafe against the tire toe, which may lead to tube failure. On a rim with a valve slot, the tube will blowout through the slot if flap is not used.
3. Only use radial flaps with radial tires and tubes. Radial flaps are more flexible than bias flaps and radial tires and tubes require a flexible radial flap in order to avoid tube chafe at the flap edge, which in turn may lead to tube failure.

TUBE AND FLAP USAGE − CONTINUED

4. Never use bias tubes in radial tires. Splices on bias tubes may not have the splice strength needed for tubes used in radial tires. Radial tubes are marked "For use in radial tires."

5. Be sure to inspect inside of tire and remove any foreign material such as paper, stones, dirt, water, etc. Foreign material may cut the tube, causing leaks. Water trapped between tube and tire during mounting may boil during hot service and generate steam. Steam and moisture can penetrate into tire body, causing separation leading to tire failure.

6. Never use a tube in tubeless tire/rim assembly where the rim is suspected of leaking. Tubeless tire/rim assemblies are designed to operate at a certain temperature without a tube. Adding a tube to this assembly adds more mass, which can generate more heat in the tire cavity, resulting in tire or rim failure. Also a tube in tubeless rim assembly may mask a potential problem with fatigue cracks or other fractures in the rim assembly which otherwise would be noticed by a slow leaking tire. Continued use may cause the rim to burst suddenly and with explosive force.

EXTREME COLD WEATHER CONDITIONS

1. If vehicles are allowed to rest directly on ice, snow, or frozen mud for long periods of time, initial thawing may occur and subsequently the tire will freeze in. The best way to keep tires from freezing to the ground is to park the vehicle on a hard surface or any other available material, such as planks, logs, flagstones, etc. The vehicle must be moved periodically to rotate the tires approximately 180 degrees.
2. Synthetic tubes become brittle when temperatures drop below -40°F (-40°C) and will fail faster than natural rubber tubes. To minimize the effect of low temperatures, lubricate the inside of tire, tube, flap, bead, bead lock, and the rim portion exposed to the tire with tire and rim lubricant (Items 90-92, WP0015 00) instead of talcum and increase tire pressure by 10 percent.

VALVE POSITIONING

For speed and convenience during inflation, valve stems should be readily accessible. They should be properly centered in valve holes to prevent scraping against the brake drums. They should be placed so that valve stems extend through the wheels. Valve stems of inside dual wheels should point away from the vehicle, and valve stems of outside dual wheels should point toward the vehicle. On dual wheels, the valve stem of the outside wheel will be placed 180 degrees apart from the valve stem of the inside wheel. With this arrangement, locating the valve stem of the inside wheel is made simple. Spare tires should also be mounted on the vehicle so that the valve stem is easily accessible. Every valve stem should be equipped with a valve cap tightened finger-tight.

MARKING OF TIRES

Using paint to mark tires in order to reduce pilferage is not recommended. A yellow label marked US GOVT will be used. Installation procedures are contained in each kit.

MATCHING OF TIRES

1. For longer tire life and more efficient performance, dual tires and tires on all-wheel drive vehicles must be the same designation, tread design, tread wear, and as close as possible to the same outside diameter. Improperly matched tires cause rapid, uneven wear. They can also cause transfer case and differential failures.
2. Accurate matching of tires is necessary because tires on all-axle drive vehicles rotate at the same speed when all axles are engaged. Dual wheels, because they rotate as a unit, must have their tire sizes matched. Mismatching dual tires forces the larger diameter tire to carry an overload, causing it to over deflect and overheat. The smaller diameter tire, lacking proper road contact, wears faster and irregularly. Tread or ply separation, tire body breaks, and blowouts can develop from mismatched dual tires. The result is uneven and rapid wear of both sets of tires and possible tire failure.
3. Never mix radial ply tires with bias or belted tires. Mixing bias and belted bias tires on the same vehicle should also be avoided. Snow tires should be of the same size and type of construction as the front tires. The problems encountered when mixing tire sizes and types on a vehicle are loss of steering control, inadequate vehicle handling, and potential mechanical damage. These problems will vary depending on the stability of the tires used, differences in dimension, differences in air pressure, and other operating conditions. New or practically new dual tires of the same make, size, tread type, and tread wear may be matched without measuring the circumference or the diameter.
4. Different manufactured tires and different brands may be mixed on the same vehicle if they fall within certain tolerances. When the tires are of a different make or there is a difference in the tread pattern, either the circumference or the overall diameter should be measured after mounting on the rim and inflating. Never over inflate or under inflate tires in an attempt to compensate for tire measurement variations. There is an allowable tolerance for the matching of dual tires that should never be exceeded. Dual tires have maximum allowable diameter differences in measurements (see Table 1). The larger size tire should be mounted outside. Minor variations of tread designs, as encountered from one manufacturer to another, may be used provided the sizes and tire constructions (bias or radial) are compatible. Never mix nondirectional cross-country (NDCC), commercial, mud-and-snow (M&S), all-terrain, or regular highway tires on the same axle, regardless of make, size, or tread wear.
5. Measure circumference at the center of the tread with a steel tape or other device. Measure overall diameter with a caliper (Item 11, WP0011 00) (See Figure 3). This tool may also be improvised.

Table 1. Maximum Allowable Diameter Differences for Dual Tires

Outside Diameter of Tire	Maximum Allowable Differences in: Diameter		Circumference	
	Inch(es)	cm	Inch(es)	cm
Under 30 inches (76.2 cm)	1/4	0.63	3/4	1.90
30 to 40 inch (76.2 to 101.6 cm)	3/8	0.95	1-1/8	2.86
40 to 50 (101.6 to 127 cm)	1/2	1.27	1-1/2	3.81
Over 50 inch (127 cm)	3/4	1.90	1-3/4	4.44

6. When using chains, care must be taken to ensure adequate clearance between loaded tires to avoid damage from chains.

MATCHING OF TIRES – CONTINUED

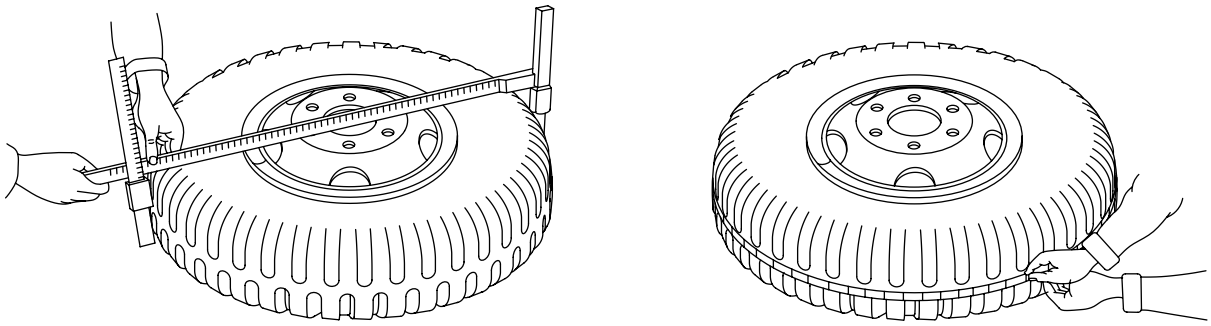


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Figure 3. Matching of Tires

TIRE INJURIES AND OZONE DAMAGE

1. Tires are constantly subjected to damage. They are cut by sharp objects and bruised by bad roads, stones, and road shocks. Tires also deteriorate from ozone exposure, heat, and age. It is dangerous to drive with a seriously injured or deteriorated tire because it may blowout, causing the driver to lose control of the vehicle.
2. Remove, repair, or replace tires when a cut or crack is deep enough to have reached the fabric or when the cord body is exposed (1, Figure 4). Small cuts or cracks in the tread that do not expose the cord body (2) need not be repaired; however, they should be periodically inspected for penetration to the cord body. Tires with a bulge (3) are unserviceable and must be removed and inspected for possible tread separation.

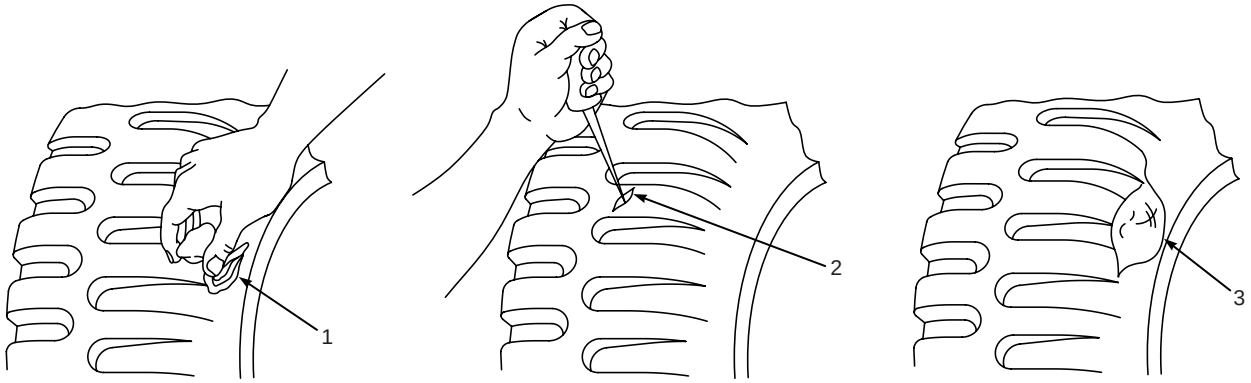

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Figure 4. Examples of Tire Damage

TIRE ROTATION

1. Rotating tires equalizes wear and extends their service life. The amount of tread wear or difference in the overall tire circumference provides the determining factor for tire rotation. Tires will be inspected at the intervals specified in the applicable vehicle TM.

2. There are two basic tread wear indicators that justify tire rotation. The first indicator is normal uneven wear. This occurs through routine over-the-road tire scrubbing and power friction generated through the drive wheels. The second indicator is unusual tread wear. This is identified by a rapid, uneven rate of wear resulting in reduced steering performance. This condition is usually caused by a mechanical maladjustment or misalignment of vehicle steering or power drive components and requires immediate action to determine the cause and to make the necessary repair.

ROTATION OF BIAS, BELTED, BELTED BIAS, AND RADIAL TIRES

When rotating bias, belted bias, and radial tires (see Figure 5), the spare tire is also rotated (in accordance with established measurements). After all of the tires are rotated, the tire that becomes the spare should be interchanged with the smallest diameter tire on the vehicle, in accordance with proper matching of tires. Some vehicles may have different sized tires mounted on the front and rear axles. These different sized tires have rotation restrictions. Check the applicable vehicle TM. When tires are rotated, the inflation pressures must be adjusted for the new position of the tire, in accordance with the actual loads on that wheel position and the vehicle TM.

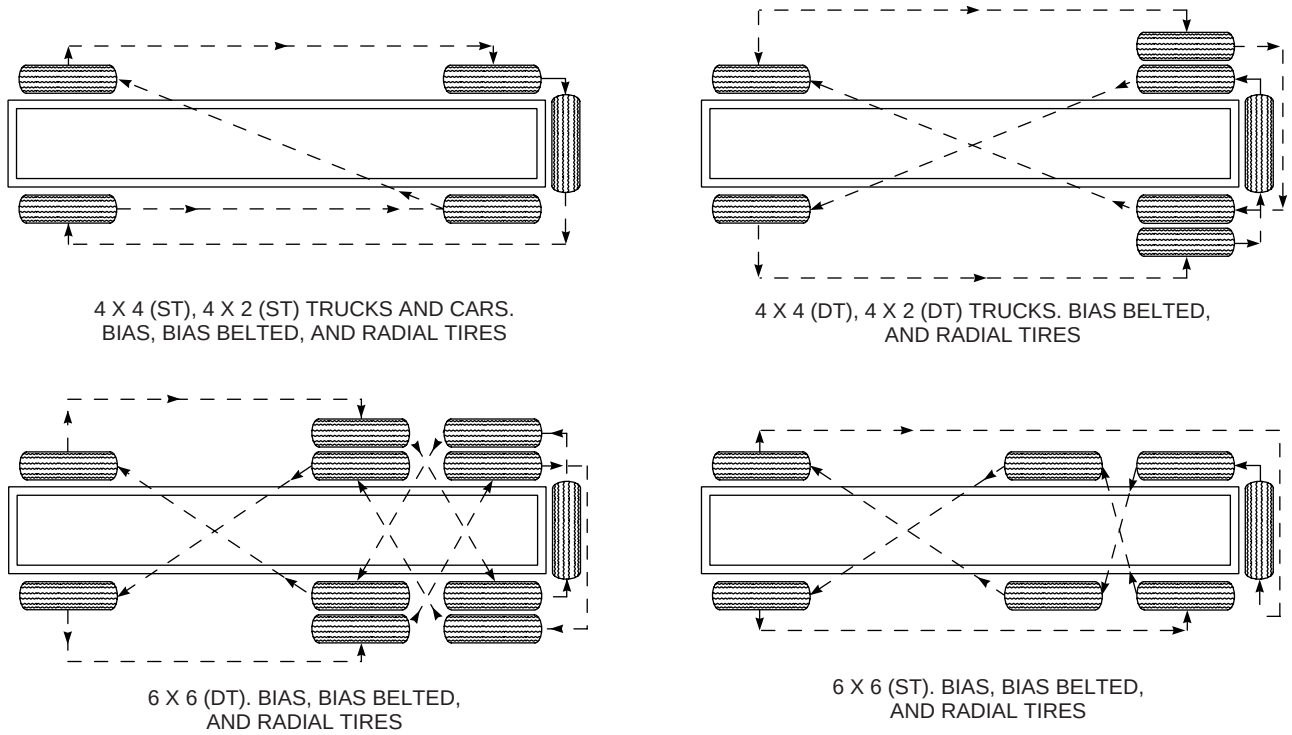


Figure 5. Rotation of Bias, Belted Bias, and Radial Tires

EFFECTS OF VEHICLE OPERATION

1. Flat Tire Operation

A vehicle should never be operated with a flat tire unless the tactical situation demands it. Operating a vehicle for only a few feet could damage a tire and tube beyond repair.

CAUTION

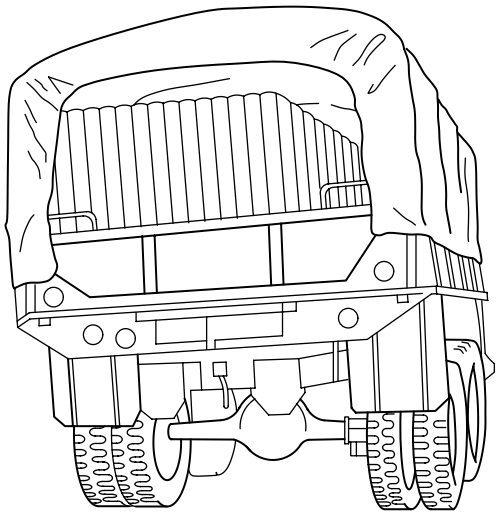
Never inflate a tire that has been run flat or seriously underinflated without first removing and checking for tire, tube, or rim damage.

2. Excessive Speed

Continued operation at high speed causes internal friction in the rubber as it flexes and thereby generates excessive heat. The higher the speed, the higher the rate of this flexing, and the hotter the tire gets. Excessive heat will weaken the cord body and soften the rubber causing excessive wear and possible tire failure. Excessive wear is particularly caused by rapid acceleration, turning at high speeds, and hard application of brakes.

3. Improper Loading

Loading vehicles beyond their rated capacity is a common cause of tire failure. Even if the total load does not exceed the capacity of the vehicle, unevenly distributed loads may overstress the tires and cause failures (see Figure 6).



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TIRES OVERLOADED BY UNEVEN DISTRIBUTION

Figure 6. Improper Loading

CAUTION

When Chains are used, care must be taken to ensure adequate clearance between loaded tires to avoid damage from chains.

4. Use Of Chains

Unauthorized use of tire chains on hard surface roads will cause rapid wear of chains. The chains could also damage the cord body or the tires leading to tire failure.

EFFECTS OF VEHICLE OPERATION – CONTINUED

5. Tire Spinning

WARNING

EXCESSIVE SPEED IN A SPINNING TIRE CAN CAUSE IT TO "EXPLODE" FROM EXTREME CENTRIFUGAL FORCE. THE ENERGY RELEASED BY SUCH AN EXPLOSION IS SUFFICIENT TO CAUSE SERIOUS INJURY OR DEATH.

The centrifugal forces created by a rapidly spinning tire can cause an explosion by literally tearing the tire apart. These forces act on the complete tire structure, and can be of such magnitude as to break the beads, in addition to rupturing the tire. Some vehicles are able to bring a tire to its failing point in just 3 to 5 seconds. The following guidelines should be followed:

- When stuck on ice, snow, mud, or wet grass, the vehicle should be rocked gently (alternately using forward and reverse gears) with the least amount of wheel spinning.
- Never exceed 35 mph indicated speed on the speedometer.
- Never allow anyone to stand near, directly ahead of, or behind the spinning tire.

EFFECTS OF VEHICLE MAINTENANCE

1. Mechanical Irregularities

In addition to proper and regular care of tires and tubes, keeping the vehicle in good mechanical condition will result in better performance and longer service of tires.

2. Excessive Wear of Vehicle Components

Badly worn components such as tie-rods, steering gears, drag links, ball joints, spring shackles, and shock absorbers cause tires to wear excessively. Faulty brakes or an improperly adjusted clutch can also cause excessive tire wear. Proper maintenance of these components, described in the applicable vehicle TM, will prevent irregular and excessive tire wear.

3. Misalignment of Wheels

Misalignment of front wheels is a common cause of irregular and excessive tire wear. Front wheels frequently encounter obstructions in the road that jolt the wheels out of alignment. Excessive toe-in or toe-out is the most common problem in front wheel alignment (see Figure 7). Too little caster angle will cause front wheels to wander from side to side, resulting in uneven tire wear. Too much caster angle may cause the wheel to "fight" or cause shimmy-wear. Unequal caster angle causes the steering wheel to pull to one side. Excessive camber angle increases slippage between the center and side sections of the tread area, also causing excessive tire wear or cupping on one or the other side of the tires. When any of these conditions develop, take immediate corrective action. Refer to applicable maintenance TM for procedures and tolerances.

3. Misalignment of Wheels − Continued

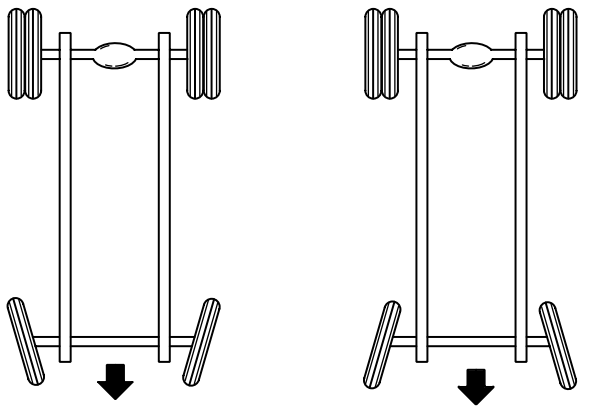

Figure 7. Misalignment of Wheels

4. Misalignment Of Axles

Misalignment of axles causes drive and trailer wheel tires to slide sideways, scuffing their tread and wearing them excessively.

IRREGULAR AND EXCESSIVE TIRE WEAR

At the first sign of irregular and excessive wear, determine the cause and take corrective action. Mechanical maladjustments and operating conditions are major causes of irregular and excessive wear. Causes might be wheel misalignment, bent wheels, loose wheels, misaligned axles, faulty brakes, faulty bearings, and damaged or weak springs. Misuse of brakes and engine power and turning at high speeds also cause irregular and excessive tire wear.

TIRE WEAR PATTERNS

WARNING

PERMANENT TIRE DAMAGE DUE TO UNDERINFLATION AND/OR OVERINFLATION CANNOT ALWAYS BE DETECTED. ANY TIRE KNOWN OR SUSPECTED TO HAVE BEEN RUN AT 80% OR LESS OF NORMAL OPERATING INFLATION PRESSURE AND/OR OVERLOADED, COULD POSSIBLY HAVE PERMANENT STRUCTURAL DAMAGE (STEEL CORD FATIGUE). PLY CORDS WEAKENED BY UNDERINFLATION AND/OR OVERLOADING MAY BREAK ONE AFTER ANOTHER, UNTIL A RUPTURE OCCURS IN THE UPPER SIDEWALL WITH ACCOMPANYING INSTANTANEOUS AIR LOSS AND EXPLOSIVE FORCE. THIS CAN RESULT IN SERIOUS INJURY OR DEATH.

CAUTION

Remove wheel and check tire, tube, and rim for damage before inflating if tire has been run flat or seriously underinflated.

1. Air Pressure

Correct air pressure is the basis for reliable tire performance. Tires are designed to operate at specified air pressures for given loads. Always check air pressure before operating the vehicle and when the tires are cold. During tire use they generate heat that will increase pressure and provide inaccurate readings. When checking air pressures, always use an accurate gauge. Air pressure gauge accuracy should be checked and calibrated periodically with a precision gauge. Also check valve cores for leaks. When necessary, inflate the tires to the prescribed air pressure as indicated in the vehicle Technical Manual.

a. Underinflation. An underinflated tire does not contain enough air for its size and the load it must carry. It flexes excessively in all directions and gets hot. In time, the heat weakens the cords in the tire and may cause a tire failure. Underinflation also causes tread edges to scuff the road, which puts uneven wear on the tread and shortens tire life (see Figure 8). Never run a flat or nearly flat tire unless the tactical situation in combat requires it. When run for even a short distance or almost flat for long distances, the tire may be ruined beyond repair.

b. Overinflation. Overinflation also causes tire failure (see Figure 8). Excessive pressure prevents the tire from flexing enough and causes it to be constantly subjected to hard jolts. When an overinflated tire hits a stone or rut, the cords may snap, causing a break in the cord body. The center of the tread wears more rapidly and does not permit equal wear across the entire tread. Hard riding from too much air pressure also increases wear.

TIRE WEAR PATTERNS − CONTINUED

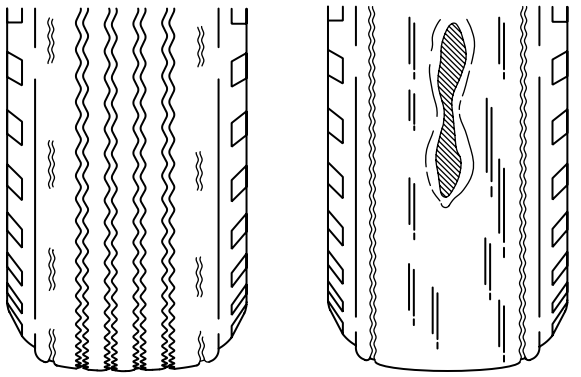

Figure 8. Example of Underinflated and Overinflated Tires.

2. **Misaligned Wheels.** Refer to Effects of Vehicle Maintenance, Misalignment of Wheels, this WP.
   a. Improper Camber Angle. An improperly adjusted camber angle will cause tires to wear. Improper camber angle means that the wheel assembly is leaning in or out at the top. This causes the tread area to contact the road harder on one side than on the other, causing that side of the tread area to wear unevenly and rapidly (see Figure 9).

   b. Excessive Toe-in. Excessive toe-in will cause a tire tread to wear. Feathered edges will develop in the inner edges of the tread design. In extreme cases the feathered edges may also appear on the inner edge of the tread area (see Figure 10).

   c. Excessive Toe-out. Excessive toe-out will cause a tire tread to wear as indicated. Feathered edges will develop on the outer edges of the tread design. In extreme cases the feathered edges may also appear on the outer edges of the tread area (see Figure 10).

TIRE WEAR PATTERNS − CONTINUED

2. Misaligned Wheels − Continued

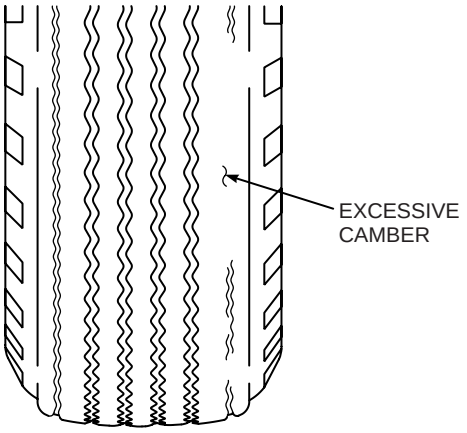

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Figure 9. Results of Excessive Chamber

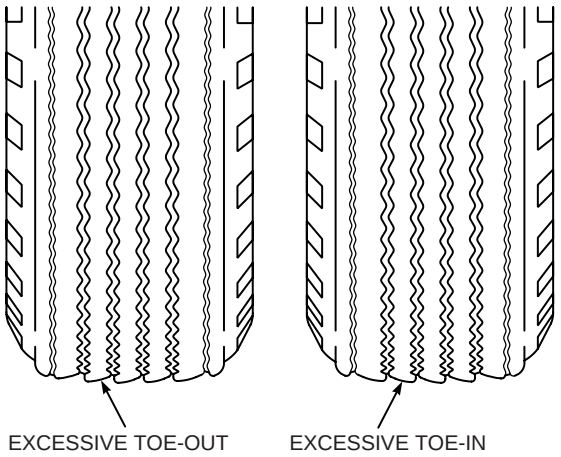

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Figure 10. Example of Excessive Toe-In and Toe-Out

END OF WORK PACKAGE

OPERATOR INSPECTIONS AND SERVICES **0004 00**

THIS WORK PACKAGE COVERS

Operator Inspections and Services

OPERATOR INSPECTIONS AND SERVICES

1. The operator must ensure that the tires receive proper care and service to prevent personal injury and unnecessary wear and to extend their service life to the maximum. Although natural wear and tear affects tire life, premature tire failure is often caused by abuse and neglect. Proper maintenance of tires will not only result in better performance and longer service, but could prevent a hazardous tire failure causing equipment damage, serious injury, or death.

2. In addition to the PMCS required by the vehicle TM, the operator must perform the following inspection and services:

   a. Inspect tires before operation. Look for cuts, bruises, nails, rocks, and uneven wear. Tires designed with built-in wear bar indicators will show solid bars of rubber across the tread crown area when wear is sufficient to require the tire to be turned in for repair or retreading. Report all tires requiring repair.

WARNING

OPERATING A VEHICLE WITH AN UNDERINFLATED OR DEFECTIVE TIRE MAY LEAD TO PREMATURE TIRE FAILURE AND MAY CAUSE EQUIPMENT DAMAGE AND SERIOUS INJURY OR DEATH.

   b. Check tire pressure before operation when tire is still cold. Inflate as prescribed in the vehicle TM.

   c. Check for loose lug nuts. Tighten or have tightened to correct torque as required.

   d. Check for missing valve caps. Replace as required.

   e. Check dual tires for proper match.

   f. Examine seal areas for oil or grease leaks.

   g. Inspect body and frame for security of mounting bolts.

   h. Inspect steering mechanisms (wheel bearings, steering knuckles, steering gears, etc.).

   i. Operator must be aware of a wide variety of conditions that may be experienced on radial/bias belted tires during operation of vehicle. Blisters, bulges, ruptures, and cracks in the sidewall or tread crown area may indicate a tread/ply separation. Observance of any of the following would require immediate evasive action to reduce speed and stop the vehicle. These may require the tire to be turned in for repair or retreading.

      - Vibration (intermittent at a given speed).
      - Tire squirm (similar to operation over ice conditions).
      - Thumps, bounces, or wobbles.

OPERATOR INSPECTIONS AND SERVICES − CONTINUED

3. For readiness reporting, equipment is not fully mission capable if:

    a. Any tires, including spare, have cuts, gouges, abrasions, or cracks that are 2/32 inch (1.6 mm) or more deep or that extend to the cord body.

    b. Any tires with leaks or bulges.

    c. Tire tread depth is less than the minimum tread depth indicated in the vehicle TM or the tire tread wear bar indicators are visible across the tread crown of the tire.

END OF WORK PACKAGE

UNIT MAINTENANCE **0005 00**

THIS WORK PACKAGE COVERS:
Unit Maintenance

GENERAL

1. Unit maintenance of tires is limited to what is prescribed in the specific vehicle manual. Check the vehicle TM first. In most instances Unit maintenance of tires is limited to the following:
   a. Inspection and initial condition code classification.
   b. Mounting and demounting of tire/wheel assemblies from vehicles.
   c. Mounting and demounting of tires from rims.
   d. Inner tube patching.
   e. Valve core replacement.
   f. Minor, temporary string repair of tires in the tread crown area only. The tread crown area is shown and explained in the illustrations on the following pages.
   g. Puncture repair of tires in the tread crown areas only within limits specified in Table 1, Table 2, and within the repair areas shown in Figures 1 and 2.

2. Unit level tire injury repairs must be within the tread area as shown. Sidewall or shoulder injuries can be repaired but require a complete section repair at a full service tire repair shop. The special tools, equipment, and time needed for section repairs are not normally available at the Unit level.

3. Chemically vulcanizing tire repair materials are manufactured so that the repair requires a minimum of time, effort, and equipment. The repair involves the cure of a layer of vulcanized rubber (patch or repair unit). The layer of rubber capable of being vulcanized with the respective chemical fluid is usually referred to as the chemical cushion. The chemical fluid that contains the vulcanizing agent, or accelerator, capable of vulcanizing the chemical cushion is referred to as the vulcanizing fluid. The layer of chemical cushion is always an intricate part of the repair. At the time of application, the chemical cushion layer comes into contact with the vulcanizing agent and self-vulcanization, or chemical vulcanization, occurs.

TIRE REPAIR LIMITS

Table 1. Puncture Repair Limits For Tread Crown Area Only

PASSENGER CAR TIRES	LIGHT TRUCK TIRES	TRUCK/ BUS TIRES
1/4 inch (6mm) Max.	3/8 inch (9.5 mm) Max.	3/8 inch (9.5mm) Max.

NOTE

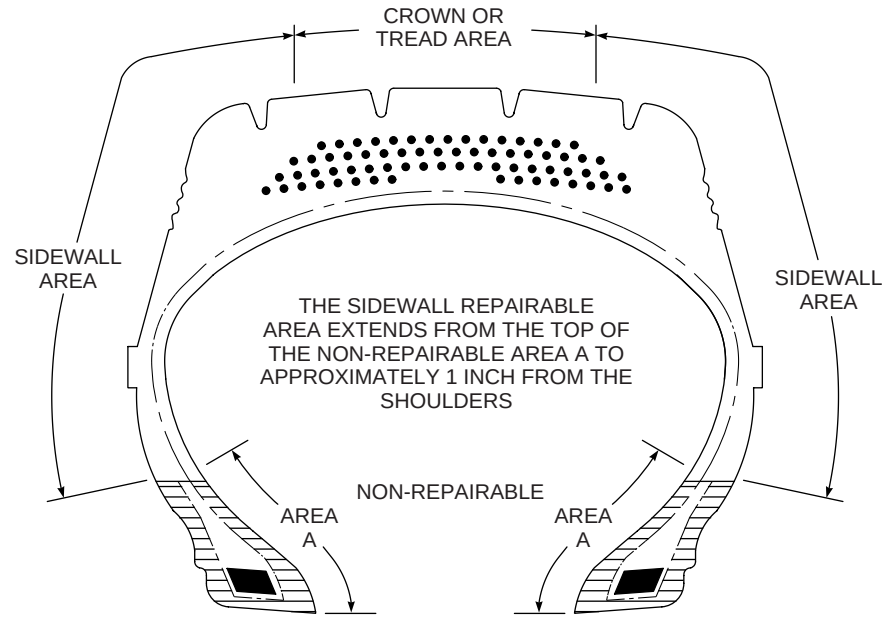
A tire puncture is defined as a penetration by a foreign object through the tire body.

Repair units cannot overlap.

Two or more injuries to the same radial cable must be a full section repair.

TIRE REPAIR LIMITS – CONTINUED

RADIAL REPAIR AREAS



BIAS REPAIR AREAS

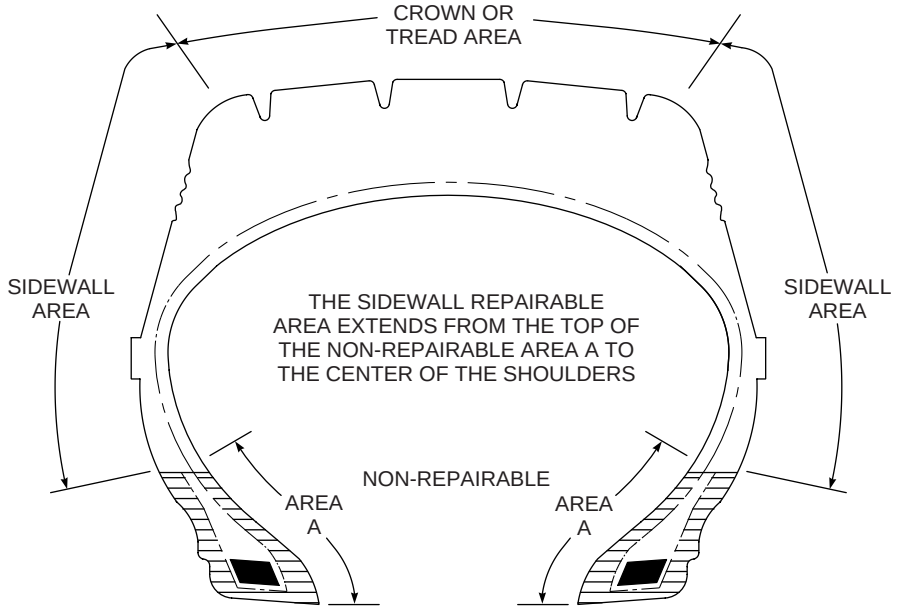


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Figure 1. Repair Areas for Radial and Bias Tires

TIRE REPAIR LIMITS – CONTINUED

Table 2. Tire Non-Repairable Areas

NON-REPAIRABLE AREA A FOR BODY PLY DAMAGE	
TIRE CROSS SECTION	DIMENSION OF NON-REPAIRABLE AREA
All Passenger Car Tires	1-1/2" (38.1 mm)
Truck –Tube type up to 7.5	3" (76.2mm)
8.25 and above	3-1/2" (88.9mm)
Truck –Tubeless up to 8.5	3" (76.2mm)
9 and above	3-1/2" (88.9mm)

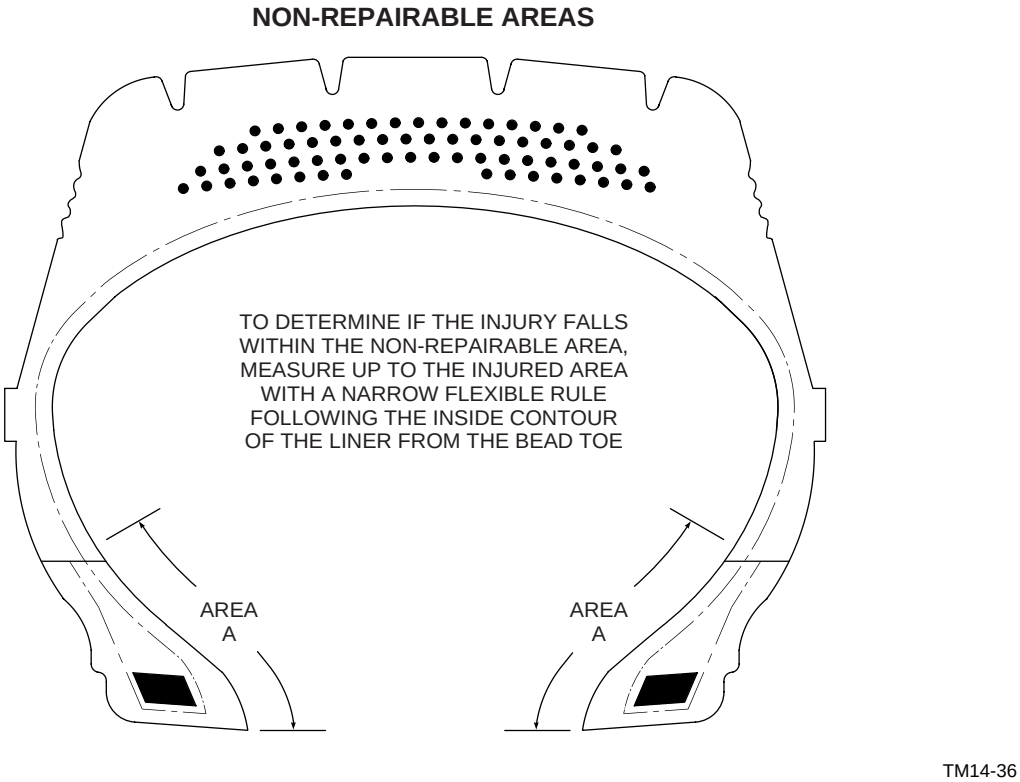

Figure 2. Tire Non-Repairable Areas

UNIT INSPECTION

1. **Responsibilities**

   Unit maintenance consists of periodic inspections and services prescribed in the applicable vehicle technical manuals and in this manual. Participation of the operator is required during some of these inspections and services.

2. **Inspection Procedures**

   During scheduled maintenance, the following procedures must be performed.

   a. Correct deficiencies noted by operator.

   b. Match and install tires according to tread design and degree of wear.

   c. Check all wheel nuts, rims, and side rings for security and serviceability

   d. Check wheel stops for proper mounting and torque. Turn front wheels fully in both directions and check turn limitation of stops. Ensure that tires clear all vehicle components.

   e. Inspect wheel and rim components for proper seating, distortions, or other obvious damage, which may cause the assembly to dislodge or fail.

   f. Inspect tires for conditions listed in Tire Inspection paragraph that follows.

   g. Painting tires to improve appearance does not provide any functional benefit. It is against maintenance policy to paint tires to make them look new or clean. Cleaning tires with soap and water when vehicle is washed will suffice.

TIRE INSPECTION

1. **Inspection of Tire Beads**

   If any of these deficiencies are noted, the tire must be removed from service immediately.

   a. Tears or gouges that are more than 2/32-inch (1.6 mm) deep or exposed bead wire.

   b. Kinked or distorted beads.

   c. Burned beads, which are indicated by rough, brittle, and/or discolored hard surface in the bead area.

   d. Petroleum damage that is indicated by blisters, swelling, spongy, dry and/or brittle rubber in the bead area.

   e. Bead damage from curbing that is indicated by localized rippling or waviness in the bead area with no exposed cord. Scuffs may also be apparent in the lower sidewall.

   f. Flow cracks from improper manufacturing processes that are indicated by a solid extended circumferential crack above the bead with no wire exposed.

2. **Inspection of Tire Sidewalls**

   Inspect tire sidewalls for the following conditions. If any of these deficiencies are noted, the tire must be removed from service immediately.

   a. Damaged tire cord or wider than normal wire spacing which is indicated by a radial (up and down), pencil shaped bulge in the sidewall.

   b. Scrapes, gouges or cuts in the sidewall that expose cords or are 2/32-inch (1.6 mm) deep or more.

TIRE INSPECTION − CONTINUED

2. Inspection of Tire Sidewalls − Continued

c. Snow chain damage, which is indicated by numerous pock marks around the tire in the upper sidewall and crown areas.

d. Sidewall separation, which is indicated by irregular shaped bulge, or in severe conditions progress into breaks or cracks, in the middle or upper sidewall areas.

e. Weatherchecking cracks, which extend to the cord body or 2/32-inch (1.6 mm) deep or which have two or more cracks that connect and have joined into one straight or arced line. Most weatherchecking is only cosmetic damage and the actual amount of weatherchecking cracks in a sidewall is not as important as the depth and pattern of the cracks.

f. Indications of circumferential cord fatigue and eventual sidewall rupture (also known as Zipper rupture). Indicators are circumferential cracks or very subtle bumps in an even circumferentially arced line, which can be felt when gently rubbing the mid or upper sidewall.

g. Nails or other foreign objects lodged into the tire sidewall which extend 2/32 inch (1.6 mm) or deeper or to the cord body.

3. Inspection of Tire Tread and Shoulders

Inspect tire tread crown areas and shoulders for the following conditions. If any of these deficiencies are noted, the tire must be removed from service immediately.

a. Nails or other foreign objects lodged into the tread lugs and extending to the cord body.

b. Nails or other foreign objects lodged into the tread groove areas which extend 2/32-inch (1.6 mm) or deeper or to the cord body.

c. Cuts in tread or shoulder area that are deeper than the tread base or tread groove, usually 360 degrees around the tire and caused by interference from other vehicle components.

d. Belt lift and separation, which is indicated by a bulge or split through the upper sidewall and tread shoulder area.

e. Tread lift and separation which is indicated by a bulge on the tread shoulder or tread face area and may result in splits through the bottom of the tread groove or complete loss of a section of tread. Usually localized wear in the tread above the separated area will occur.

f. Brake skid damage that extends 2/32 inch (1.6 mm) or more below the tread. This damage is indicated by a localized spot of excessive wear across the tread face showing abrasion marks from the tread sliding on the road surface.

g. Tread chunking that is indicated by sections of the tread torn from the tire.

h. Petroleum or chemical damage indicated by localized blistering or spongy or deteriorated rubber in the tread area.

i. Excessive tread wear.

TREAD DEPTH MEASUREMENT

1. Tread Wear Bars

Some tires are designed with built-in wear bar indicators (see Figure 3). These tires will show solid bars of rubber across the tread crown area when wear is sufficient for the tire to be removed from service and turned in for retreading.

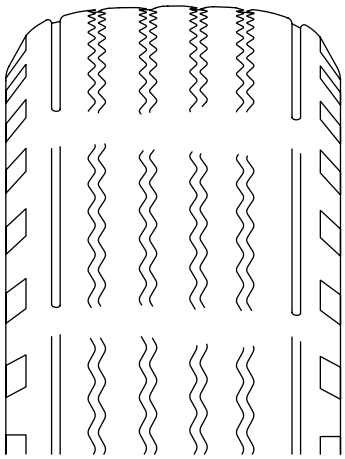

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Figure 3. Wear Bar Indicators

2. Using a Tread Depth Gauge

Tire tread depth should be checked only with a tread depth gauge (Item 22, WP0011 00).The gauge folds for easy storage in a pocket. The plunger tip (1, Figure 4) must be pushed all the way in before the gauge is opened, or the gauge will be bent. The contact bar (2) can then be folded out to form a T. Gauge scale markings (3) are in 1/32 inch (0.8 mm) increments. The tread depth gauge is used to measure the tread depth at three equally spaced points around the circumference of the tire. Take the first measurement adjacent to the valve stem if tire is mounted or adjacent to size markings if tire is not mounted.

TREAD DEPTH MEASUREMENT − CONTINUED

2. Using A Tread Depth Gauge − Continued

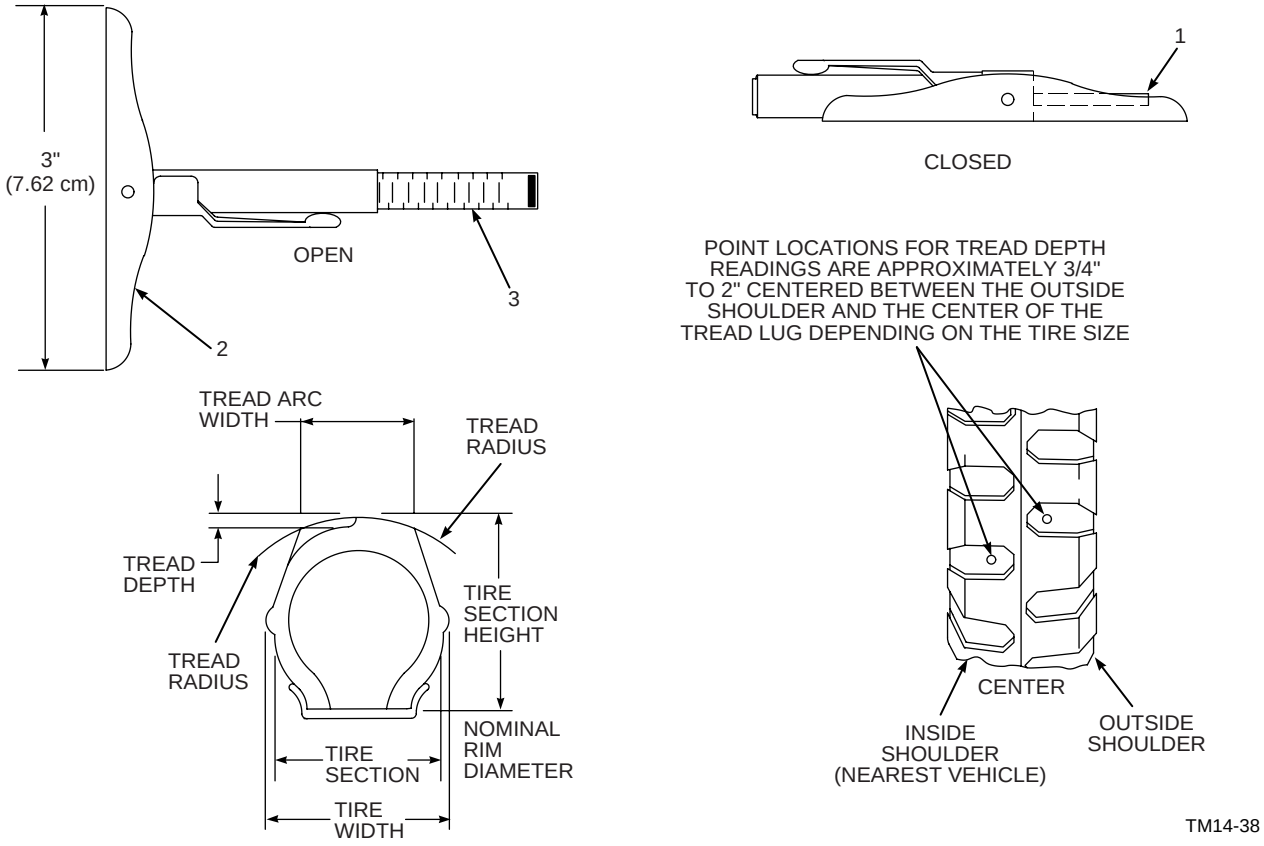


Figure 4. Using a Tread Depth Gauge

3. Tread Depth Measurement

a. Military Tires

The minimum tread depth for military tires is 4/32 inch (3.2 mm). This dimension applies to both front and rear tires. In most instances tread depth measurements for a military tire will be taken by measuring tread depth approximately 3/4 (19 mm) to 2 inches (51 mm) from the centerline of the tire, depending on the tire size (see Table 3). Place contact bar of tread depth gauge parallel with tire centerline and press down plunger until its tip touches the center of the tread groove. The gauge will indicate the tread depth.

TREAD DEPTH MEASUREMENT – CONTINUED

3. Tread Depth Measurement − Continued

Table 3. Military Tire Tread Depth Location Measurements

Tire Size	Location From Centerline	
	inch(es)	cm
7.00-16	3/4	1.9
9.00-16	1-1/4	3.2
8.25-20	1-1/4	3.2
9.00-20	1-1/4	3.2
11.00-20	1-1/2	3.8
12.00-20	1-1/2	3.8
14.00-20	2	5.1

a. Truck Tires (16 inch rims or higher).

The minimum tread depth for truck tires (16 inch rim and above) is 4/32 inch (3.2 mm). This dimension applies to both front and rear tires. Measure the tread depth by bridging the tread groove with the contact bar and pressing the plunger into the center of the groove.

b. Passenger Car and Light Truck Tires.

The minimum tread depth for commercial tires mounted on the steering axle is 4/32 inch (3.2 mm). The minimum tread depth for commercial tires mounted on all other axles is 2/32 inch (1.6 mm). Measure the tread depth by bridging the tread groove with the contact bar and pressing the plunger into the center of the groove.

c. Off-road Tires.

The minimum tread depth for off-road tires cannot be definitively stated. Off-road tires should be replaced when the tread is worn to a point that adequate traction is no longer provided for the particular use. The following information is provided as a guide only and should be used when no specific information is available:

(1) Minimum tread depth for industrial vehicles and earth moving equipment (except industrial tractors) is 11/32 inch (8.8 mm). This includes rough terrain fork trucks, loaders, graders, scrapers, ditching machines, entrenching machines, crane-shovels, and snow removal equipment.

(2) Minimum tread depth for industrial tractors is 17/32 inch (13.5 mm).

4. Examples of Tire Wear Conditions

Figure 5 shows examples of excessive irregular wear.

TREAD DEPTH MEASUREMENT – CONTINUED

4. Examples of Tire Wear Conditions – Continued

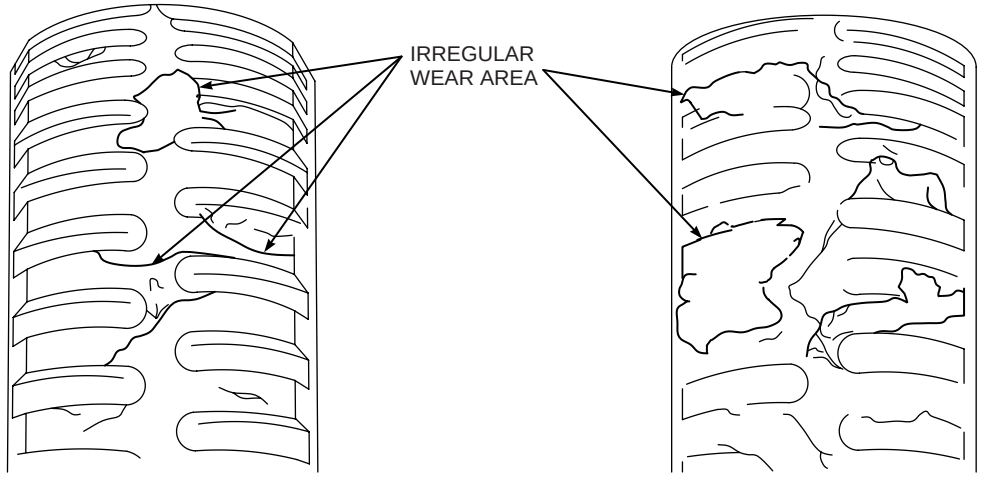


Figure 5. Examples of Tire Wear Conditions

RETREADING

1. General

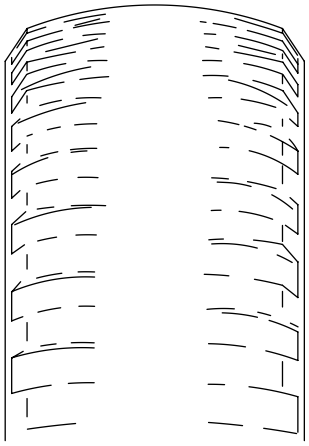
Tires can be retreaded more than once as long as the casing is removed from the vehicle before excessive wear occurs. Tires should be removed for retreading and replaced with serviceable tires upon reaching minimum allowable remaining tread depth (see Table 3, this WP). Tires designed with built-in wear bar indicators will show solid bars of rubber across the tread crown area when wear is sufficient to require replacement/retreading. Tires will not be re-grooved to increase tread depth.

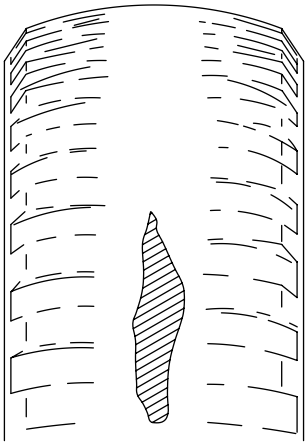
2. When To Retread Tires

Tires should be carefully inspected and removed for retreading at the proper time. The tire on the left in Figure 6, is worn just enough and should be turned in for retreading. For minimum allowable tread see Table 3, this WP. The tire on the right has been worn too far before being removed for retreading. The tread design is worn off, as is a portion of the rubber under the tread area, exposing the cord body. Tires worn to the extent that the cord body shows, on any one spot cannot be retreaded and must be replaced.

TREAD DEPTH MEASUREMENT – CONTINUED

2. When To Retread Tires − Continued





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READY FOR RETREADING WORN TOO FAR FOR RETREADING

Figure 6. When to Retread Tires

VALVE CORE REPLACEMENT

1. Removal

   a. Remove valve cap (3, Figure 7) from valve stem (1).

   b. Deflate tire by removing valve core (2) from valve stem (1) with a valve core extractor (Item 45, WP0011 00). Run a piece of wire through valve stem (1) to ensure that it is not plugged.

   c. With tire completely deflated, install valve cap (3) onto valve stem (1). This will protect valve stem threads.

2. Installation

   a. Remove valve cap (3) from valve stem (1).

   b. Install valve core (2) in valve stem (1) using a valve core extractor (Item 45, WP0011 00).

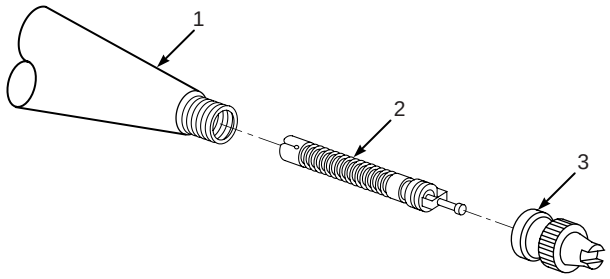

Figure 7. Valve Core Replacement and Installation

AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE

1. Initial Setup

The following equipment conditions must be established prior to demounting tires:

a. Tire and wheel assembly is removed per applicable vehicle TM.

b. The valve core is removed and tire deflated (see Valve Core Replacement paragraph, this WP).

2. Tools and Test Equipment

The following list of tools and test equipment is required to perform tire maintenance:

- Tire iron (Item 31, WP0011 00)
- Two tire irons, hooked, spooned, drop-center type (Item 37, WP0011 00).
- Fishing tool (Item 21, WP0011 00)
- Inflator gauge, pneumatic tire (includes 10 foot hose) (Item 29, WP0011 00)
- Bead breaker (optional, Item 6, WP0011 00)
- Tire balancer (Item 5, WP0011 00)

3. Demounting

WARNING

WHEN DISLODGING TIRE BEADS, BE ABSOLUTELY CERTAIN NO AIR PRESSURE REMAINS IN THE TIRE. SERIOUS INJURY MAY RESULT.

CAUTION

Use tire and rim lubricant as necessary to avoid damaging tire beads or bead seats when demounting tire.

Never use petroleum-based products such as oil or grease when demounting/mounting tires from rims. Petroleum-based products have a severe degrading affect on tire rubber. Use only approved tire and rim lubricant

NOTE

This task is for tube and tubeless tires.

Use of a bead breaker to separate tire beads from rim flanges is encouraged. Follow instructions that accompany bead breaker.

a. All Tires

(1) Loosen both tire beads from rim flanges by inserting tire iron (1, Figure 8) between rim flange (2) and tire bead.

(2) Rotate tire iron (1) down and work progressively around rim, forcing both tire beads into drop-center well area.

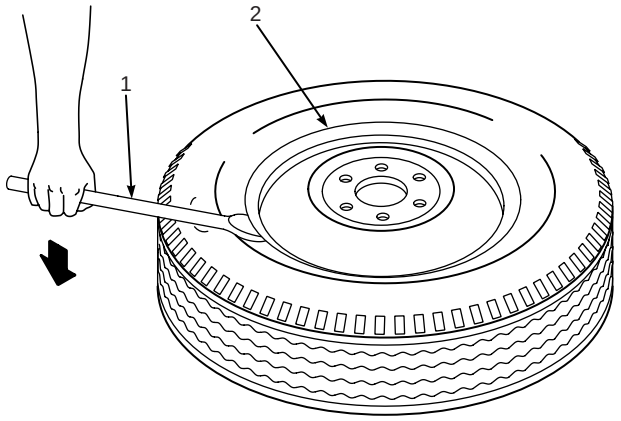

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Figure 8. Loosening Tire Beads

3. Demounting − Continued

a. All Tires − Continued

(3) Determine which rim flange (2) is nearest drop-center well and position rim and tire, with this side up.

(4) Kneel on tire, opposite valve stem, to force tire bead (3, Figure 9) into drop-center well area.

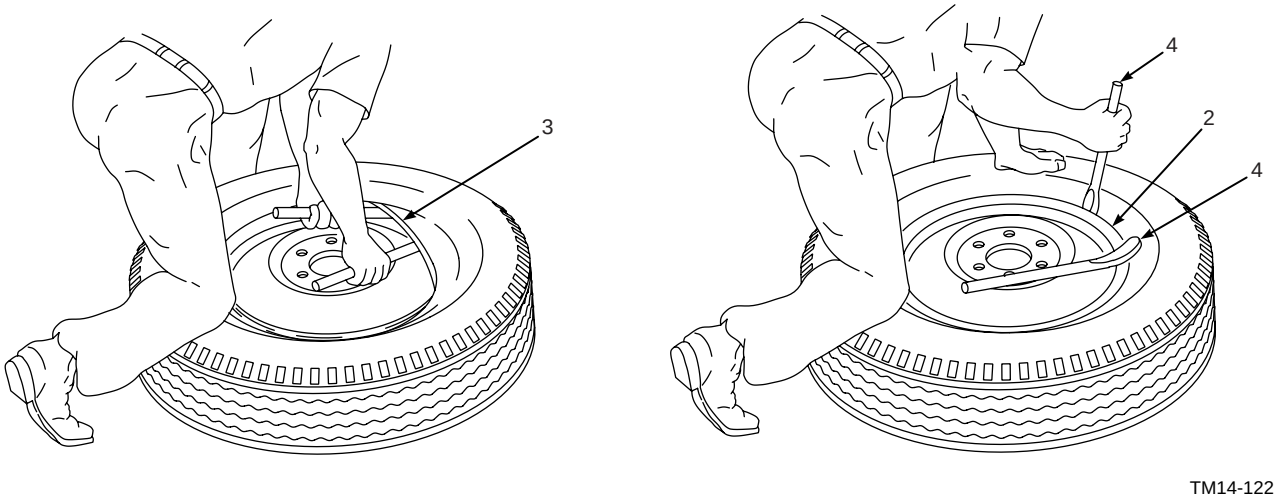

Figure 9. Using Tire Irons

(5) Insert two hooked tire irons (4) about 6 inches (15.2 cm) apart between rim flange (2) and tire bead (3).

(6) Pull both hooked tire irons (4) toward you, working tire bead (3) partly over rim flange (2).

(7) Work both hooked tire irons (4) progressively around the rim until tire bead (3) is completely over rim flange (2).

b. Tube Tires

Push tube valve stem (5, Figure 10) through valve hole (8) in rim (10) and remove inner tube (6).

c. All Tires

(1) Stand tire (9) and rim (10) upright and push rim down so that inner tire bead is in drop-center well area.

(2) Using tire iron (1) placed between rim flange (2) and inner tire bead, work tire (9) off rim (10).

3. Demounting − Continued

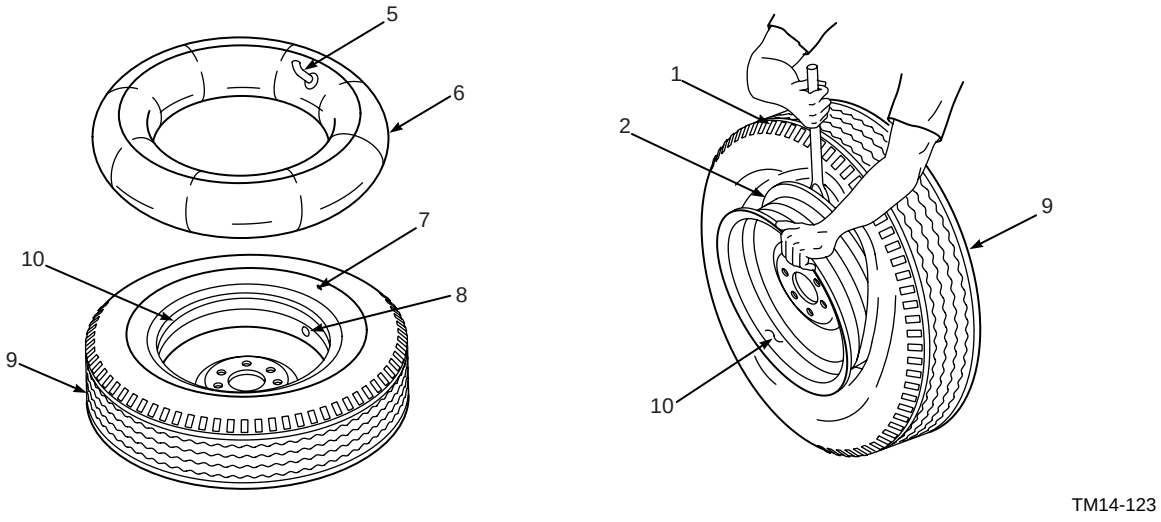

Figure 10. Demounting Tube-Type and Tubeless Tires

4. Rim Maintenance

a. All Tires

(1) Inspect rim and rim flanges for damage or abnormal wear. Check for elongated mounting holes in rim.

(2) Inspect rim for cracks, splits, or tears.

(3) Check rim diameter. Ensure that rim diameter matches tire diameter.

(4) Remove rust, oil, and tire and rim lubricant resides from rim.

b. Tubeless Tires

Inspect tire valve stem. Replace if damaged or deteriorated.

5. Mounting

CAUTION

Never mount a tire on a rim that is damaged or has been repaired by welding or brazing.

NOTE

When using new tubes or new tubeless valve stems, always ensure that valve core is removed before initial inflation.

5. Mounting − Continued

a. Initial Mounting of All Tires

(1) Place rim (10, Figure 11) flat on floor. Lubricate both tire beads (3) with tire and rim lubricant.

(2) Place tire (9) on rim (10) so that both tire beads (3) are partly in drop-center well.

(3) Hold both tire beads (3) in well area with one foot. Work inner bead only completely into drop-center well using tire iron (1).

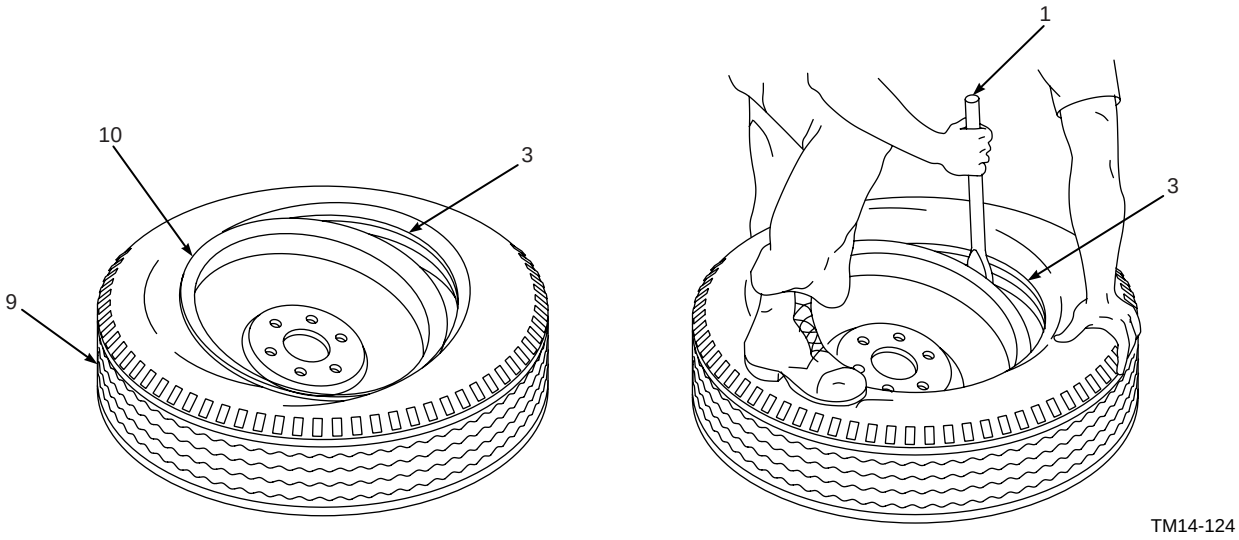

Figure 11. Initial Mounting of All Tires

b. Installing Tube into Tire

(1) Insert inner tube (6, Figure 10) into tire (9) and align valve stem (5) with balance mark (7) (if provided) on tire, then align valve stem and balance mark with valve hole (8) in rim (10).

(2) Attach valve stem fishing tool to valve stem (5) and guide valve stem through valve hole (8) in rim (10).

c. All Tires

Hold outer tire bead (3, Figure 12) in drop-center well near valve stem (5) using one foot. Using tire iron, progressively work tire bead over rim flange.

d. Tube Tires

(1) Shift tire (9) and inner tube on rim (10) as necessary to center valve stem (5) in rim. Ensure that balance mark (7) remains aligned with valve stem.

5. Mounting − Continued

e. Tube Tires − Continued

(2) With valve stem fishing tool still attached, inflate tire (9) to a maximum of 15 psi (103 kPa) and allow to deflate. This allows inner tube to center itself in tire without wrinkling or pinching.

(3) Remove valve stem fishing tool.

f. Tubeless Tires

(1) Shift tire (9) on rim (10) as necessary to center balance mark (7) with valve stem (5).

(2) Inflate tire to 15 psi (103 kPa) and allow to deflate.

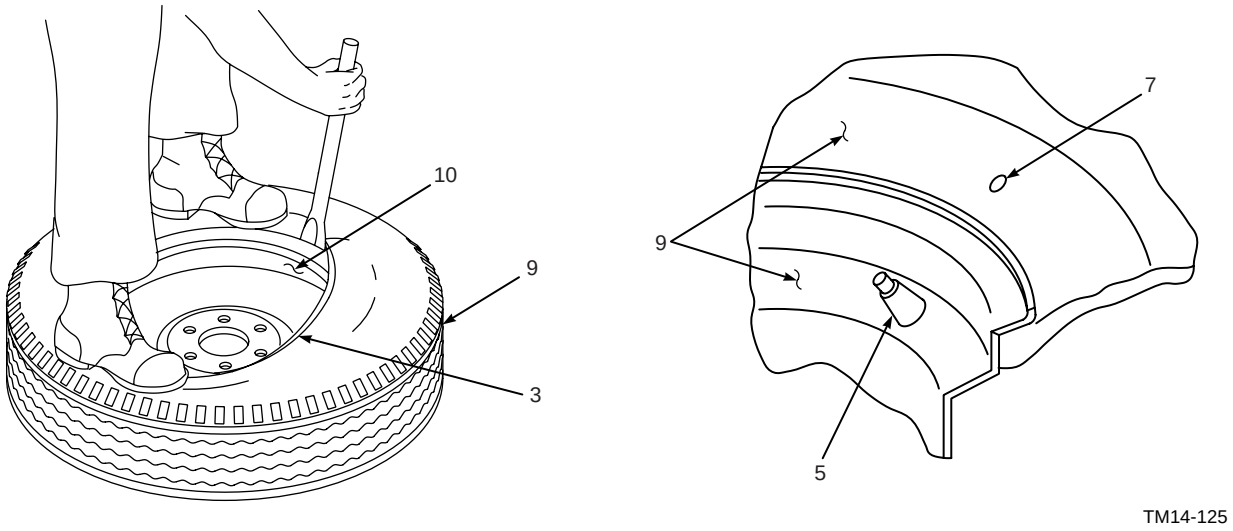

Figure 12. Final Mounting of Tire

AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE − CONTINUED

5. Mounting – Continued

g. All Tires

WARNING

ALWAYS USE AN INFLATION SAFETY CAGE TO INFLATE TIRE/RIM ASSEMBLY NOT MOUNTED ON A TIRE CHANGING MACHINE THAT HAS A POSITIVE LOCK DOWN DEVICE DESIGNED TO HOLD THE ASSEMBLY DURING INFLATION. WHEN USING A TIRE CHANGING MACHINE, ALWAYS FOLLOW THE MANUFACTURERS MOUNTING AND SAFETY INSTRUCTIONS. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH.

WHEN INFLATING TIRES IN AN INFLATION SAFETY CAGE, ALWAYS USE AN EXTENSION AIRHOSE AND A PNEUMATIC TIRE INFLATOR-GAUGE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH.

NEVER LEAN, STAND, OR REACH OVER TIRE/RIM ASSEMBLY DURING INFLATION. SERIOUS INJURY OR DEATH COULD RESULT.

NEVER PUT HANDS OR FINGERS NEAR RIM FLANGES OR BEAD SEATS WHEN INFLATING TIRE. SERIOUS INJURY COULD RESULT.

NEVER INFLATE TIRES OVER 40 PSI (276 KPA) TO SEAT TIRE BEADS. IF BEADS DO NOT SEAT, DEFLATE, DEMOUNT, AND CHECK THE TIRE/RIM MATCH. MOUNT AND LUBRICATE ACCORDING TO INSTRUCTIONS. SERIOUS INJURY OR DEATH COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

(1) If a tire changing machine with a positive lock down device is not available, position tire in an inflation safety cage. Using an extension air hose and a pneumatic tire inflator-gauge, inflate tire to 40 psi (276 kPa) to seat tire beads. If tire beads do not seat, deflate and demount tire, correct the problem, mount tire using additional tire and rim lubricant on both beads, then repeat this step.

(2) When both tire beads are properly seated, allow tire to deflate, then install valve core (see Valve Core Replacement paragraph, this WP). Inflate tire to normal operating pressure.

(3) Check tire pressure, then install valve cap finger-tight.

(4) Remove tire/rim assembly from inflation safety cage, as required.

(5) Balance tire and wheel assembly in accordance with TM 9-4910-743-14&P.

FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTI-PIECE RIMS)

1. Initial Setup

The following equipment conditions must be established prior to demounting tires:

a. Tire and wheel assembly is removed per applicable vehicle TM.

b. The valve core is removed and tire deflated (see Valve Core Replacement paragraph, this WP).

2. Tools and Test Equipment

The following list of tools and test equipment is required to perform tire maintenance:

- Tire Iron, Curved Bead Breaker (Item 32, WP0011 00).
- Tire Iron, Curved Type (Item 33, WP0011 00)
- Tire Iron, Lockring Type (Item 34, WP0011 00)
- Tapered Tire Tool (Item 35, WP0011 00)
- Rawhide Mallet (Item 40, WP0011 00)
- Inflator-gauge, pneumatic tire (includes 10 foot hose) (Item 29, WP0011 00)

3. Demounting

WARNING

WHEN DISLODGING TIRE BEADS, LOCKRINGS, OR SIDE RING FLANGES, BE ABSOLUTELY CERTAIN NO AIR PRESSURE REMAINS IN TIRE. SERIOUS INJURY OR DEATH COULD RESULT.

CAUTION

Use tire and rim lubricant as necessary to avoid damaging tire beads or bead seats when demounting tire.

Never use petroleum-based products such as oil or grease when demounting/mounting tires from rims. Petroleum-based products have a severe degrading effect on tire rubber. Use only approved tire and rim lubricant

NOTE

There are four types of demountable flat base rims:

Two-piece continuous base split side ring
Two-piece continuous side ring with split base
Two-piece continuous side ring with continuous rim base
Flange and split lockring

3. Demounting – Continued

a. All Flat Base Rims

(1) Loosen tire beads from rim flanges (2, Figure 13) by inserting curved bead breaker tire iron (1) between tire bead and rim flange.

(2) Work progressively around rim, rotating tire iron (1) down, forcing tire beads towards center of rim base.

(3) With both tire beads free of rim flanges (2), and position tire and rim with de-mountable flange or side ring facing up.

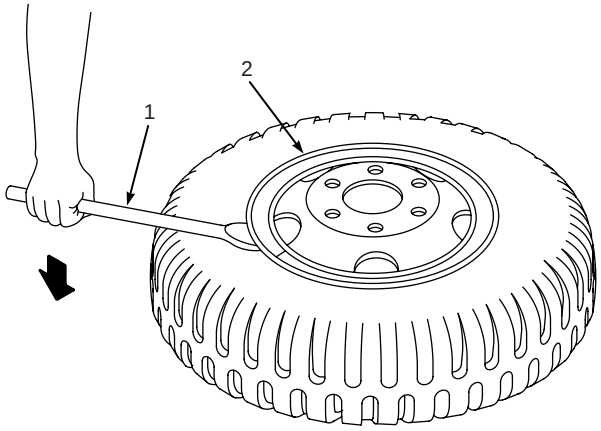

Figure 13. Demounting Flat Base Rims

b. Continuous Flat Base Split Side Ring

(1) Remove split side ring flange (3, Figure 14) by inserting a lockring tire iron (4), curved side up, into prying notch (5).

(2) Work Split side ring flange (3) out of rim gutter with lockring tire iron (4).

(3) Insert curved flat tire iron (6) adjacent to lockring tire iron (4) between split side ring flange (3) and rim base. Work both tire irons progressively around rim, removing flange a little at a time.

3. Demounting – Continued

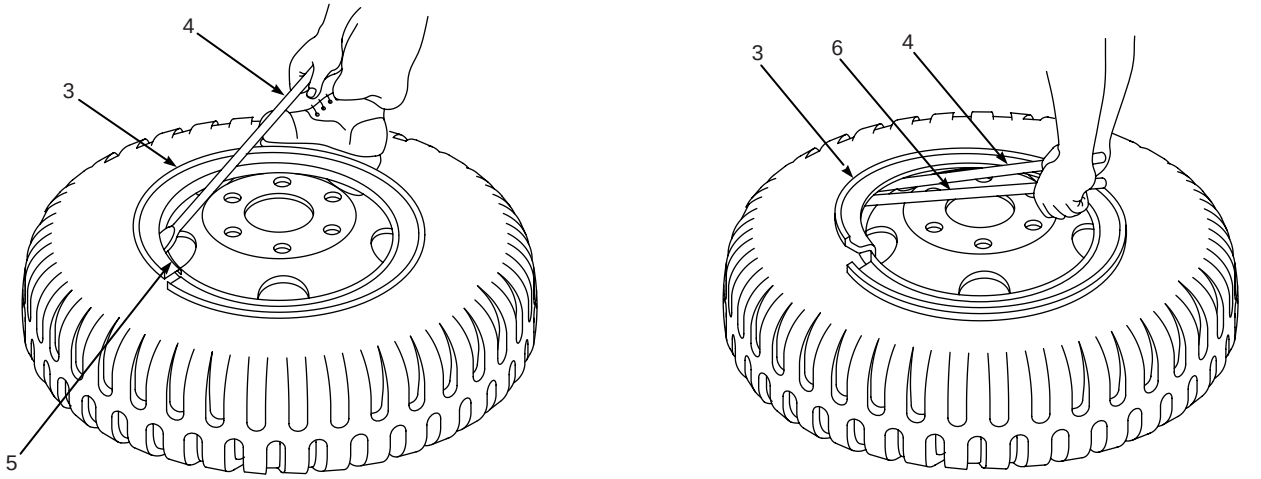

Figure 14. Removing Split Side Ring

c. Two-Piece Continuous Side Ring with Split Base

(1) Insert tapered end of lockring tire iron (4, Figure 15) into breaking notch near rim split and push downward toward center, partially offsetting rim ends (7).

(2) Insert lockring tire iron (4) in second rim notch and push downward toward center of rim, working continuous side ring from rim.

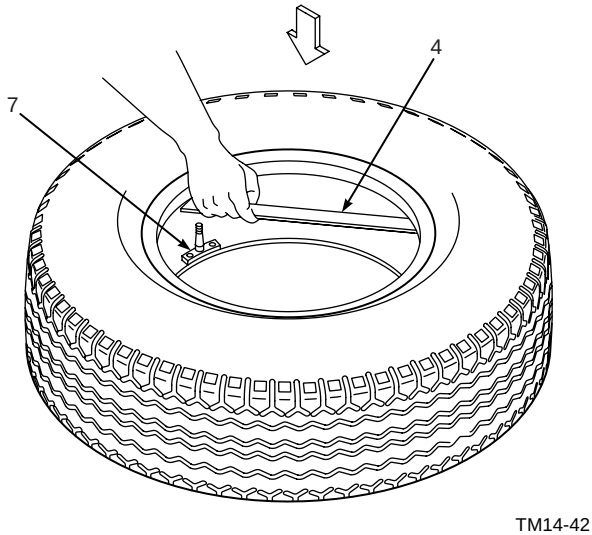

Figure 15. Removing Two-Piece Continuous Side Ring

FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTI-PIECE RIMS) − CONTINUED

3. Demounting – Continued

d. Continuous Flat Side Ring with Continuous Rim Base

(1) Insert tapered tire tool between bossed points on rim (8, Figure 16). Push side ring downward at a point opposite bossed points and work side ring upward by pushing downward on tire iron. Side ring should disengage from rim.

(2) Continue to work side ring until free from rim.

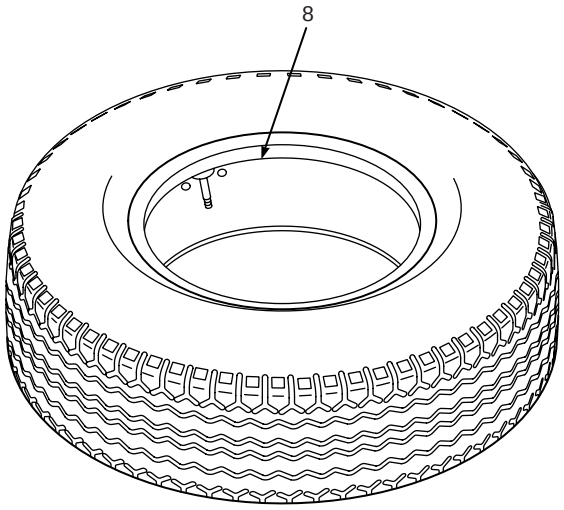

Figure 16. Removing Continuous Flat Side Ring

e. Flange and Split Lockring

(1) Insert tire tool into notch near split in lockring and work lockring from gutter in rim base.

(2) Progressively work lockring around rim base until it is completely separated from base.

(3) Remove flange from rim

f. All Flat Base Rims

(1) Install valve stem cap and push valve stem into rim.

(2) Turn tire and wheel assembly over and lift rim from tire.

(3) Remove tire flap and tube from tire.

FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTI-PIECE RIMS) − CONTINUED

4. Rim Maintenance

a. Inspect rim, lockring, and flanges for damage or abnormal wear. Check for elongated mounting holes in rim and bent lockrings.

b. Inspect rim for cracks, splits, or tears.

c. Check rim diameter. Ensure that rim diameter matches tire diameter.

d. Remove rust, oil, and tire and rim lubricant residue from rim.

5. Mounting

WARNING

NEVER EXCEED 3 PSI (21 KPA) INFLATION PRIOR TO PLACING TIRE AND WHEEL ASSEMBLY INTO INFLATION SAFETY CAGE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY OR DEATH.

CAUTION

Use tire and rim lubricant as necessary to avoid damaging tire beads or bead seats when mounting tire.

NOTE

Always use new tubes and new flaps with new tube tires.

a. All Flat Base Rims

(1) Insert tube into tire and partially inflate to round out the tube.

(2) Insert tire flap. Apply tire and rim lubricant to inside and outside surface of tire beads.

(3) Apply tire and rim lubricant sparingly to tire flap.

(4) Position rim with valve slot up.

b. Continuous Flat Base Split Side Ring

(1) Align tire valve stem with rim slot and place tire over rim.

(2) Insert tire valve stem through rim slot.

(3) Place side ring on rim so that split in ring is 180 degrees opposite valve stem.

(4) Start side ring into rim groove and progressively walk side ring onto rim.

(5) Ensure that side ring is fully seated in rim groove.

5. Mounting − Continued

b. Continuous Flat Base Split Side Ring − Continued

WARNING

NEVER EXCEED 3 PSI (21 KPA) INFLATION PRIOR TO PLACING TIRE AND WHEEL ASSEMBLY INTO INFLATION SAFETY CAGE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY OR DEATH.

(6) Inflate tire to 3 psi (21 kPa) and check side ring for proper seating in rim groove. If side ring is not properly seated, deflate tire and correct the problem,

c. Two-piece Continuous Side Ring with Split Base

(1) Spread split base by placing a block under rim. Remove block.

(2) Align tire valve stem with slot in rim.

(3) Place tire on rim and insert tire valve stem through rim slot.

(4) Position side ring on rim and walk ring into proper position on rim.

(5) Turn tire and wheel assembly over and position block under rim to properly position split in rim.

(6) Tap rim so that split is aligned.

WARNING

NEVER EXCEED 3 PSI (21 KPA) INFLATION PRIOR TO PLACING TIRE AND WHEEL ASSEMBLY INTO INFLATION SAFETY CAGE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY OR DEATH.

(7) Inflate tire to 3 psi (21 kPa) and check lockring and split base for proper positioning. If rim or lockring is not aligned, deflate tire and correct the problem.

d. Two-piece Continuous Side Ring with Continuous Rim Base

(1) Place disk portion of wheel on floor with rim gutter facing up.

(2) Align tire valve stem with valve stem hole in rim.

(3) Place tire over disk portion of wheel and insert tire valve stem through rim valve slot.

(4) Position side ring with operating notch between embossed points approximately 3 inches (7.6 cm) from tire valve stem.

(5) At a point opposite tire valve stem, seat side ring on rim as far as possible.

FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTI-PIECE RIMS) − CONTINUED

5. Mounting − Continued

d. Two-piece Continuous Side Ring with Continuous Rim Base − Continued

(6) Use a suitable tire iron positioned between embossed points to apply pressure so that side ring can be positioned over rim gutter. Seat side ring using rawhide mallet. Continue to hammer side ring until it is completely seated in rim gutter.

(7) Ensure that side ring is seated properly by applying hand pressure downward on side ring. Side ring should move freely. If side ring does not move freely, correct the problem.

WARNING

NEVER EXCEED 3 PSI (21 KPA) INFLATION PRIOR TO PLACING TIRE AND WHEEL ASSEMBLY INTOINFLATION SAFETY CAGE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY OR DEATH.

(8) Inflate tire to 3 psi (21 kPa). Check side ring for proper mounting.

e. Flange and Split Lockring

(1) Align tire valve stem with valve slot in rim.

(2) Position tire over rim and insert tire valve stem through rim slot.

(3) Position lockring with split 180° from tire valve stem.

(4) Snap leading edge of lockring into rim gutter.

(5) Progressively walk lockring around rim so that lockring is positioned in rim gutter.

WARNING

NEVER EXCEED 3 PSI (21 KPA) INFLATION PRIOR TO PLACING TIRE AND WHEEL ASSEMBLY INTO INFLATION SAFETY CAGE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY OR DEATH.

(6) Inflate tire to 3 psi (21 kPa). Ensure that lockring is properly mounted and engaged in rim gutter.

FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTI-PIECE RIMS) − CONTINUED

5. Mounting − Continued

f. All Flat Base Rims

WARNING

ALWAYS USE AN INFLATION SAFETY CAGE TO INFLATE TIRES MOUNTED ON MULTIPIECE RIMS. FAILURE TO DO SO MAY RESULT IN SERIOUS INJURY OR DEATH.

IMPROPERLY SEATED SIDE RING FLANGES OR LOCKRINGS MAY FLY OFF DURING INFLATION. NEVER ATTEMPT TO SEAT A SIDE RING FLANGE OR LOCKRING DURING INFLATION OR AFTER INFLATION. SERIOUS INJURY OR DEATH COULD RESULT.

NEVER INFLATE TIRES OVER 40 PSI (276 KPA) TO SEAT TIRE BEADS. IF BEADS DO NOT SEAT. DEFLATE, DEMOUNT, AND CHECK THE TIRE/RIM MATCH. MOUNT AND LUBRICATE ACCORDING TO INSTRUCTIONS. SERIOUS INJURY OR DEATH COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

WHEN INFLATING TIRES IN AN INFLATION SAFETY CAGE, ALWAYS USE AN EXTENSION AIRHOSE AND A PNEUMATIC TIRE INFLATOR-GAUGE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY.

NOTE

When using new tubes, always ensure that valve core is removed before initial inflation.

(1) Inspect all rim components to ensure that they are properly seated. Place tire and rim assembly in inflation safety cage (see Inflation Safety paragraph, WP0003 00).

(2) Using a pneumatic tire inflator-gauge and an extension air hose, inflate tire to 40 psi (276 kPa) to seat tire beads. If tire beads do not seat, deflate and demount tire, correct the problem, mount tire using additional tire and rim lubricant on both tire beads, then repeat this step.

(3) Visually check to ensure that all rim components are properly seated, then allow tire to deflate. This will center the tube in tire and rim.

(4) Install valve core in valve stem (see Valve Core Replacement paragraph, this WP).

(5) Inflate tire to normal operating pressure. Visually inspect all rim components to ensure that they are properly seated.

(6) Install valve cap finger-tight.

(7) Remove rim and tire assembly from inflation safety cage.

RUNFLAT TIRE MAINTENANCE (HMMWV)

1. Initial Setup

The following equipment conditions must be established prior to performing tire maintenance:

- Wheel is removed in accordance with TM 9-2320-280-20

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire maintenance:

- Torque wrench adapter (Item 2, WP0011 00)
- Thickness gauge contained in Shop equipment, Automotive Maintenance and Repair, Organizational Maintenance, Common No. 1 (Item 1, WP0011 00)
- Inflator-gauge, pneumatic tire (includes 10 foot hose) (Item 29, WP0011 00)
- Compressor, Tool Run Flat (NSN 5120-01-335-5847)
- Strap, Run Flat

3. Materials and Parts

The following materials and/or parts are required to perform tire maintenance:

- Adhesive tape (see TM 9-2320-280-24P)
- Filament Tape (see TM 9-2320-280-24P)
- One preformed packing (see TM9-2320-280-24P
- Twelve self-locking nuts (see TM 9-2320-280-24P)
- Tire and rim lubricant (Item 24, WP0012 00)
- Wire brush (Item 31, WP0012 00)

RUNFLAT TIRE MAINTENANCE (HMMWV) – CONTINUED

4. Removal

To remove the runflat from the tire, perform the following steps:

a. Remove tire from wheel (see Automotive and Light Truck Tire Maintenance demounting paragraph, this WP).

b. After the wheel is removed, move tire away from the wheel and push runflat tire to one side. See Figure 17.

Figure 17. Preparing to Remove Runflat

NOTE

Strap should be inserted in the direction that will enable the ratchet to compress properly.

c. Insert the strap over top of runflat and feed past the other bead.

d. Pull the strap past the runflat and again insert the strap past the runflat exercising care not to twist the strap.

e. Roll the tire and runflat around so the portion of the strap being fed through can be pulled over the top of the runflat as shown in Figure 18.

Figure 18. Pulling Strap Over Top of Runflat

4. Removal − Continued

f. Align the strap opposite the two cross grooves in the bottom of the runflat. Grab the end of the strap and pull the lead end through the tire until the ratchet is pressed against the bead as shown in Figure 19.

Figure 19. Pressing Ratchet Against Tire Bead

g. Liberally apply the tire lubricant to both beads at the top and bottom exercising care not to allow any on the strap (see Figure 20).

Figure 20. Lubricating Beads

h. Center the runflat with the strap facing the 3 o’clock and 9 o’clock position as shown in Figure 21. Ensure that the runflat is pressed as far to the bottom as possible.

Figure 21. Centering the Strap

RUNFLAT TIRE MAINTENANCE (HMMWV) – CONTINUED

4. Removal − Continued

CAUTION

Extreme care must be taken not to damage beads when using a tire iron.

i. From the back side of the tire, insert the tire iron with curved end up and over the runflat as shown in Figure 22. The end of the tire iron should protrude past the opposite tire bead and rest in the runflat air slot.

Figure 22. Inserting the Tire Iron

j. Lay the tire down with the tire iron handle resting on the floor, taking care to keep the tire iron in the runflat air groove as shown in Figure 23.

Figure 23. Resting Tire Iron Handle on Hard Surface

k. Place one foot on the tire iron and press down with steady pressure, while utilizing the ratchet to compress the runflat to less than half the original diameter. The tire will eventually begin to lift up and the runflat will begin to exit from the tire cavity (see Figure 24).

4. Removal − Continued

Figure 24. Compressing the Runflat

l. Using the leverage provided by the tire iron, lift the tire iron handle to help extract the remaining section of the runflat (see Figure 25).

Figure 25. Extracting the Runflat From the Tire

m. When more than one-half of the runflat is protruding from the tire, it will become easier to remove the runflat from the tire.

n. Inspect the runflat and tire carefully for cuts or other signs of damage. Replace all damaged or worn parts. If it is determined that the runflat is in good condition and is going to be used in another tire, leave the unit compressed as shown in Figure 26. If the unit is no longer serviceable, carefully release the ratchet and dispose the rubber runflat in accordance with Unit regulations. Remove any lubricant from the ratchet assembly before using again.

Figure 26. Runflat in Compressed State

5. Installation

To install the runflat into the tire, perform the following procedures:

a. Apply lubricant throughout the tire crown area, ensuring that it is evenly spread (see Figure 27).

Figure 27. Applying Runflat Lubricant

b. Lubricate the tire beads with tire bead lubricant at the locations where the tire will make contact with the runflat.

c. Record the serial number of the runflat before inserting into the tire (see Figure 28).

Figure 28. Runflat Serial Number Location

d. Open up the ratchet strap assembly and lay flat on the ground with the handle facing downward. Place runflat device over top of strap as shown in Figure 29.

Figure 29. Preparing to Compress Runflat

5. Installation − Continued

e. Feed strap end through slot in hub barrel and pull the strap tight against the runflat (see Figure 30). Place the belt just slightly off-center of the runflat (approximately 60/40).

Figure 30. Feeding Strap End Through Slot in Hub Barrel

f. Utilize the ratchet to compress the runflat to less than one-half of the original inside diameter, as shown in Figure 31, taking care to avoid pinching fingers on the ratchet mechanism.

Figure 31. Compressing the Runflat

g. Position tire against a solid object such as a wall or rail. Insert the runflat device into the tire cavity with the ratchet handle facing in towards the opening as shown in Figure 32.

Figure 32. Inserting the Runflat into Tire Cavity

5. Installation − Continued

h. Turn the tire around and push the runflat into the tire as far as possible, as shown in Figure 33. Tire irons can be used to expand the width of the tire allowing the edges of the runflat to slide in past the beads.

Figure 33. Pushing Runflat into Tire

i. Once the runflat has been carefully inserted as far as possible into the tire cavity, lay the tire and runflat on the floor with the ratchet handle facing up. Press down on the tire to allow for the runflat edges to enter into the tire cavity as far as possible (see Figure 34).

Figure 34. Runflat on Floor with Ratchet Handle Up

CAUTION

When pushing the runflat into the tire, do not use excessive force, as this will cause cutting the tire bead or deforming the tire bead wire.

j. The tire can be turned over and a tire iron may be used as shown in Figure 35, to help push the tooth of the runflat further into the cavity. Approximately 60% to 70% of the runflat must be in the tire or the runflat will not install.

5. Installation − Continued

Figure 35. Installing Runflat with Tire Iron

k. Once the runflat has been inserted into the tire cavity, carefully release the ratchet mechanism and allow the runflat to expand into the tire cavity (see Figure 36).

Figure 36. Runflat Installed with Ratchet Released

l. Remove the ratchet and strap assembly and align the runflat device with the tire beads as shown in Figure 37.

Figure 37. Aligning Runflat with Tire Beads

5. Installation − Continued

m. Inspect the tire around the bead area to ensure that there are no cuts or gouges.

n. Mount tire onto rim in accordance with the procedures of Automotive and Light Truck Tire Maintenance, this WP.

BOLT-TOGETHER RIMS REPAIR (M939A1 SERIES)

1. Initial Setup

The following equipment conditions must be established prior to performing tire maintenance:

- Wheel is removed in accordance with TM 9-2320-272-20.
- Valve core removed and tire deflated (see Valve Core Replacement paragraph, this WP).

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire maintenance:

- Wheel Assembly Tool (Item 52, WP0011 00)
- Inflator gauge, pneumatic tire (includes 10 foot hose) (Item 29, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire maintenance:

- One preformed packing (see TM 9-2320-272-24P)

4. Disassembly

a. All Bolt-Together Rim Tires

WARNING

ENSURE THAT TIRE IS TOTALLY DEFLATED BEFORE REMOVING SELF-LOCKING NUTS. FAILURE TO FOLLOW PROPER SAFETY PRECAUTIONS COULD CAUSE SERIOUS INJURY OR DEATH.

CAUTION

Loosen self-locking nuts no more than 1/2 inch (12.7 mm) at a time. Uneven beadlock pressure on clamp ring may result in damage to wheel rim studs.

Never use petroleum-based products such as oil or grease when demounting/mounting tires from rims. Petroleum-based products have a severe degrading effect on tire rubber. Use only approved tire and rim lubricant.

(1) Loosen then remove ten self-locking nuts (14, Figure 38) from wheel rim studs (13). Discard self-locking nuts.

(2) Remove clamp ring (12) and wheel rim (9) from tire (1).

4. Disassembly − Continued

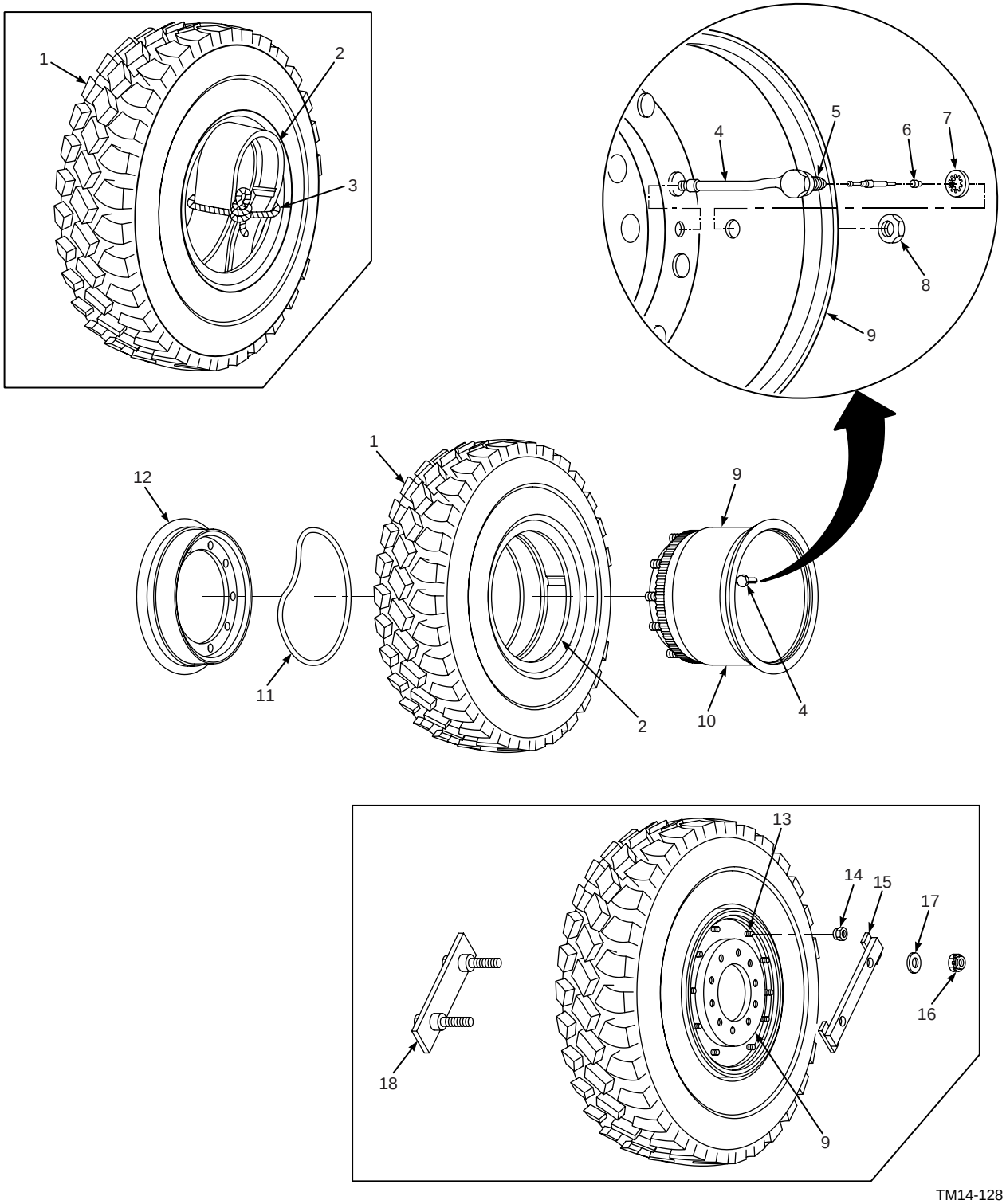

Figure 38. Bolt-Together Rims Disassembly

BOLT-TOGETHER RIMS REPAIR (M939A1 SERIES) − CONTINUED

4. Disassembly − Continued

a. All Bolt-Together Rim Tires − Continued

NOTE

Perform step 3 only if wheel rim is being replaced.

(3) Remove nut (8) grommet (7) and turret valve (4) from wheel rim (9)

(4) Remove preformed packing (11) from wheel rim (9). Discard preformed packing

NOTE

Use of a tire iron is required in step 5 to obtain clearance between beadlock and tire for installation of rope.

(5) Compress beadlock (2) enough to install rope (3). Remove beadlock from tire (1).

5. Rim Maintenance

The following procedures pertain to all rims.

a. Inspect rim, flanges, and rim components for damage or abnormal wear. Check for elongated mounting holes in rim.

b. Inspect rim for cracks, splits, or tears.

c. Remove rust, oil, and tire and rim lubricant residue from rim.

6. Assembly

CAUTION

Never install a Goodyear beadlock in a Michelin tire or a Michelin beadlock in a Goodyear tire. Damage to equipment may result if tire components of different manufacturers are interchanged.

NOTE

When new wheel rim is installed, use attaching parts from old wheel rim.

a. Install rope (3, Figure 39) on beadlock (2). Compress bead lock and install in tire (1). Remove rope. Ensure that beadlock is centered in tire.

b. Install grommet (7) on turret valve (4).

c. Install turret valve (4) on wheel rim (9) using nut (8). Torque nut to a value of 40-65 lb.-in. (5-7 N.m).

d. Install wheel rim (9) on tire (1).

e. Install new preformed packing (11) on groove (10).

f. Install clamp ring (12) on wheel rim (9) with valve stem hole aligned with turret valve (4).

6. Assembly – Continued

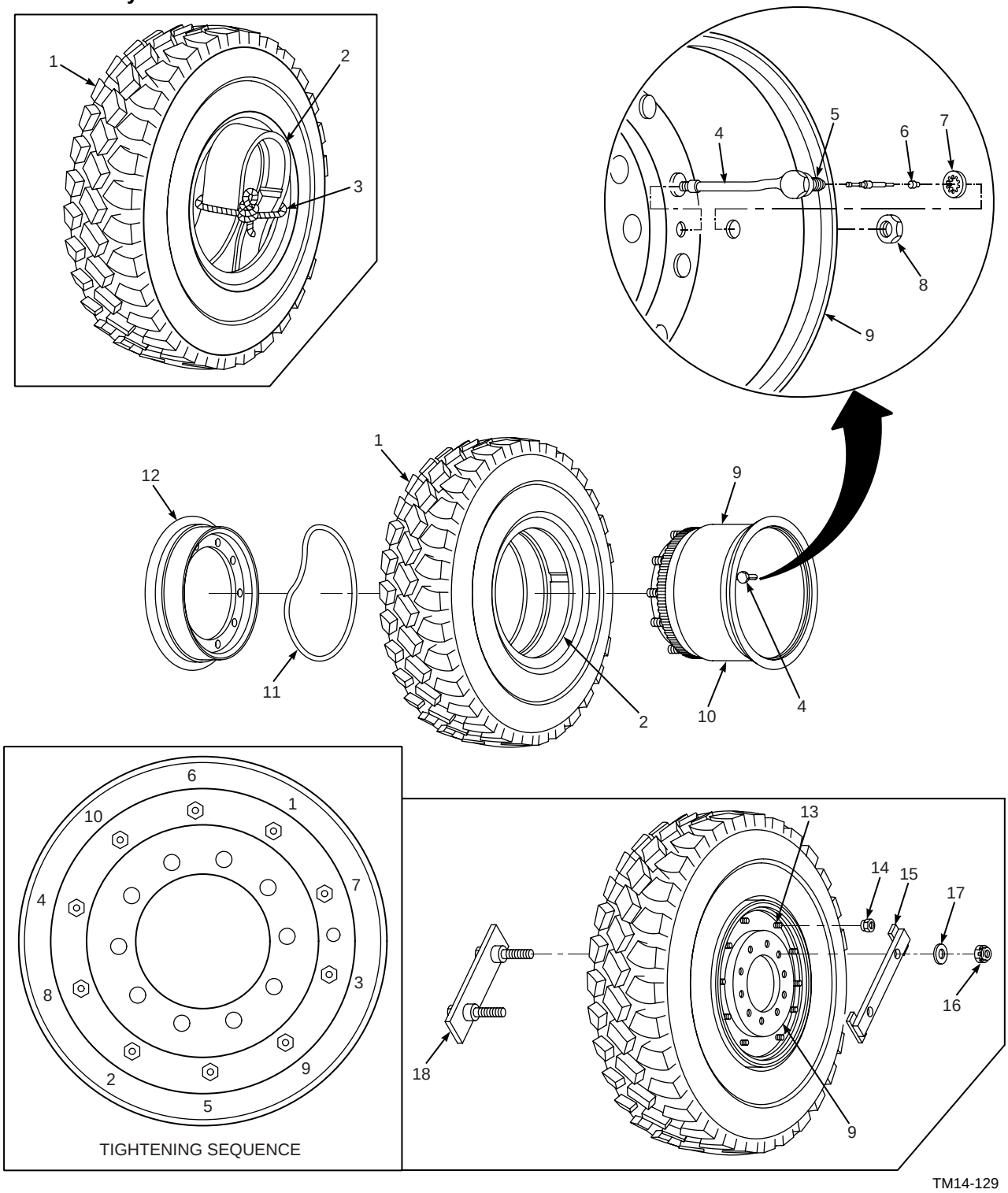

Figure 39. Bolt-Together Rims Assembly

BOLT-TOGETHER RIMS REPAIR (M939A1 SERIES) − CONTINUED

6. Assembly − Continued

g. Install wheel assembly tool base (18) on wheel rim (9).

h. Install wheel assembly tool plate (15) on wheel assembly tool base (18) using two washers (17) and two nuts (16). Tighten nuts enough to perform step i.

i. Install ten new self-locking nuts (14) on wheel rim studs (13) finger-tight.

j. Remove two nuts (16), two washers (17), wheel assembly tool plate (15), and wheel assembly tool base (18).

k. Torque self-locking nuts (14) alternately, in increments, and in sequence shown to a value of 210-240 lb.-ft. (285-325 N.m).

l. Install valve core (see Valve Core Replacement paragraph, this WP).

m. Inflate tire to proper pressure (see TM 9-2320-272-10) and install valve cap (6) on valve stem (5) finger-tight.

n. Install wheel (see TM 9-2320-272-10).

TIRE REPAIR PROCEDURES – TEMPORARY STRING REPAIR FOR TUBLESS TIRES ONLY

1. Initial Setup

The following equipment condition must be established prior to performing tire repair:

- Tire mounted on rim and inflated to normal operating pressure.

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Awl, Scratch (Item 4, WP0011 00)
- Hand file (Item 20, WP0011 00)
- File handle (Item 28, WP0011 00)
- Shears (Item 46, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Pneumatic tire puncture repair kit (Item 12, WP0012 00)

4. Repair

WARNING

THIS IS A TEMPORARY REPAIR ONLY. A PERMANENT TIRE REPAIR MUST BE PERFORMED IN ACCORDANCE WITH THIS TM, UPON RETURNING TO BASE. THE TEMPORARYILY REPAIRED TIRE MUST NOT BE RUN FOR MORE THAN 100 MILES AT SPEEDS NO GREATER THAN 50 MPH BEFORE THE TIRE IS INSPECTED AND PERMANENTLY REPAIRED.

ANY OUTSIDE-TO-IN TIRE REPAIR, LIKE STRING REPAIR, IS CONSIDERED ONLY A TEMPORARY FIX TO PROVIDE GET HOME CAPABILITY. A PERMANENT AND COMPLETE REPAIR INCLUDES INSPECTION OF THE TIRE FOR FURTHER DAMAGE, FILLING VOIDS IN THE INJURED AREA AND APPLYING THE APPROPRIATE PATCH OR PATCH/PLUG COMBINATION FROM THE INSIDE OF THE TIRE OUTWARD. FAILURE TO COMPLETELY REPAIR A TIRE MAY CAUSE THE TIRE TO EVENTUAL FAIL, WHICH COULD RESULT IN EQUIPMENT DAMAGE, INJURY OR DEATH.

a. Using an awl, gently and gradually probe injury. Do not force awl abruptly through tire. Note direction of penetration through tire and possible accumulation of foreign substances (see Figure 40).

b. If foreign substances are present, utilize a hand file to clean out the injury.

NOTE

Needle length may be adjusted for larger and thicker tires.

c. Some pneumatic puncture repair kits come with an injector tool that has an adjustable needle for inserting the string compound. If your injector tool is adjustable adjust needle length to a minimum of 2 inches (51 mm). Non-adjustable injector tools are standard size and will also work with just about any truck tire size or smaller (see Figure 41).

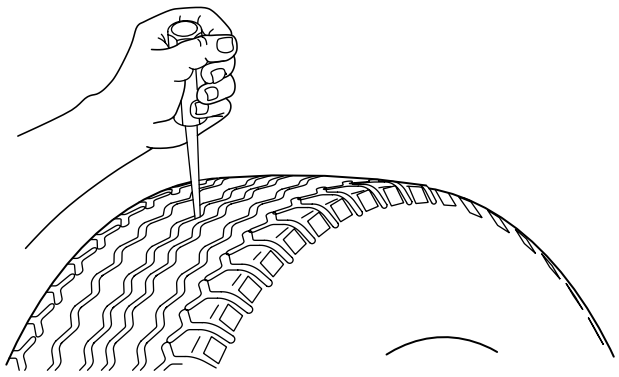

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Figure 40. Tire Repair Using a Scratch Awl

4. Repair − Continued

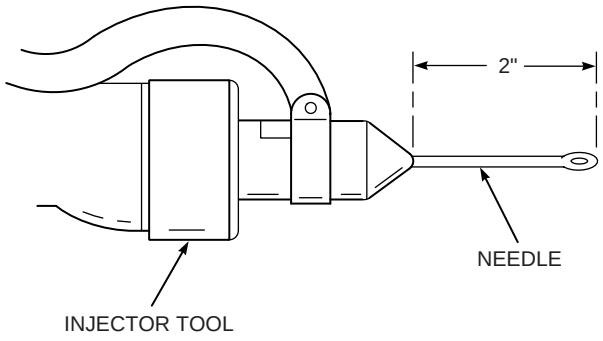

Figure 41. Temporary String Repair Injector Tool

d. Dip eye of needle 1/2 inch (12.7 mm) into bonding compound (see Figure 42).

e. Insert needle of injector tool into injury and through tire following path of injury, then remove from tire.

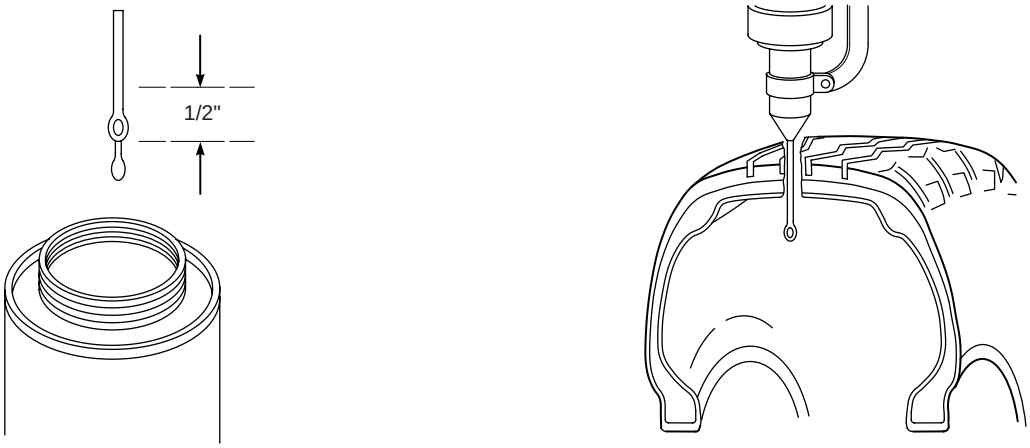

Figure 42. Preparation for Temporary String Repair

TIRE REPAIR PROCEDURES – TEMPORARY STRING REPAIR − CONTINUED

4. Repair − Continued

NOTE

Length of repair material will differ depending on size and thickness of tire being repaired. As a guide, 4 inches (102 mm) for light duty tires and 8 inches (203 mm) for heavy duty tires will be pulled through the eye of injector tool. Use double strand for large punctures.

f. Pull full length of needle out of injector tool and thread repair material through eye of needle (see Figure 43).

g. Push needle of injector tool back to 2 inches (5.1 cm) length.

h. Dip end of injector tool needle 1/2 inch (12.7 mm) into adhesive.

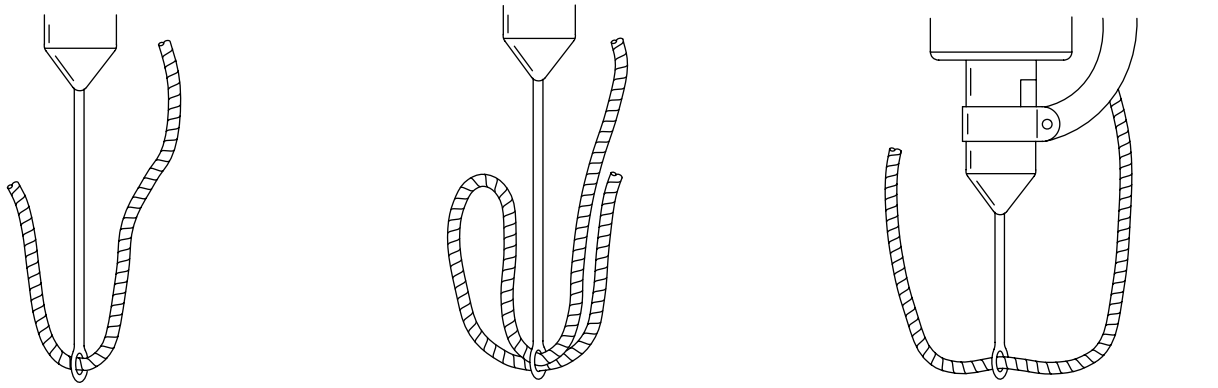

Figure 43. Threading of Repair Material

i. Using injector tool, insert repair material into injury with a steady pressure, following direction of puncture (see Figure 44).

j. Increase length of needle as required to insert repair material so that loose end of repair material is 1/2 inch (12.7 mm) from surface of tire.

k. With a steady pull, withdraw injector tool needle until tip is 1/2 inch (12.7 mm) above surface of tire (see Figure 45).

4. Repair − Continued

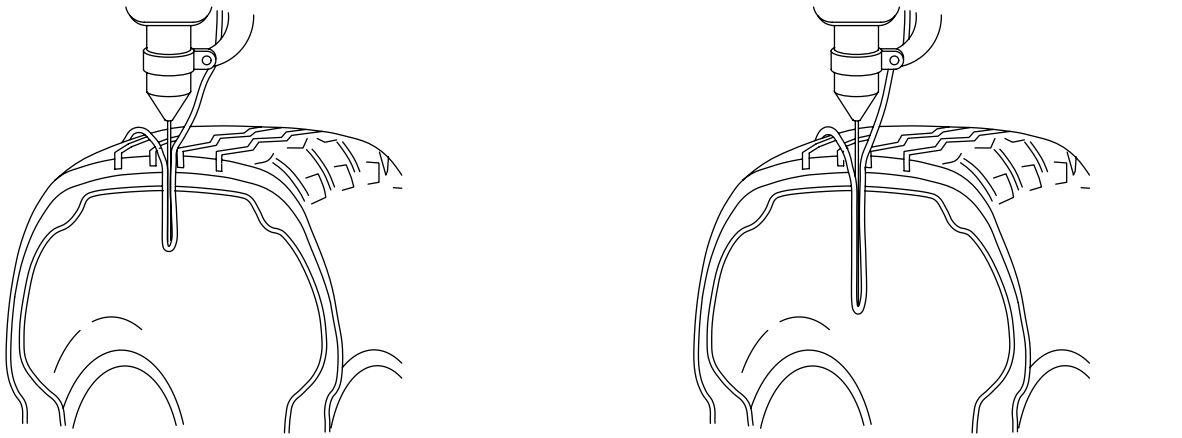

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Figure 44. Inserting Repair Material

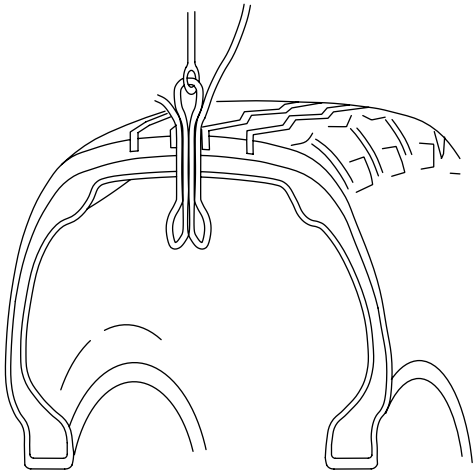

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Figure 45. Withdrawing Injector Tool Needle

l. Using shears cut repair material from injector tool needle and trim any excess repair material to 1/2 inch (12.7 mm) above surface of tire.

m. Repeat steps f through k with additional repair material as required to seal puncture.

n. Tire may be returned to service when puncture is sealed. Since this is only a temporary repair, tire must be scheduled for a permanent repair.

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR

1. Initial Setup

The following equipment conditions must be established prior to performing tire repair:

- Tire and wheel Assembly removed (see applicable vehicle TM)
- Tire Demounted (see Tire Maintenance and Bolt-together Rim Repair paragraphs, this WP)

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Awl, Scratch (Item 4, WP0011 00)
- Stitcher, Cementing and Vulcanizing (Item 47, WP0011 00) (There may be a stitcher supplied with repair kit)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Patch, as required:
  -Passenger car or light truck (bias or radial) (Item 2, WP0012 00)
  -Large truck tire (bias) (Item 1, WP0012 00)
  -Large truck tire (steel belted) (Item 10, WP0012 00)
- Pneumatic tire puncture repair kit (Item 11, 12, 13 or 14, WP0012 00)
- Marking chalk (Item 17, WP0012 00)
- Vulcanizing fluid (Item 19, WP0012 00)
- Buffing solution (Item 30, WP0012 00)

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR − CONTINUED

4. **Repair**

CAUTION

Unit maintenance level should not attempt any repair to the sidewall of pneumatic tires unless the repair person has been trained and has the tools to do it properly. Injuries sustained in the sidewall or shoulder of the tire require special tools and training to ensure tire integrity.

NOTE

Repairing pneumatic tubeless tires by using either the repair kit or inserting a plug from outside a mounted tire is an acceptable TEMPORARY repair ONLY. Temporary tire repairs are acceptable when there is insufficient time or inadequate facilities to perform a complete tire repair.

The following procedure is the only acceptable method of complete tire repair:

a. Inspect tire for any puncturing objects.

b. Check the injured area to see if injury falls within the tread crown area and determine if it is repairable.

c. Remove any puncturing objects and mark an area slightly larger than the injury on the inner liner with chalk.

d. From the outside of the tire carefully probe puncture with awl to determine size, depth, and direction of injury. Use the awl to remove any foreign object.

e. Examine tire liner for any other sign of damage.

CAUTION

Step f is critical. Filling the injury prevents moisture or dirt from entering tire and deteriorating the plies. Dirt draws additional moisture that could lead to belt separation.

f. Fill injury with plug material in repair kit (item 13, WP0012 00) or plugs from repair kit (Item 14, WP0012 00). If plug is used, remove and buff head of plug even with inner liner and/or tread. Using a vacuum, remove any debris from the inner liner that was generated by buffing action.

g. Select patch required and clean punctured area of inner liner with buffing solution. Clean an area slightly larger than patch. While buffing solution is still moist, clean and scrape the area first then wipe with a clean cloth.

WARNING

USE VULCANIZING FLUIDS AND CLEANING FLUIDS IN A WELL-VENTILATED AREA. READ ALL WARNINGS AND CAUTIONS ON CONTAINERS. PROLONGED INHALATION OF FUMES COULD BE A HEALTH HAZARD.

h. Apply thin coat of vulcanizing fluid to buffed surface and in the injury channel. Allow cement to dry. Most patch applications fail because the vulcanizing fluid is not allowed to dry adequately.

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR – CONTINUED

4. **Repair – Continued**

   i. Center patch over injury and press it lightly into place.

   j. Using a stitcher, stitch patch down thoroughly from center of patch to edges.

   k. Check repair to ensure that seal is complete.

5. **One-Piece Repair**

   a. Refer to tire repair and repair limits paragraph, this WP, to determine that the tire can be repaired.

   b. Locate and mark the injury on the inside and outside of the tire. Remove any foreign objects that may still be in the tire.

NOTE

In order to use a one-piece combination repair unit, the angle of penetration must be less than 25 degrees.

   c. Inspect the injury with a probe to determine the size and angle of the penetration.

   d. Select the proper one-piece combination repair unit according to the size of the injury. Most one-piece repair units can be installed in bias and radial tires. Check with the tire repair manufacturer to ensure the correct repair unit is being used. Never mix materials from different manufacturers.

CAUTION

Failure to properly clean the inner liner can reduce repair unit adhesion and cause repair failure.

   e. Apply liner cleaner or rubber buffer to the liner around the injured area.

   f. While the area is still moist, scrape the inner liner until an area approximately 1/2 inch (12.7 mm) larger than the repair unit, on all sides, is free of all contaminants and has a uniform, clean, dull, black appearance. Repeat this process if necessary.

   g. Center the repair unit over the injury and mark an area approximately 1/2 inch (12.7 mm) larger than the repair unit with a tire marking crayon. Relax the beads of the tire.

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR – CONTINUED

5. One-Piece Repair − Continued

NOTE

In the event that buffing through the inner liner and reaching the shiny rubber-encased body ply occurs, the tire must be referred to a full service tire repair facility for a section repair.

When buffing the inner liner of a tube-type bias ply tire, or other tires with a thin inner liner, a soft wire brush mounted on a low RPM buffer can be used to clean and texturize the liner without damaging the body cords.

h. Using a low RPM buffer which has a maximum speed of 5,000 RPM and a cup rasp, buff the inner liner of the tire starting on the right and working to the left.

i. Continue buffing until the mold marks in the liner have been removed and the surface is clean and smooth with a velvet-like finish.

j. Check the buffed area to ensure it is large enough for the selected repair unit, making sure not to touch the buffed surface.

NOTE

When installing a one-piece combination repair unit, use the appropriate size carbide cutter in a low RPM drill with a maximum speed of 1,200 RPM to prepare the injury.

k. Drill the injury following the direction of the penetration from the inside of the tire to the outside a minimum of three times. If the angle of penetration is greater than 25 degrees, a two-piece repair unit must be installed.

l. Drill the injury following the direction of the penetration from the outside of the tire to the inside a minimum of three times.

m. If loose steel remains, use a high-speed air tool with a minimum of 20,000 RPM and an aluminum oxide stone to trim the steel back to solid rubber in the injury channel.

n. If scorching is present, use the appropriate wire brush in a low-speed air tool with a maximum speed of 5,000 RPM to remove the scorched material.

o. Using a soft wire brush mounted on a low RPM buffer, clean the steel shavings and buffing dust around the injury on the buffed surface. After the surface is cleaned, vacuum the remaining buffing dust and debris from inside the tire.

p. Lubricate the injury with vulcanizing cement using a clean probe. Do not remove the probe until the one-piece repair unit is ready for installation.

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR – CONTINUED

5. One-Piece Repair − Continued

NOTE

If the one-piece repair unit has a polyfilm backing, reposition it onto the cap. If the one-piece repair unit does not have a polyfilm backing, be careful not to touch the cushion gum area.

q. Apply a small amount of vulcanizing cement to the tapered portion of the stem for lubrication. Be careful not to apply too much cement because an excessive amount of cement can result in wet cement being trapped under the repair unit.

r. Remove the probe from the injury and insert the stem part of the repair unit into the injury.

s. Grasp the wire on the outside of the tire with a pair of pliers and pull the stem through the tire until a slight dimple is present on the repair unit inside the tire.

t. Press down the center of the repair unit and stitch it down from the center outward. If the repair unit has polyfilm backing, remove it and stitch down the repair unit again.

u. If repair unit manufacturer requires inner liner sealant be used, apply the sealant to the buffed areas around the repair unit.

v. Cut the plug on the outside of the tire leaving approximately 1/8 inch (3.2 mm) protruding above the tread surface. Do not pull on the plug while cutting it off.

6. Two-Piece Repair

a. Refer to tire repair and repair limits paragraph, this WP, to determine that the tire can be repaired.

b. Locate and mark the injury on the inside and outside of the tire. Remove any foreign objects that may still be in the tire.

NOTE

If the angle of penetration exceeds 25 degrees, a two-piece repair unit must be installed.

c. Inspect the injury with a probe to determine the size and angle of the penetration.

d. Select the proper two-piece repair unit according to the size of the injury. Radial tires must be repaired with radial tire repair units. Bias ply tires must be repaired with repair units specifically designed for bias ply tires. Universal repair units can be used in radial and bias tires. Check with the tire repair manufacturer to ensure the correct repair unit is being used. Never mix materials from different manufacturers.

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR – CONTINUED

6. Two-Piece Repair − Continued

CAUTION

Failure to properly clean the inner liner can reduce repair unit adhesion and cause repair failure.

e. Apply liner cleaner or rubber buffer to the liner around the injured area.

f. While the area is still moist, scrape the inner liner until an area approximately 1/2 inch (12.7 mm) larger than the repair unit on all sides is free of all contaminants and has a uniform, clean, dull, black appearance. Repeat this process if necessary.

g. Center the repair unit over the injury and mark an area approximately 1/2 inch (121.7 mm) larger than the repair unit with a tire-marking crayon. Relax the beads of the tire.

NOTE

When installing a two-piece combination repair unit, use the appropriate size carbide cutter in a low RPM drill with a maximum speed of 1,200 RPM to prepare the injury.

h. Drill the injury following the direction of the penetration from the inside of the tire to the outside a minimum of three times.

i. Drill the injury following the direction of the penetration from the outside of the tire to the inside a minimum of three times.

j. Check for splits in the radial ply. Make sure no rust or belt separation remains in the injury. All damage must be removed; therefore, it may be necessary to drill the injury again. If rust or signs of separation remain, they must be removed, and the repair will have to be upgraded to a section repair.

k. If loose steel remains, use a high-speed air tool with a minimum of 20,000 RPM and an aluminum oxide stone to trim the steel back to solid rubber in the injury channel.

l. If scorching is present, use the appropriate wire brush in a low-speed air tool with a maximum speed of 5,000 RPM to remove the scorched material.

m. Using a soft wire brush mounted on a low RPM buffer, clean the steel shavings and buffing dust around the injury on the buffed surface. After the surface is cleaned, vacuum the remaining buffing dust and debris from inside the tire.

NOTE

If the stem is covered with polyfilm, carefully remove it before installation.

n. Lubricate the injury with vulcanizing cement using a clean probe. Install the rubber stem into the stem insertion tool, being careful not to touch the cushion gum area.

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR – CONTINUED

6. Two-Piece Repair − Continued

o. Lubricate the stem by cementing the tip and then pull it through the injury from the inside to the outside of the tire.

p. Trim the rubber stem on the inside of the tire using a flexible knife or side cutters. Be careful not to pull on the stem and leave approximately 1/8 inch remaining above the unbuffed inner liner.

q. Using a low RPM buffer which has a maximum speed of 5,000 RPM and a cup rasp, buff the inner liner of the tire starting on the right and working to the left.

NOTE

In the event that buffing through the inner liner and reaching the shiny rubber-encased body ply occurs, the tire must be referred to a full service tire repair facility for a section repair.

When buffing the inner liner of a tube-type bias ply tire, or other tires with a thin inner liner, a soft wire brush mounted on a low RPM buffer can be used to clean and texturize the liner without damaging the body cords.

r. Continue buffing until the stem is level with the surrounding liner, the mold marks in the liner have been removed, and the surface is clean and textured to a velvet-like finish.

s. Check the buffed area to ensure it is large enough for the selected repair unit, making sure not to touch the buffed surface. Relax the beads of the tire.

t. Brush and vacuum the buffing dust, as well as other debris, being careful not to touch the buffed surface. Use a soft wire brush mounted on a low RPM buffer to remove any excess buffing dust.

u. Cement the clean, buffed surface with vulcanizing cement from the repair material manufacturer.

v. Apply a thin even coat of cement by working it into the buffed surface. Allow the cement to dry to a dull tacky surface. Low temperature and high humidity can increase drying time.

w. Break the polyfilm backing on the repair unit in the center and peel it approximately halfway back on each side, being careful not to touch the cushion gum.

x. With the tire beads in a relaxed position, align the bead arrows, if present on the repair unit, so they point toward the beads. Center the repair unit over the injury and press the center of the repair unit down with your thumb.

y. Remove the remaining polyfilm from under the repair unit as you stitch from the center to the outer edges, being careful not to trap air under the repair unit.

z. Stitch the repair unit in the opposite direction to ensure that no air is trapped and the edges are completely stitched down. If the top of the repair unit has a polyfilm covering, remove it.

aa. If repair unit manufacturer requires inner liner sealant be used, apply the sealant to the buffed areas around the repair unit.

ab. Cut the plug on the outside of the tire leaving approximately 1/8 inch (3.2 mm) protruding above the tread surface. Do not pull on the plug while cutting it off.

7. Tube-Type Tire Repairs

The following procedures pertain to tube-type tire repair only. To repair inner tubes, refer to Inner Tube Repair paragraph, this WP

NOTE

Before removing the tube from the tire, mark the position of the valve stem on the sidewall. This will assist in finding the hole in the tube.

a. Refer to tire repair and repair limits paragraph, this WP, to determine that the tire can be repaired.

b. Locate and mark the injury on the inside and outside of the tire. Remove any foreign objects that may still be in the tire.

NOTE

In order to use a repair unit, the angle of penetration must be less than 25 degrees.

c. Inspect the injury with a probe to determine the size and angle of the penetration.

d. Select the proper size plug according to the size of the injury. Most plugs can be installed in bias and radial tires. Check with the tire repair manufacturer to ensure the correct repair unit is being used. Never mix materials from different manufacturers.

CAUTION

Failure to properly clean the inner liner can reduce repair unit adhesion and cause repair failure.

e. Apply liner cleaner to the liner around the injured area.

f. While the area is still moist, scrape the inner liner until an area approximately 1/2 inch (12.7 mm) larger than the repair unit, on all sides, is free of all contaminants and has a uniform, clean, dull, black appearance. Repeat this process if necessary.

g. Center the repair unit over the injury and mark an area approximately 1/2 inch (12.7 mm) larger than the repair unit with a tire marking crayon. Relax the beads of the tire.

TIRE REPAIR PROCEDURES – COMPLETE TIRE REPAIR – CONTINUED

7. Tube-Type Tire Repairs - Continued

NOTE

When installing a one-piece combination repair unit, use the appropriate size carbide cutter in a low RPM drill with a maximum speed of 1,200 RPM to prepare the injury.

h. Drill the injury following the direction of the penetration from the inside of the tire to the outside a minimum of three times. If the angle of penetration is greater than 25 degrees, a two-piece repair unit must be installed.

i. Drill the injury following the direction of the penetration from the outside of the tire to the inside a minimum of three times.

j. Install the proper size plug making sure the cushion gum area is visible on both sides.

k. Trim the plug on the inside of the tire as close as possible to the inner liner.

CAUTION

Do not buff into the nylon cords on bias tires.

l. Using a wire brush or buffing stone, buff the area for the repair unit. On bias tires, the surface of the liner can be very thin and a velvet-like finish is not possible. Avoid exposing the nylon cord by using a wire brush and lightly buffing the area. The surface needs to be thoroughly clean on bias tires with thin liners.

m. Apply a thin, even coat of cement to the buffed area.

n. Install the repair unit making sure not to touch the cushion gum or buffed area.

o. Stitch the unit down by starting in the middle of the repair unit and working to the edges to remove any trapped air.

p. If repair unit manufacturer requires inner liner sealant be used, apply the sealant to the buffed areas around the repair unit.

q. After the sealant is thoroughly dry, apply tire talc to prevent the repair unit from sticking to the tube.

r. Trim the plug on the outside of the tire leaving approximately 1/8 inch (3.2) above the tread.

INNER TUBE REPAIR PROCEDURES

1. Initial Setup

The following equipment conditions must be established prior to performing tire repair:

- Tire and wheel assembly removed (see applicable vehicle TM)
- Tire Demounted (see Tire Maintenance and Bolt-Together Rim Repair paragraphs, this WP)
- Inner tube removed from demounted tire

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Stitcher, Cementing and Vulcanizing (Item 47, WP0011 00) (There may be a stitcher supplied with repair kit)
- Abrasive stick or wheel assembly tool (Item 52, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Patch, Inner Tube (Items 3 through 8, WP0012 00)
- Vulcanizing fluid (Item 19, WP0012 00)
- Buffing solution (Item 30, WP0012 00)

4. Inspection and Repair Criteria

a. Minor injuries to inner tubes can be repaired quickly and easily. Check inner tubes for punctures, pinches, cuts, and cracks.

b. Refer to Table 4 for authorized repairs. If the location of the injury is not obvious, locate the leak by submerging either the whole inner tube or part of the inner tube in water. Extremely large leaks can be located by running water over the surface and watching closely for bubbles.

c. Inspect valves for proper bends. Replace any leaky valve cores. Check for proper tightening of valve stem nut, especially on new inner tubes. Ensure that each valve stem has a valve cap.

4. Inspection and Repair Criteria − Continued

Table 4. Authorized Inner Tube Repairs

Inner Tube Size	Two Repairs Not Exceeding
8.25 8.25 – 16.00 16.00 and up	1 sq. inch (6.5 sq. cm) each 2 sq. inches (12.9 sq. cm) each 4 sq. inches (25.8 sq. cm) each

5. Inner Tube Repair

a. Mark location of injury.

b. Remove valve core (see Valve Core Replacement paragraph, this WP).

NOTE

Small punctures, such as nail holes or small cuts, can be repaired without removing damaged material.

c. Cut damaged material out of tube (see Figure 46). Round ends of injury or cut X punctures in a circle.

WARNING

USE VULCANIZING FLUIDS AND CLEANING FLUIDS IN A WELL-VENTILATED AREA. READ ALL WARNINGS AND CAUTIONS ON CONTAINERS. PROLONGED INHALATION OF FUMES COULD BE A HEALTH HAZARD.

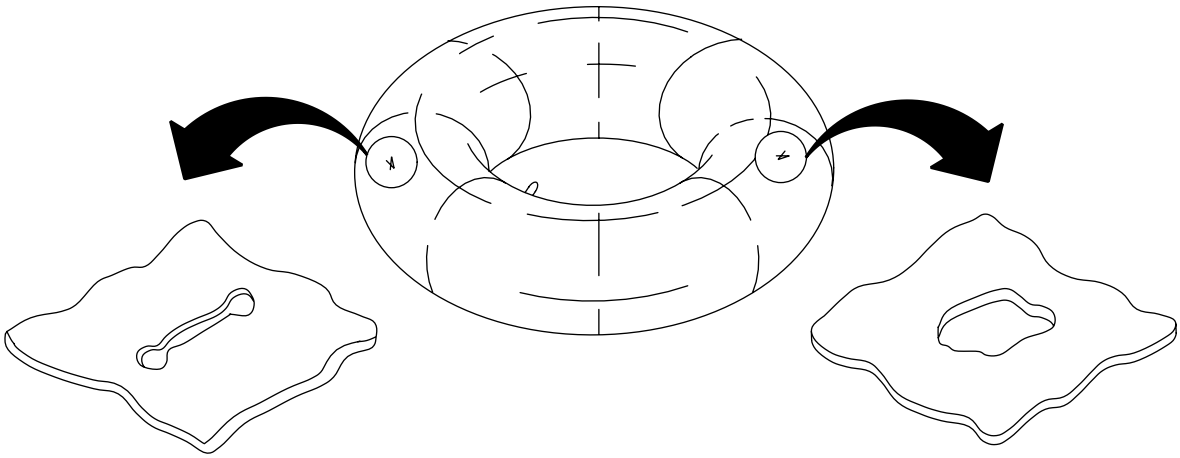

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Figure 46. Cutting Out Damaged Material

5. Inner Tube Repair − Continued

d. Clean injured area with buffing solvent (see Figure 47).

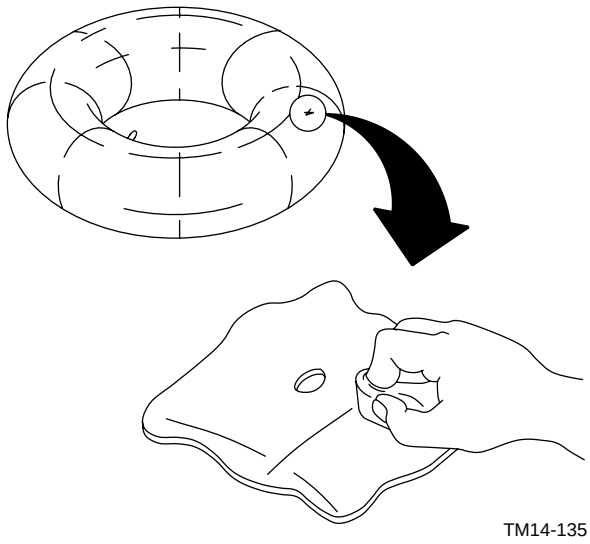

Figure 47. Applying Buffing Solvent

e. Select a patch that will adequately cover injury. Mark area approximately 1/2 inch (12.7 mm) larger than the patch.

f. Buff around injury with an abrasive stick or buffing tool (see Figure 48). Buff to size marked in step e. Do not gouge tube during buffing.

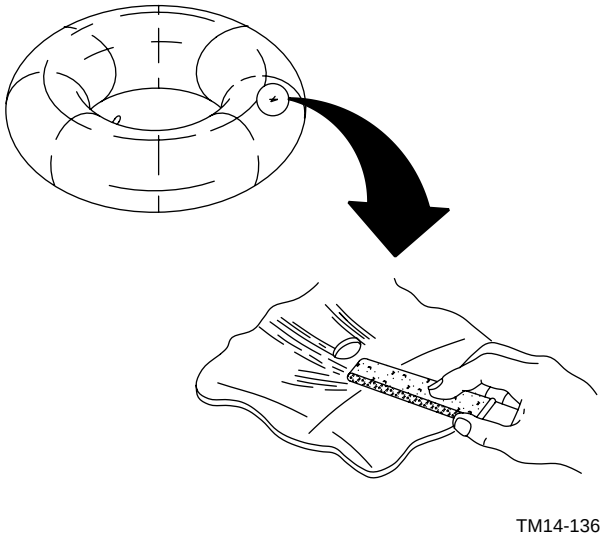

Figure 48. Buffing with an Abrasive Stick

5. Inner Tube Repair − Continued

WARNING

WHEN USING COMPRESSED AIR, ALWAYS WEAR SAFETY GOGGLES TO PREVENT DIRT AND DEBRIS FROM GOING INTO EYES. COMPRESSED AIR PRESSURE, IF USED, MUST NOT EXCEED 30 PSI (207 KPA).

g. Remove buffing dust with compressed air.

h. Apply one coat of vulcanizing fluid to buffed area of inner tube and allow to dry for a minimum of 20 minutes.

i. Remove backing from patch. Center patch over injury and press into place.

j. Thoroughly stitch patch with stitcher, working from center of patch to outer edges (see Figure 49).

k. Remove top coating from patch (if applicable).

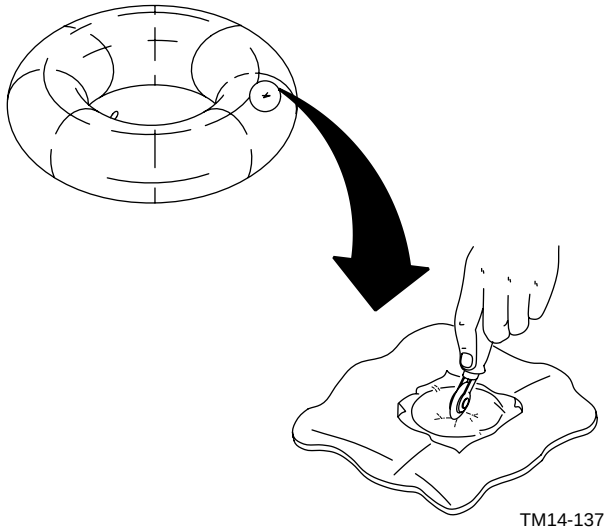

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Figure 49. Stitching of Patch

END OF WORK PACKAGE

DIRECT SUPPORT MAINTENANCE **0006 00**

THIS WORK PACKAGE COVERS:
Direct Support Maintenance

GENERAL

1. The following paragraphs present methods of demounting and mounting tires that are beyond the capabilities of Unit Maintenance.

2. Most tires requiring demounting at the Direct Support Level are those commonly referred to as non-demountable (the rim is not removed from the vehicle being serviced).

3. Demountable tires requiring demounting at the Direct Support Level may come from using organizations that are not equipped with a tire changer machine. Unit Maintenance will submit a Maintenance Request (DA Form 2407) with the assembled tire and wheel for tire demounting, repair or replacement, and mounting. The instructions for using the tire changer machine accompany the machine and must be followed. These procedures are not included in this manual.

4. The following demounting procedures are representative of the manual methods used to remove a tire from a rim and do not fully address using hydraulic or pneumatic bead breakers or bead expanders. Use of this equipment is encouraged. The instructions for using these special tools accompany the equipment and must be followed. These procedures are not included in this manual.

NON-DEMOUNTABLE FLAT BASE RIM TUBE TIRE MAINTENANCE

1. Initial Setup

The following equipment conditions must be established prior to performing tire repair:

- Tire will be demounted and mounted with the non-demountable rim remaining on vehicle.
- Vehicle will be jacked up. Refer to appropriate vehicle maintenance TM for jacking instructions and safety precautions.

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Inflator-gauge, pneumatic tire (includes 10 foot hose) (Item 29, WP0011 00)
- Two tire irons, curved flat type (Item 33, WP0011 00)
- Tire iron, lockring type (Item 34, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Tire and rim lubricant (Item 21, 22 or 23, WP0012 00)

4. Demounting

a. Remove valve core and deflate tire (see Valve Core Replacement paragraph, WP0005 00). Run a piece of wire through valve stem to ensure that it is not plugged.

WARNING

WHEN DISLODGING TIRE BEADS, LOCK RING, OR SIDE RING FLANGES, BE ABSOLUTELY CERTAIN NO AIR PRESSURE REMAINS IN THE TIRE. SERIOUS INJURY OR DEATH COULD RESULT.

CAUTION

Use care when demounting tires to avoid damaging tire beads or bead seats.

Never use petroleum-based products such as oil or grease when demounting/mounting tires from rims. Petroleum-based products have a severe degrading effect on tire rubber. Use only approved tire and rim lubricant.

b. Insert a curved flat tire iron (1, Figure 1) between tire bead and outer rim flange (2).

c. Working progressively around rim, work outer tire bead completely free of outer rim flange.

d. Work outer rim flange (2) inward away from lockring (3), enough to permit removal of lockring.

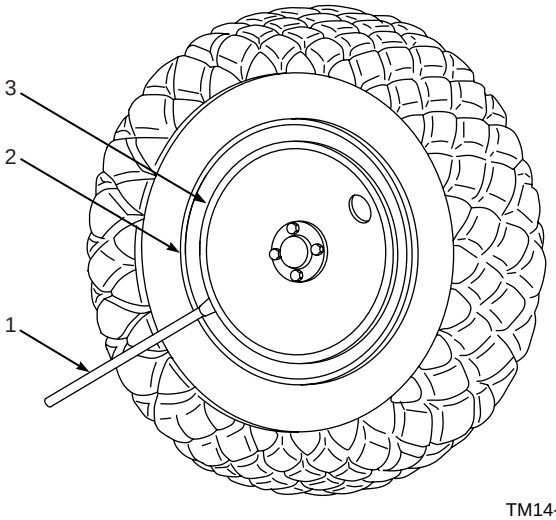

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Figure 1. Removal of Lockring

NON-DEMOUNTABLE FLAT BASE RIM TUBE TIRE MAINTENANCE − CONTINUED

4. Demounting − Continued

e. With two, curved flat tire irons (1, Figure 2), have an assistant work outer rim flange (2) inward away from lockring near prying notch.

f. With assistant working rim flange (2) inward, insert a lockring tire iron (4) into prying notch and work lockring (3) partly out of rim gutter.

g. With assistant, work progressively around rim holding flange (2) in and working lockring (3) out to completely remove lockring.

h. With lockring (3) completely removed, slide outer rim flange (2) completely off rim (5).

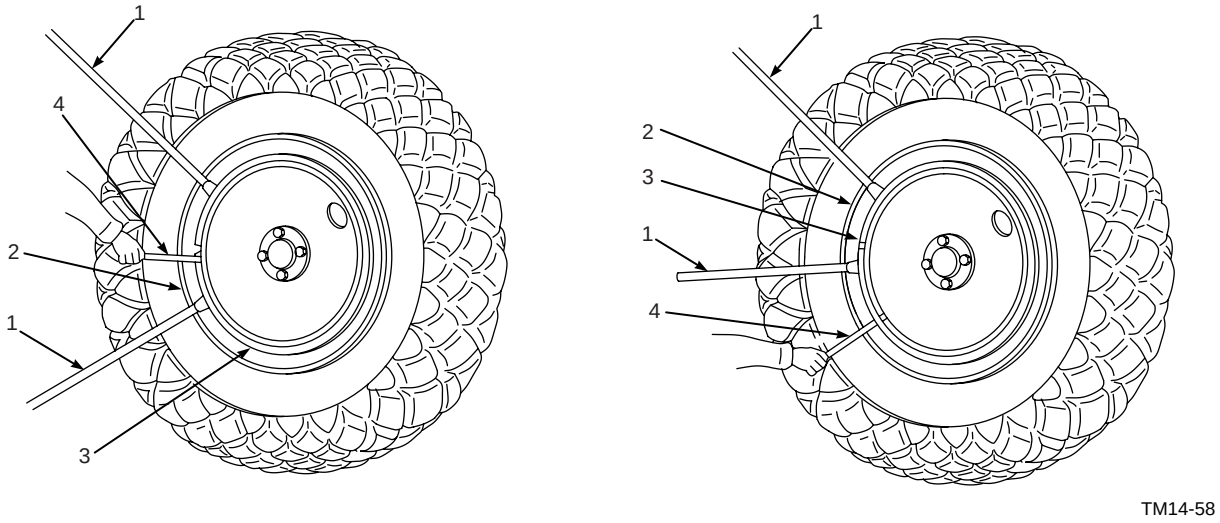

Figure 2. Removal of Outer Rim Flange

i. Work inner tire bead (6, Figure 3) from inner rim flange (7) with a curved flat tire iron (1) inserted between inner tire bead and inner rim flange.

NOTE

Refer to appropriate vehicle maintenance TM for jacking instructions and safety precautions. If a crane or hoist is available, it may be used to raise and lower the tire instead of jacking the vehicle up or down.

j. With inner tire bead (6) completely free of inner rim flange (7), force bottom of tire out as far as possible. Have assistant lower vehicle so weight of tire rests on ground.

k. Force top of tire out as far as possible. Have assistant raise vehicle so weight of tire is not resting on ground.

4. Demounting − Continued

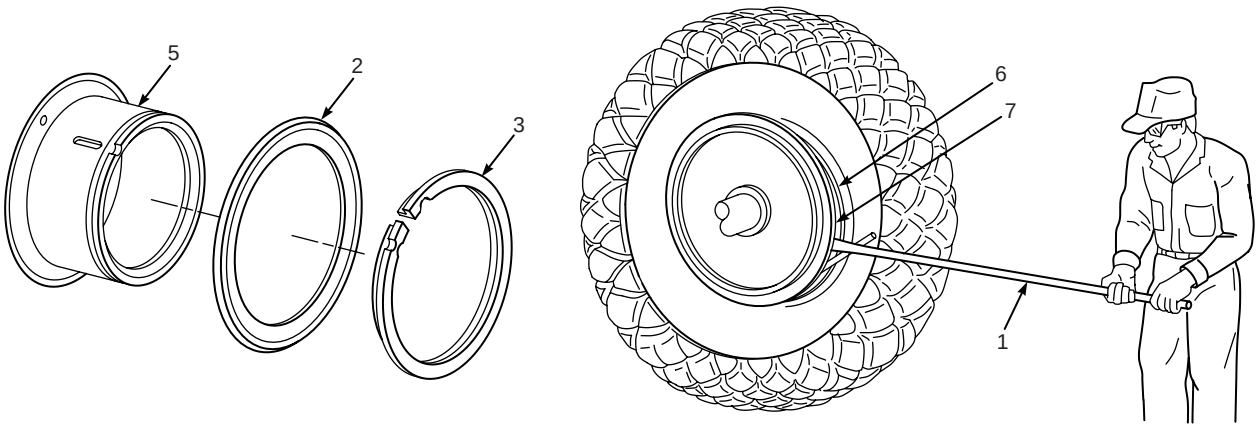

Figure 3. Separating Inner Rim Flange from Tire Bead

l. Repeat steps j and k until tire is almost completely off rim.

m. Working with assistant, completely remove tire from rim and lean tire in an upright position against vehicle or other solid object.

n. With curved flat tire iron (1, Figure 4) slide inner rim flange (7) off rim.

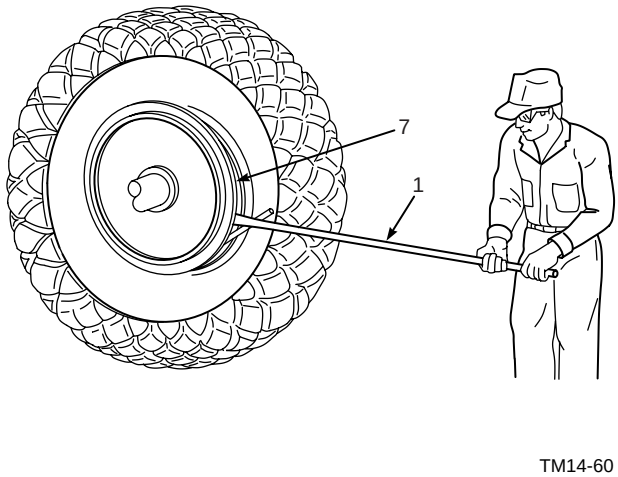

Figure 4. Removing Inner Rim Flange

4. Demounting − Continued

NOTE

When removing tire flap and tube, it may be necessary to use a tire bead spreader or small jack to spread tire beads apart.

o. Using a flat tire iron (8, Figure 5), work tire flap (9) out of tire, being careful not to damage tube and tire flap.

p. Remove tube from tire, being careful not to damage valve stem.

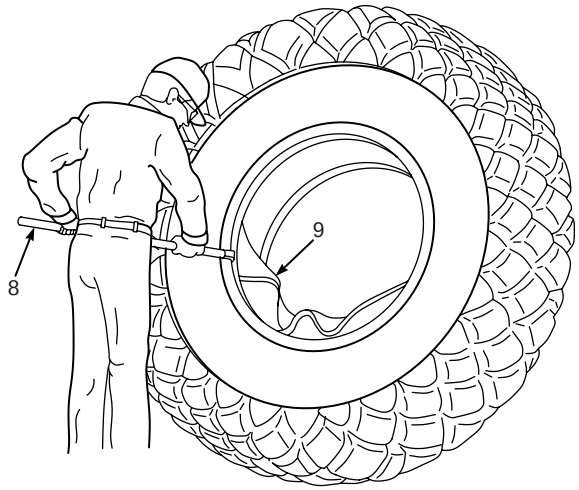

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Figure 5. Removing Tube from Tire

5. Rim Maintenance

The following procedures pertain to all rims.

a. Inspect rim, lockring and flanges for damage or abnormal wear.

b. Inspect rim components for cracks, splits, or tears.

c. Remove rust, oil, and tire and rim lubricant residue from rim.

6. Mounting

a. Install tube (10, Figure 6) in tire, starting at bottom of tire and working around. As tube is worked into tire, add enough air to shape tube to help hold tube in place and eliminate the possibility of tube becoming wrinkled or pinched.

b. Install tire flap (9) starting at bottom and rotating tire so the portion being installed is at the bottom of tire.

c. Apply tire and rim lubricant to both beads and tire flap (9).

6. Mounting − Continued

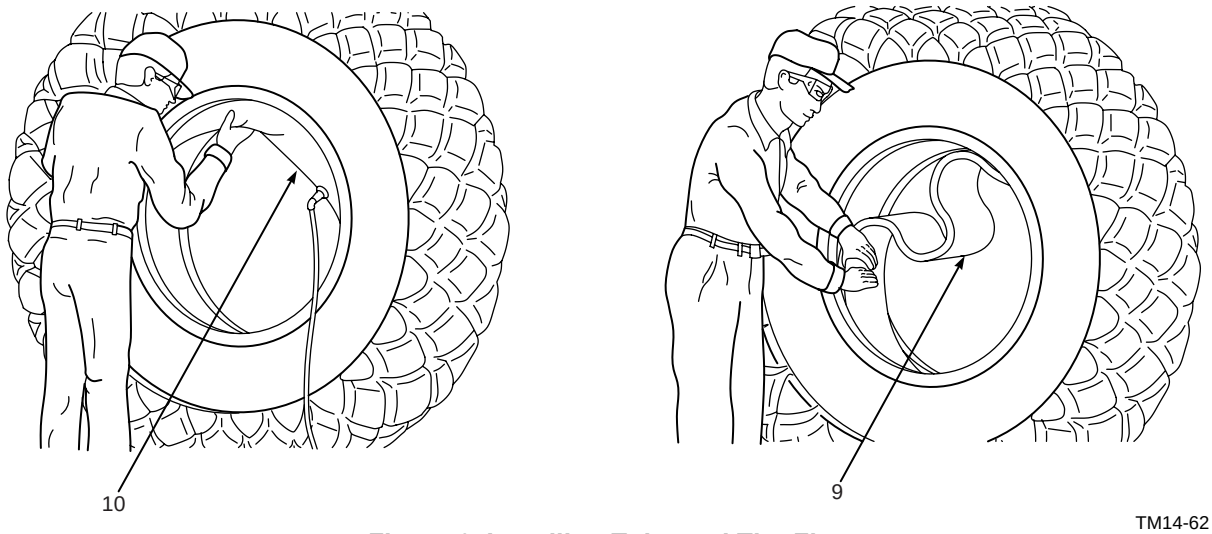


Figure 6. Installing Tube and Tire Flap

d. Slide inner rim flange (7, Figure 7) into proper position on rim (5).

e. With help from assistant, place tire in upright position, leaning against rim (5). Ensure that valve stem (11) is pointing in correct direction and aligned with valve hole in rim.

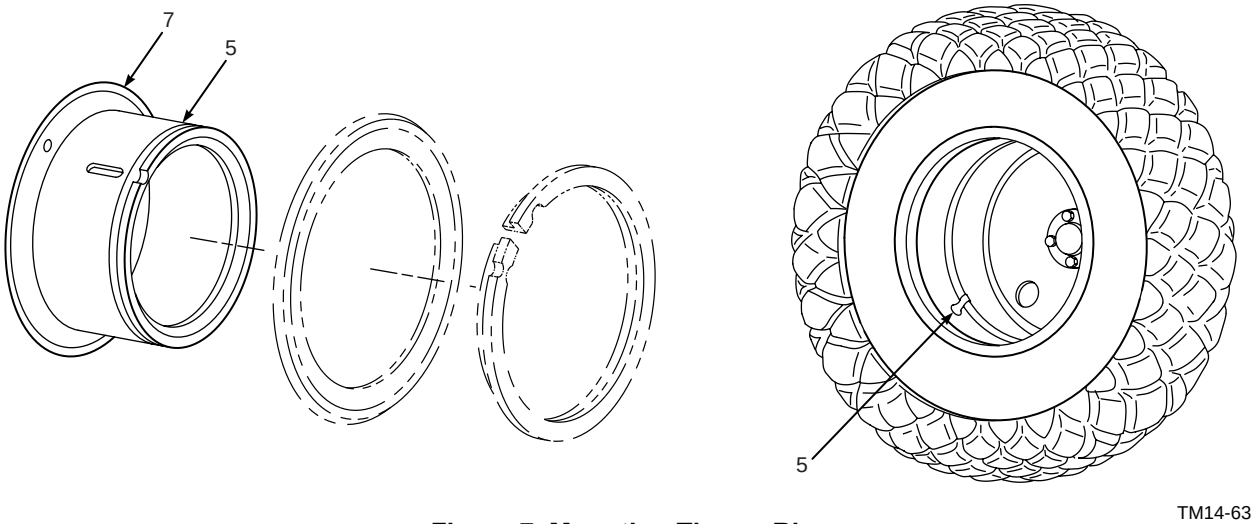


Figure 7. Mounting Tire on Rim

6. Mounting − Continued

NOTE

Refer to appropriate vehicle maintenance TM for jacking instructions and safety precautions. If a crane or hoist is available, it may be used to raise and lower the tire instead of jacking the vehicle up and down as described below.

f. Have assistant lower vehicle until center of tire is aligned with rim (5) and push top of inner tire bead onto rim.

g. Have assistant raise vehicle so weight of tire does not rest on ground. Push bottom of tire in as far as possible.

h. Have assistant lower vehicle so weight of tire will rest on ground. Push top of tire in as far as possible.

i. Repeat steps g and h until tire is completely on rim (5), up against inner rim flange (7), and up off ground.

j. Slide outer rim flange (2, Figure 8) onto rim (5) and under outer tire bead.

k. With help from assistant, work outer rim flange (2) in and away from gutter of rim (5) with two curved flat tire irons (1).

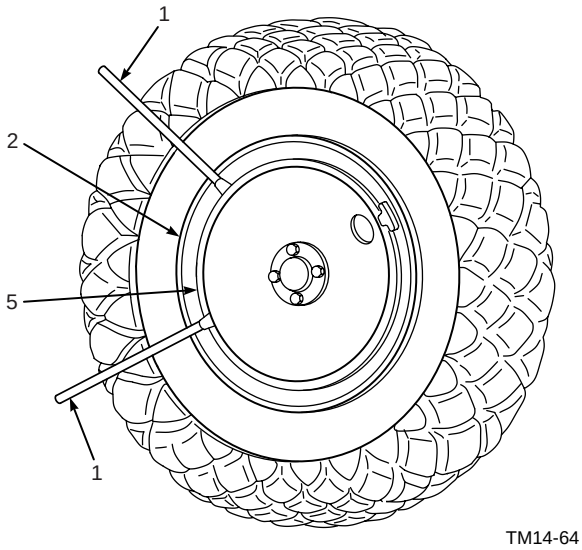


Figure 8. Installing Outer Rim Flange

l. With help from assistant, work outer rim flange in and away from gutter of rim (5, Figure 9) and place end of lockring (3) without prying notch into gutter of rim as shown.

m. Working progressively around rim (5) with assistant, work outer rim flange (2) in and away from gutter of rim as lockring (3) is pried over edge and into gutter of rim using lockring tire iron (4).

n. With lockring (3) completely installed, allow outer rim flange (2) to come out and contact lock rim throughout entire circumference.

6. Mounting − Continued

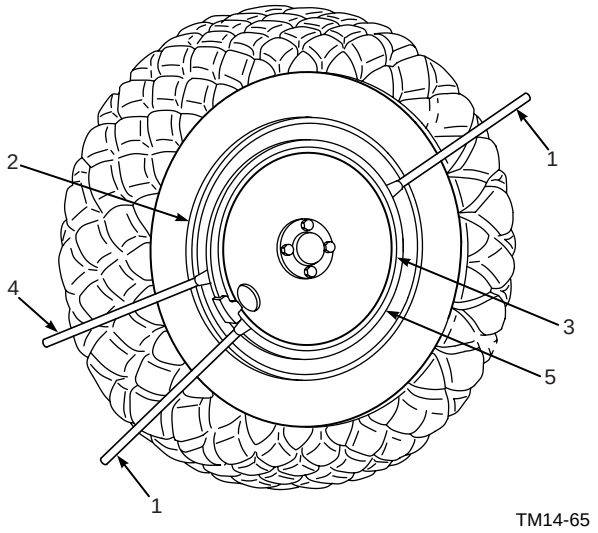


Figure 9. Installing Lockring

WARNING

IMPROPERLY SEATED RIM FLANGES OR LOCKRINGS MAY FLY OFF DURING INFLATION. NEVER ATTEMPT TO SEAT RIM FLANGES OR LOCKRINGS DURING INFLATION OR AFTER INFLATION. SERIOUS INJURY OR DEATH COULD RESULT.

o. Inspect all rim components to ensure that they are properly seated.

WARNING

WHEN INFLATING TIRES MOUNTED ON THE VEHICLE, PERSONNEL MUST REMAIN A MINIMUM OF 10 FT (3.1 M) AWAY FROM TIRE AND NOT IN POSSIBLE PATH OF LOCKRING OR RIM FLANGE TRAJECTORY IN THE EVENT OF RIM SEPARATION. SHOULD COMPONENTS FLY OFF, SERIOUS INJURY OR DEATH COULD RESULT.

NEVER INFLATE TIRES OVER 40 PSI (276 KPA) TO SEAT TIRE BEADS. IF BEADS DO NOT SEAT, DEFLATE, DEMOUNT, AND CHECK THE TIRE/RIM MATCH. MOUNT AND LUBRICATE ACCORDING TO INSTRUCTIONS. SERIOUS INJURY OR DEATH COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

WHEN INFLATING TIRES ON NONDEMOUNTABLE RIMS, ALWAYS USE A PNEUMATIC TIRE INFLATOR-GAUGE AND 10 FT. (3.1 MM) AIR HOSE. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY.

6. Mounting − Continued

p. Using a pneumatic tire hose (13, Figure 10) with in-line inflator-gauge (12), stay out of the danger area and inflate tire to a maximum of 15 psi (103 kPa) and then allow tire to completely deflate. This will allow tube to center in tire.

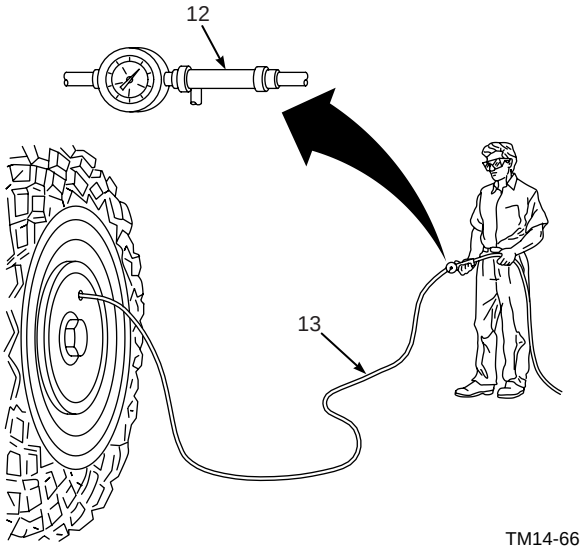


Figure 10. Tire Inflation

q. Inflate the tire enough to seat both tire beads. Both tire beads should seat properly before reaching 40 psi (276 kPa). If tire beads fail to seat, deflate tire, determine cause of failure, take corrective action, add additional tire and rim lubricant, and repeat this step.

r. Visually inspect all rim components to ensure that they are properly seated and allow tire to deflate.

s. Install valve core (see Valve Core Replacement paragraph, WP0005 00).

t. Inflate tire to normal operating pressure (see appropriate vehicle TM). Visually inspect rim components to ensure that they are properly seated.

u. Install valve cap on valve stem finger-tight.

v. Lower jack and remove from under vehicle (see appropriate vehicle TM).

DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE

1. Initial Setup

The following equipment condition must be established prior to performing tire maintenance:

- Valve core removed and tire completely deflated (see Valve Core Replacement paragraph, WP0005 00)

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Inflator-gauge, pneumatic tire (includes 10 foot hose) (Item 29, WP0011 00)
- Tire iron, curved flat type (Item 33, WP0011 00)
- Tire iron, lockring type (Item 34, WP0011 00)
- Tire iron, curved bead breaker type (Item 33, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Tire and rim lubricant (Item 21, 22, or 23, WP0012 00)
- Preformed packing (refer to the vehicle RPSTL)

4. Demounting

a. Run a piece of wire through valve stem to ensure that it is not plugged.

WARNING

WHEN DISLODGING TIRE BEADS, LOCKRING, OR SIDE RING FLANGES, BE ABSOLUTELY CERTAIN THAT NO AIR PRESSURE REMAINS IN TIRE. SERIOUS INJURY OR DEATH COULD RESULT.

CAUTION

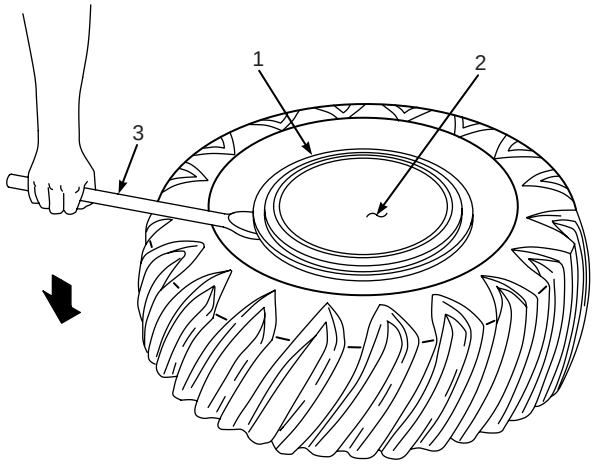
Use tire and rim lubricant as necessary to avoid damaging tire beads or bead seats during demounting and mounting.

Never use petroleum-based products such as oil or grease when demounting/mounting tires from rims. Petroleum-based products have a severe degrading effect on tire rubber. Use only approved tire and rim lubricant.

4. Demounting − Continued

b. Loosen outer tire bead from demountable side ring flange (1, Figure 11) by inserting a curved bead breaker tire iron (3) between tire bead and side ring flange.

c. Work progressively around rim (2) rotating curved bead breaker tire iron (3) down until outer tire bead is completely free of side ring flange (1).



TM14-138

Figure 11. Demounting Flat Base Rim Tire

d. Force side ring flange (1, Figure 12) down enough to clear lockring (7).

e. Insert lockring tire iron (5) into prying notch (6) and work lockring (7) partly out of gutter of rim (2).

f. Insert curved flat tire iron (4) between lockring (7) and rim (2).

g. Work both curved flat tire iron (4) and lockring tire iron (5) progressively around rim (2), removing lockring (7).

h. With lockring (7) removed, force side ring flange (1) down and remove preformed packing.

i. Slide ring flange (1) straight up and off rim (2).

4. Demounting − Continued

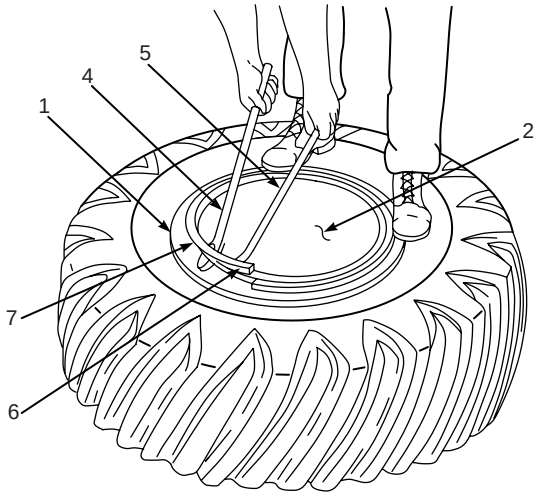


Figure 12. Removing Lockring and Ring Flange

j. Turn tire and rim (2, Figure 13) over and loosen inner tire bead from inner rim flange (8) by inserting a curved bead breaker tire iron (3) between tire bead and rim flange.

k. Work progressively around rim (2), rotating curved bead breaker tire iron (3) down until inner tire bead is completely free of inner rim flange (8).

l. Lift rim (2) out of tire.

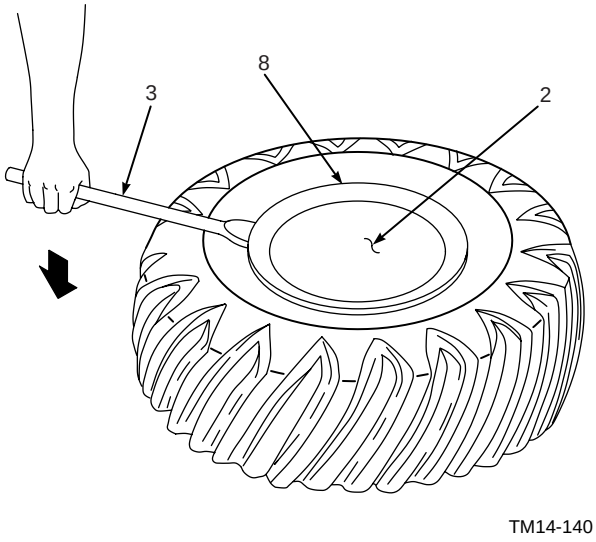


Figure 13. Removing Rim from Tire

5. Rim Maintenance

The following procedures pertain to all rims.

a. Inspect rim, lockring and flanges for damage or abnormal wear.

b. Inspect rim components for cracks, splits, or tears.

c. Remove rust, oil, and tire and rim lubricant residue from rim.

6. Mounting

a. Place rim (2, Figure 14) flat on floor; lubricate both beads of tire with tire and rim lubricant, and place tire completely on rim.

b. Slide side ring flange (1) down onto rim (2) and under bead of tire.

c. Force side ring flange (1) down past gutter of rim (2) and install preformed packing in groove of rim.

d. Holding side ring flange (1) down past gutter of rim (2) place end of lockring (7) without prying notch into gutter of rim.

e. Working progressively around rim (2), work lockring (7) over edge of rim with lockring tire iron (5) and step on lockring, forcing it down into gutter of rim.

f. Ensure that preformed packing is properly installed, and guide side ring flange (1) up over preformed packing and onto lockring (7).

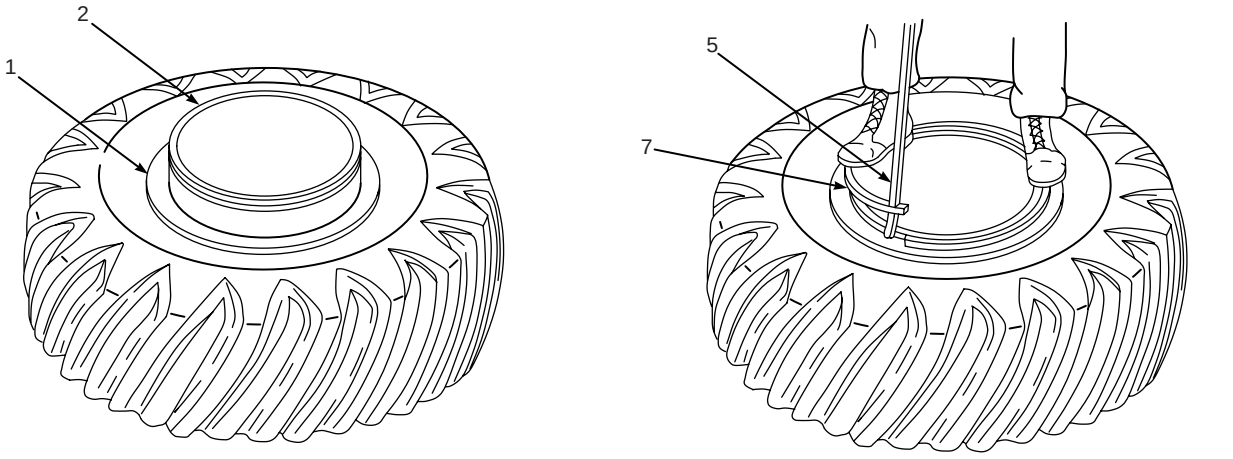


Figure 14. Mounting of Tire

6. Mounting − Continued

WARNING

IMPROPERLY SEATED SIDE RING FLANGES OR LOCKRINGS COULD FLY OFF DURING INFLATION. NEVER ATTEMPT TO SEAT SIDE RING FLANGES OR LOCKRINGS DURING OR AFTER INFLATION. SERIOUS INJURY OR DEATH COULD RESULT.

NOTE

When using new tubes or new tubeless valve stems, always ensure that the valve core is removed before initial inflation.

g. Inspect all rim components to ensure that they are properly seated. Place rim and tire assembly in an inflation safety cage (see Inflation Safety paragraph, WP0003 00).

WARNING

ALWAYS INFLATE TIRES MOUNTED ON RIMS WITH DEMOUNTABLE SIDE RING FLANGES OR LOCKRINGS IN AN INFLATION SAFETY CAGE OR SERIOUS INJURY OR DEATH COULD RESULT.

NEVER INFLATE TIRES OVER 40 PSI (276 KPA) TO SEAT TIRE BEADS. IF BEADS DO NOT SEAT, DEFLATE, DEMOUNT, AND CHECK THE TIRE/RIM MATCH. MOUNT AND LUBRICATE ACCORDING TO INSTRUCTIONS. SERIOUS INJURY OR DEATH COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

WHEN INFLATING TIRES IN A SAFETY CAGE, ALWAYS USE A PNEUMATIC TIRE INFLATOR-GAUGE AND A 10 FT. (3.1 MM) AIR HOSE. FAILURE TO DO SO COULD CAUSE SERIOUS INJURY OR DEATH.

h. Using a pneumatic tire hose (9, Figure 15) with in-line, inflator-gauge (10), inflate tire to 40 psi (276 kPa) maximum to seat both tire beads. Both tire beads should seat before reaching 40 psi (276 kPa). If tire beads fail to seat, deflate tire, determine cause of failure, take corrective action, add additional tire and rim lubricant, and repeat this step.

i. Visually check to see that all rim components are properly seated and allow tire to deflate.

j. Install valve core (see Valve Core Replacement paragraph, WP0005 00).

6. Mounting – Continued

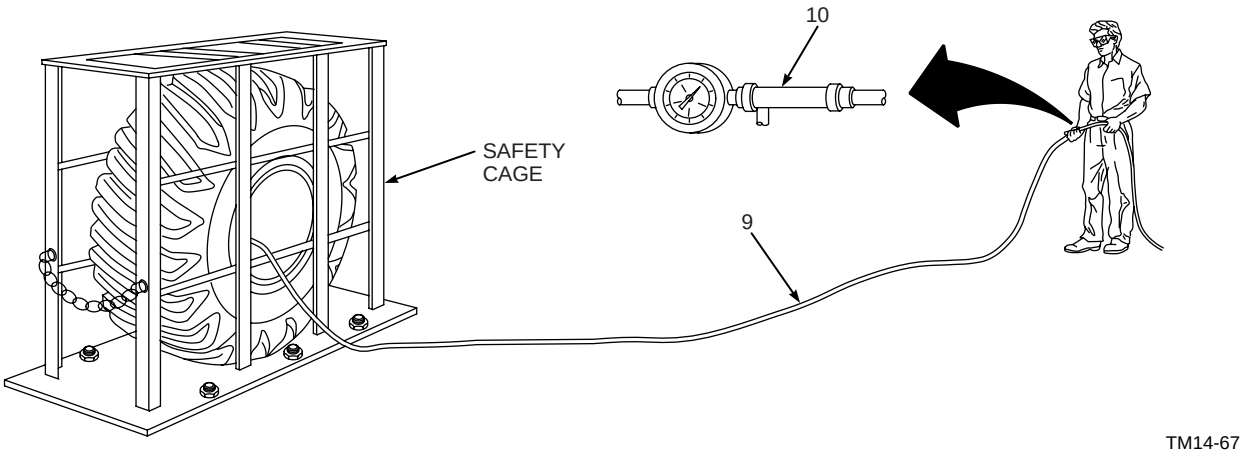


Figure 15. Inflating Tire in Safety Cage

k. Inflate tire to normal operating pressure (see appropriate vehicle TM). Visually inspect all rim components to ensure that they are properly seated.

l. Install valve cap onto valve stem finger-tight.

m. Remove rim and tire assembly from inflation safety cage.

NON-DEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE

1. Initial Setup

The following equipment conditions must be established prior to performing tire repair:

NOTE

This task requires two personnel.

- Tire will be demounted and mounted with the non-demountable rim remaining on vehicle.
- Vehicle will be jacked up. Refer to appropriate vehicle maintenance TM for jacking instructions and safety precautions.

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Hydraulic tire removing tool (optional)
- Inflator-gauge, pneumatic tire (includes 10 foot hose) (Item 29, WP0011 00)
- Tire iron, rim type (Item 35, WP0011 00)
- Tire iron, curved flat type (Item 33, WP0011 00)
- Tire iron, lockring type (Item 34, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Tire and rim lubricant (Item 21, 22 or 23, WP0012 00)

4. Demounting

a. Remove valve core and completely deflate tire (see Valve Core Replacement paragraph WP0005 00). Run a piece of wire through valve stem to ensure that it is not plugged.

WARNING

IMPROPER USE OF POWER EQUIPMENT OR USE OF FAULTY OR DAMAGED POWER EQUIPMENT COULD CAUSE SERIOUS INJURY OR DEATH.

WHEN DISLODGING TIRE BEADS, LOCKRINGS, OR SIDE RING FLANGES, BE ABSOLUTELY CERTAIN NO AIR REMAINS IN TIRE. SERIOUS INJURY OR DEATH COULD RESULT.

CAUTION

Never use petroleum-based products such as oil or grease when demounting/mounting tires from rims. Petroleum-based products have a severe degrading effect on tire rubber. Use only approved tire and rim lubricant.

NON-DEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE − CONTINUED

4. Demounting − Continued

NOTE

If a hydraulic tire remover is available to loosen tire beads, the manufacturer's instructions must be followed. When tire bead is completely free of rim flange, proceed with step h.

b. Place end of tire iron (1, Figure 16) into one of the prying slots between bead seat band (3) and outer rim flange (2).

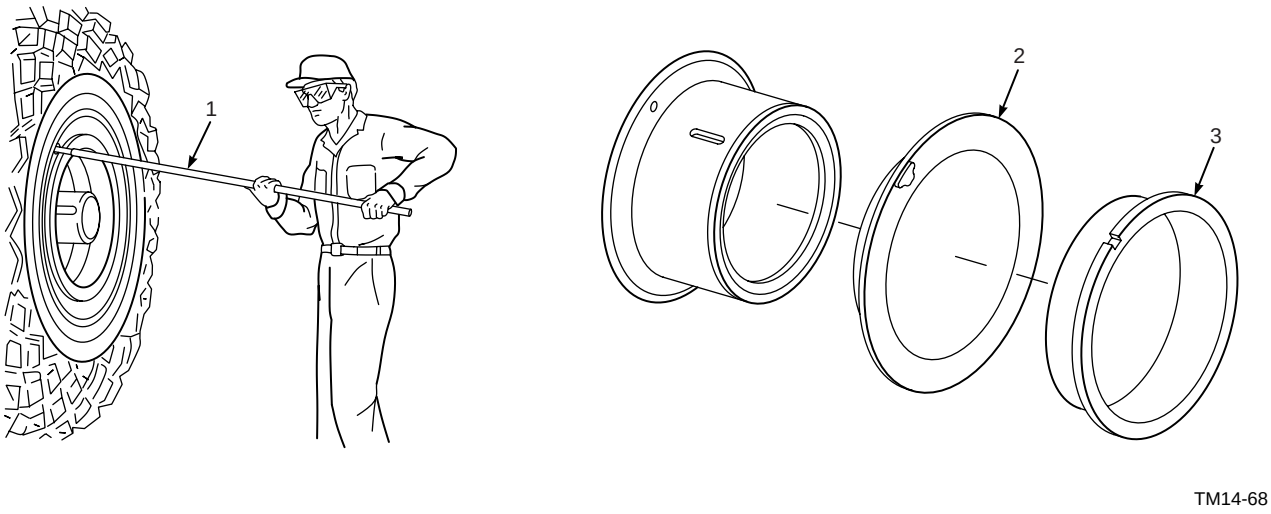


Figure 16. Working Outer Rim Flange Away From Bead Seat Band

c. Work outer rim flange (2) in and away from bead seat band (3).

d. Have assistant place second tire iron (1, Figure 17) between bead seat band (3) and outer rim flange (2).

e. With assistant, work both tire irons (1) progressively around rim (4) until outer rim flange (2) is completely free of bead seat band (3).

f. Place tire iron (1, Figure 18) between bead seat band (3) and lockring (5) and work bead seat band in and away from lockring.

g. Working with assistant and a second tire iron, work progressively around rim (4) until bead seat band (3) is in and away from lockring (5).

4. Demounting − Continued

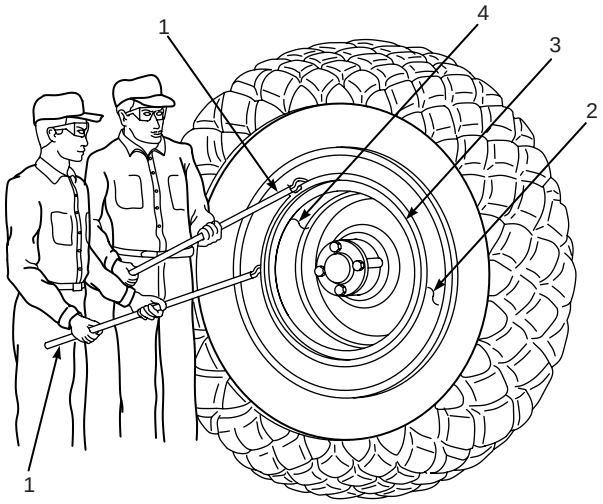


Figure 17. Separating Rim Flange From Bead Seat Band

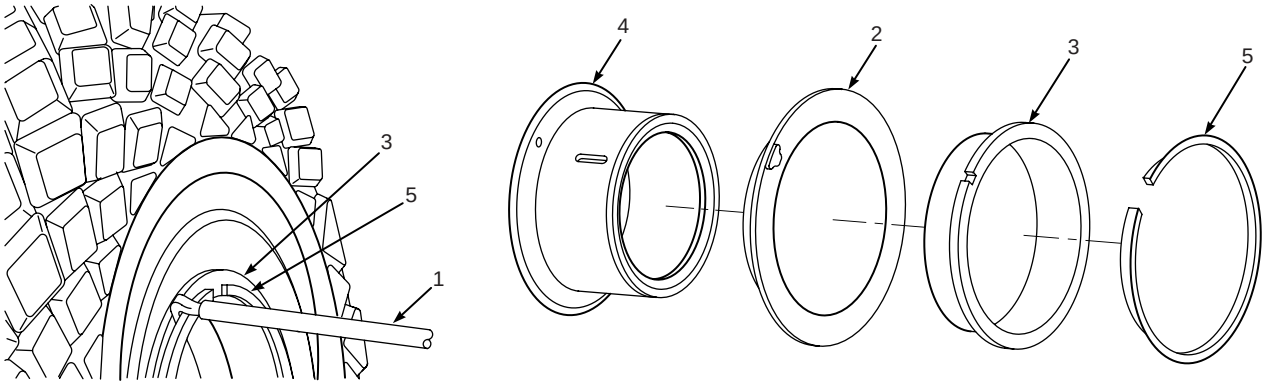


Figure 18. Separating Bead Seat Band From Lockring

h. Using a lockring tire iron (6, Figure 19), work lockring (5) partly out of gutter by inserting tire iron into prying notch and rotating tire iron down.

i. Insert a second tire iron (1) between base of rim (4) and lockring (5).

j. Work both tire irons (1 and 6) progressively around rim (4) until lockring (5) is completely removed.

4. Demounting − Continued

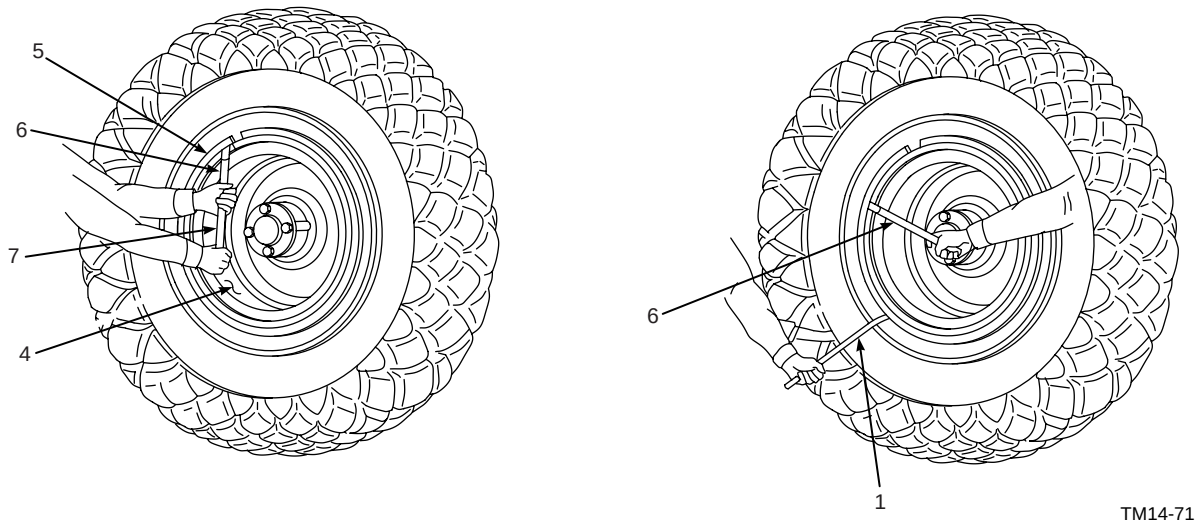


Figure 19. Removal of Lockring

k. Remove bead seat band (3, Figure 20) by working with curved flat tire iron (8).

l. Insert curved flat tire iron (8) between outer rim flange (2) and outer tire bead.

m. Work progressively around rim (4) with curved flat tire iron (8) until outer rim flange (2) is completely free of outer tire bead.

n. Slide outer rim flange (2) off rim (4).

o. Insert curved flat tire iron (8) between inner rim flange (10) and inner tire bead (9).

4. Demounting − Continued

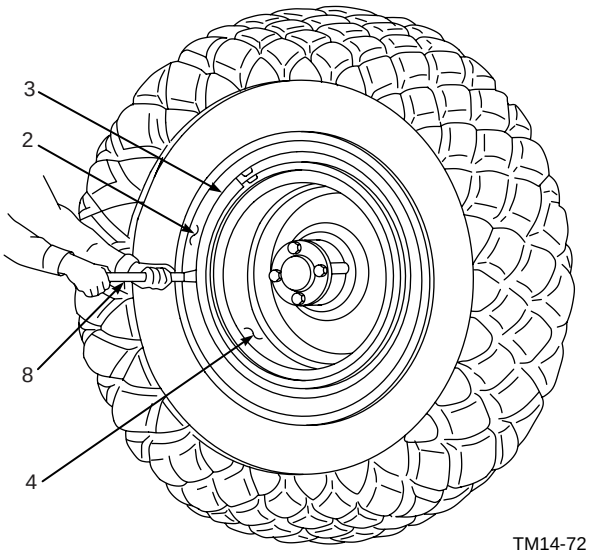


Figure 20. Removal of Outer Rim Flange

NOTE

Refer to appropriate vehicle maintenance TM for jacking instructions and related safety precautions. If a crane or hoist is available, it may be used to raise and lower tire instead of jacking vehicle up and down.

p. Work progressively around rim (4, Figure 21) with curved flat tire iron (8), working inner tire bead (9) completely free of inner rim flange (10).

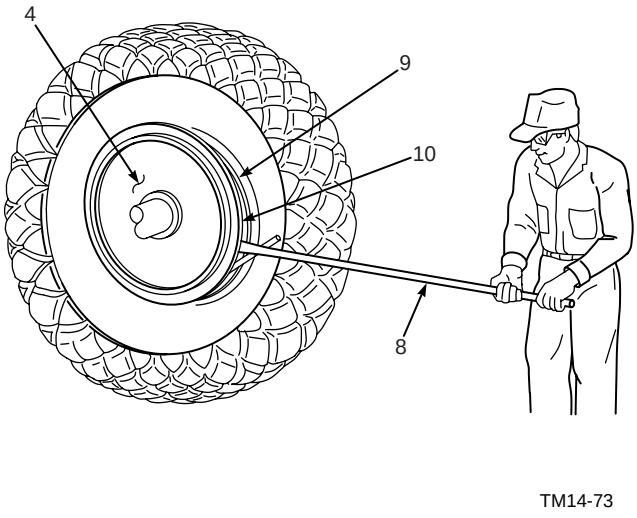


Figure 21. Working Inner Tire Bead Free of Inner Rim Flange

NON-DEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE − CONTINUED

4. Demounting − Continued

q. With inner tire bead completely free of inner rim flange (10, Figure 22), force bottom of tire (13) out as far as possible. Have assistant lower vehicle so that weight of tire rests on ground.

r. Force top of tire (13) out as far as possible. Have assistant raise vehicle so that weight of tire is not resting on ground.

s. Repeat steps q and r until tire is almost completely off rim.

t. With assistant, completely remove tire (13) from rim (4) and lean tire in an upright position against vehicle or other solid object.

u. Slide inner rim flange (10) off of rim (4).

NOTE

When removing tire flap and tube, it may be necessary to use a tire bead spreader or small jack to spread tire beads apart.

v. Using a flat tire iron, work tire flap (11) out of tire, being careful not to damage tube (12) and tire flap. Remove tube (12) from tire, being careful not to damage valve stem.

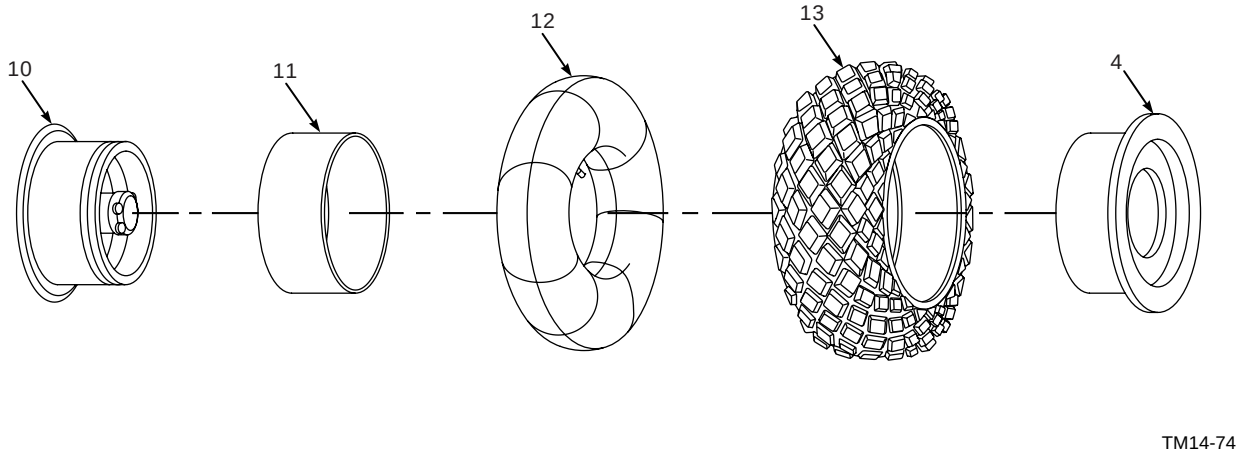


Figure 22. Removing Tire From Rim

5. Rim Maintenance

The following procedures pertain to all rims.

a. Inspect rim, lockring and flanges for damage or abnormal wear.

b. Inspect rim components for cracks, splits, or tears.

c. Remove rust, oil, and tire and rim lubricant residue from rim.

NON-DEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE − CONTINUED

6. Mounting

a. Install tire flap (11, Figure 22) and tube (12) into tire (13).

b. Lubricate both tire beads and tire flap (11) with tire and rim lubricant.

c. Place inner rim flange (10, Figure 23) on rim (4) and align drive lug (14) with slot in rim base.

d. With assistant, lean tire against rim (4) in an upright position.

NOTE

Refer to appropriate vehicle maintenance TM for jacking instructions and related safety precautions. If a crane or hoist is available, it may be used to raise and lower the tire instead of jacking the vehicle up and down as described below.

e. Have assistant lower vehicle until center of tire is aligned with rim (4) and push top of inner tire bead onto rim.

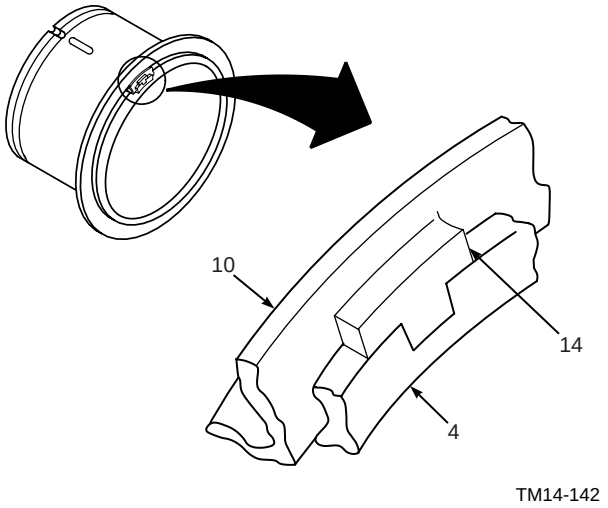


Figure 23. Aligning Inner Rim Flange and Drive Lug

f. Have assistant raise vehicle so weight of tire does not rest on ground. Push bottom of tire in as far as possible.

g. Have assistant lower vehicle so weight of tire will rest on ground. Push top of tire in as far as possible.

h. Repeat steps f and g until tire is completely on rim (4) and up against inner rim flange (10) and up off ground.

i. Place bead seat band (3) into outer rim flange (2) and align drive lug (14) on outer rim flange with slot in bead seat band.

j. Hook two tire irons (15, Figure 24) onto rim gutter approximately 4 inches (10.2 cm) from either side of valve stem.

6. Mounting − Continued

k. Keeping together as one unit, slide bead seat band (3) and outer rim flange (2) over both tire irons (15) and onto rim.

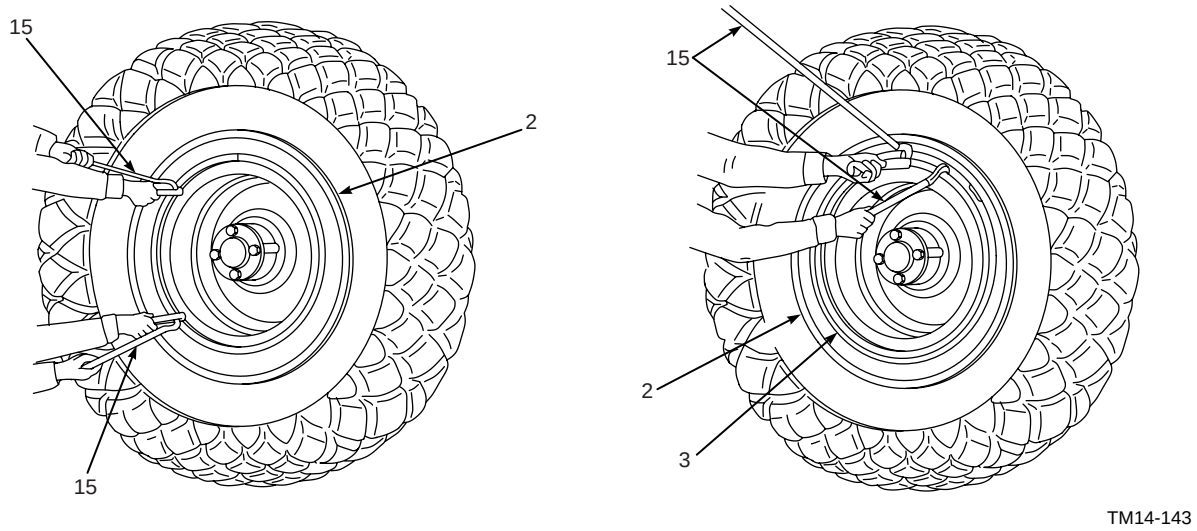


Figure 24. Installing Bead Seat Band and Outer Rim Flange

l. Working with assistant, work both tire irons (15, Figure 25) alternately, working bead seat band and outer rim flange onto rim.

m. Use tapered wedge of tire iron (16) placed between bead seat band (3) and rim base to hold bead seat band in place.

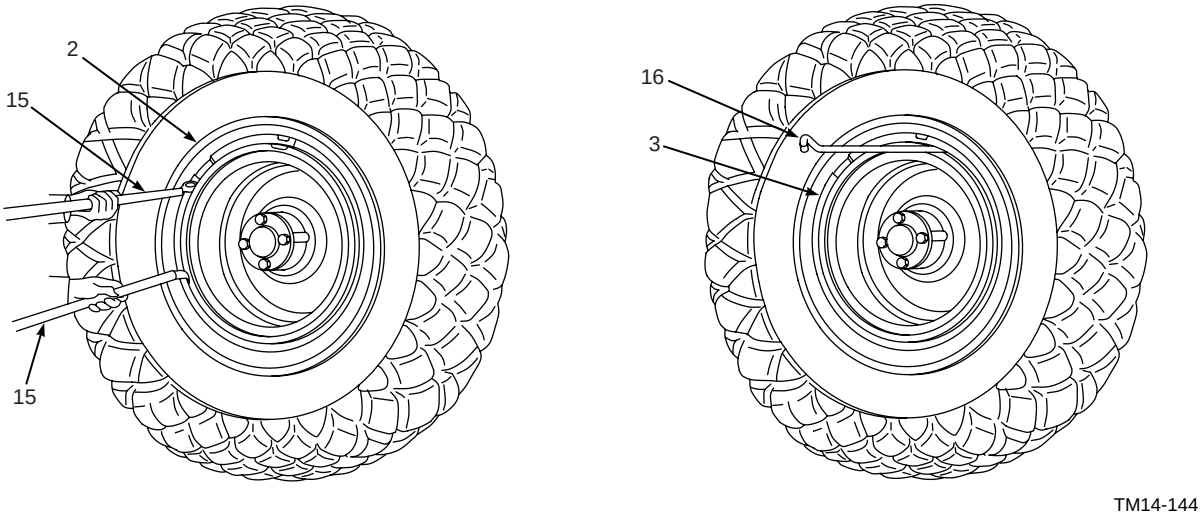


Figure 25. Holding Bead Seat Band in Place

NON-DEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE − CONTINUED

6. Mounting − Continued

n. Place end of lockring (5, Figure 26) without prying notch into gutter and adjacent to drive lug of outer rim flange (2).

o. With assistant, work progressively around rim (4), working bead seat band in and away from gutter as lockring (5) is pried over edge and into gutter of rim with lockring tire iron (6).

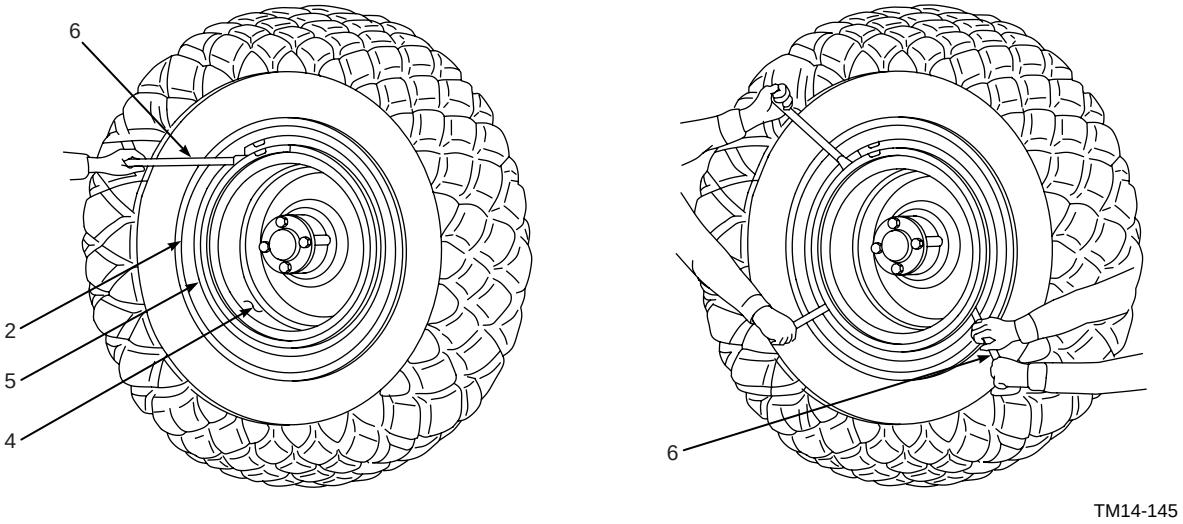


Figure 26. Installing Lockring

p. Remove all tools from rim and guide bead seat band and outer rim flange (2, Figure 27) out onto lockring (5). Ensure that drive lug (14) is positioned between ends of lockring.

q. Inspect all rim components to ensure that they are properly seated.

r. Install valve core (see Valve Core Replacement paragraph, WP0005 00).

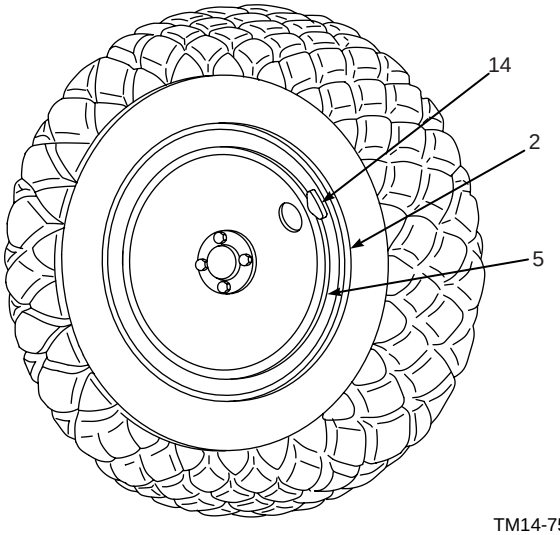


Figure 27. Positioning Bead Seat Band and Outer Rim Flange

6. Mounting − Continued

WARNING

WHEN INFLATING TIRES MOUNTED ON THE VEHICLE, ALL PERSONNEL MUST REMAIN A MINIMUM OF 10 FT (3.1 M) AWAY FROM TIRE AND NOT IN POSSIBLE PATH OF LOCKRING OR RIM FLANGE. SHOULD THEY FLY OFF, SERIOUS INJURY OR DEATH COULD RESULT.

IMPROPERLY SEATED RIM FLANGES OR LOCKRINGS MAY FLY OFF DURING INFLATION. NEVER ATTEMPT TO SEAT RIM FLANGE OR LOCKRINGS DURING INFLATION OR AFTER INFLATION. SERIOUS INJURY OR DEATH COULD RESULT.

NEVER INFLATE TIRES OVER 40 PSI (276 KPA) TO SEAT TIRE BEADS. IF BEADS DO NOT SEAT, DEFLATE, DEMOUNT, AND CHECK THE TIRE/RIM MATCH. MOUNT AND LUBRICATE ACCORDING TO INSTRUCTIONS. SERIOUS INJURY OR DEATH COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.

WHEN INFLATING TIRES ON NON-DEMOUNTABLE RIMS, ALWAYS USE A PNEUMATIC TIRE INFLATOR-GAUGE AND A 10 FT (3.1 M) HOSE. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.

s. Remove valve cap. Using a pneumatic tire inflator-gauge with 10 ft air hose (17, Figure 28), inflate tire (13) to 40 psi (276 kPa) maximum to seat both tire beads out against rim flange. Tire beads should seat before reaching 40 psi (276 kPa). If tire beads fail to seat, deflate tire, correct cause of failure, add additional tire and rim lubricant, and repeat this step.

t. Visually check that all rim components are properly seated. If they are not, deflate tire (13) and correct the problem.

u. Inflate tire to normal operating pressure (see appropriate vehicle TM). Visually inspect all rim components again to ensure that they are properly seated.

u. Install valve cap on valve stem.

v. Lower jack and remove from under vehicle (see appropriate vehicle TM).

6. Mounting − Continued

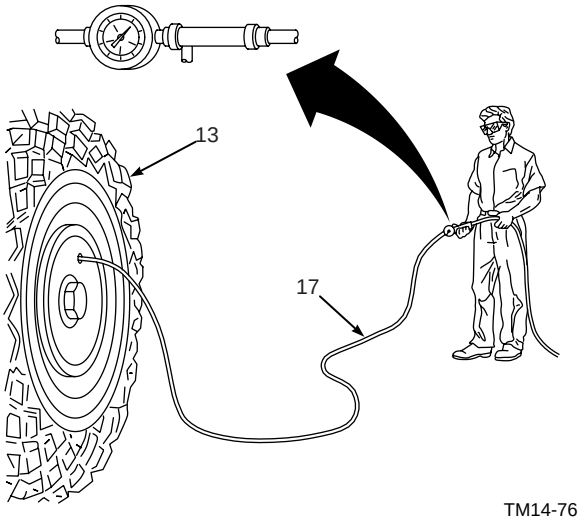


Figure 28. Inflating the Tire

END OF WORK PACKAGE

GENERAL SUPPORT MAINTENANCE **0007 00**

THIS WORK PACKAGE COVERS:
General Support Maintenance

GENERAL

1. This work package provides instructions for General Support maintenance units responsible for repairing tires. The type of repair depends on the extent, location, and type of damage.

2. The normal standard equipment condition to start a tire repair procedure is with the tire removed from the rim or wheel assembly. Equipment conditions will not be listed unless some other condition exists.

3. Personnel are listed only if a task requires more than one technician. A repair on a very large tire, for example, may require more than one technician to move and position the tire.

4. All items required to perform a spot repair or sectional repair on a damaged tire of any size are available in chemically vulcanizing repair materials. Tire section units, also referred to as tire patches, range in size from 3 inches (7.6 cm) in width containing two plies of reinforced cord to 30 inches (76.2 cm) in width containing 20 plies. One-piece sections and vulcanized plug units are available for injuries from1/4 inch (6.4 mm) to 2 inches (5.1 cm) in diameter. Rubber with the properties equivalent to those of better grades of tread stock is packaged in two parts, marked A and B. This rubber is used for making spot repairs, building plugs for sectional repairs, and repairing tubeless tire liners. Vulcanizing fluid is packaged in half-pints, quarts, and gallons. This vulcanizing fluid cures at room temperature, 70°F (21°C) or higher. All chemical agents should be stored in closed containers when not in use, opened only for immediate use, and closed again after use.

5. Chemically vulcanizing tire repair materials are manufactured so that the repairs require a minimum of time, effort, and equipment. The process involves the cure of a layer of vulcanized rubber. The layer of rubber capable of being vulcanized with the respective chemical fluid is usually referred to as the chemical cushion. The chemical fluid that contains the vulcanizing agent, or accelerator, capable of vulcanizing the chemical cushion is referred to as the vulcanizing fluid. The layer of chemical cushion is always an intricate part of the repair. At the time of application, the chemical cushion layer comes into contact with the vulcanizing agent and self-vulcanization, or chemical vulcanization, occurs.

TIRE REPAIR AND REPAIR LIMITS

1. General

This section provides information on the different types of repairs repair limitations for each type. The tire inspector and repair person need to be familiar with the types of repairs and limits set forth in this work package.

2. Types of Tire Repairs

There are three different types of tire repairs shown in this manual. The type of repair will depend on the type of injury, the extent of the injury, the location of the injury, and the construction characteristics and application of the tire. The three basic tire repair types are as follows:

a. Puncture Repair (also known as nail hole repair). This type of repair is for minor punctures in the tread crown area only. It consists of cleaning and buffing the damaged area, filling the injured cavity with a repair insert, stem, or material, and applying cement and a patch (repair unit) specifically designed for punctures, to the inner liner. Repair units may also come as a combination patch-plug (also known as a tee unit).

b. Spot Repairs. This type of repair is for filling outside injuries that only extend into the surface rubber on the tread, shoulder, and sidewalls of radial tires or no more than 25% of the actual plies of a bias tire. Because spot repairs are surface repairs, no reinforcement patch is needed

TIRE REPAIR AND REPAIR LIMITS − CONTINUED

2. Types of Tire Repairs − Continued

c. Section Repairs. This type of repair is for sidewall, shoulder, and tread crown injuries that usually extend through the casing or beyond 25% of the actual body plies of bias tires. Section repairs can be accomplished using a heated spotter to cure hole fill material and a reinforced patch (repair unit), or chemically cured fill materials and reinforced patch. Repair kits available from the military supply system and outlined in this manual do not require heat application with a spotter as they come with chemically vulcanized fill material and patch or chemically cured reinforced patch-plug combination (tee unit).

3. Non-Repairable Areas

Use Figures 1 and 2, and Table 1 to determine if tire injuries can be repaired. If tires are injured outside the repairable areas or beyond the tolerances indicated, the tire should be scrapped.

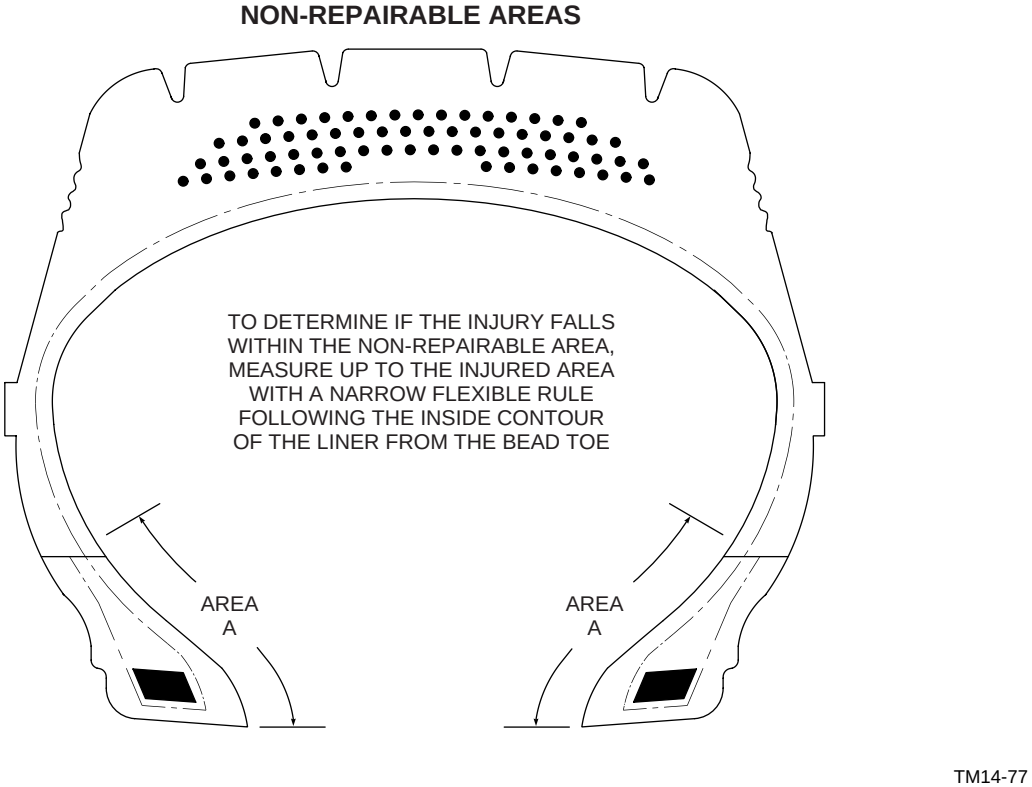
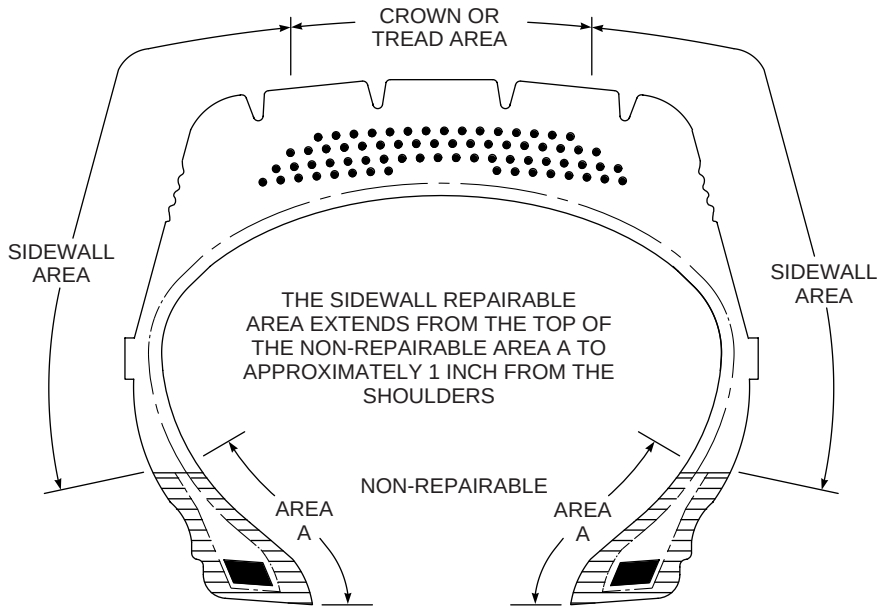


Figure 1. Non-Repairable Areas

TIRE REPAIR AND REPAIR LIMITS − CONTINUED

3. Non-Repairable Areas − Continued

RADIAL REPAIR AREAS



BIAS REPAIR AREAS

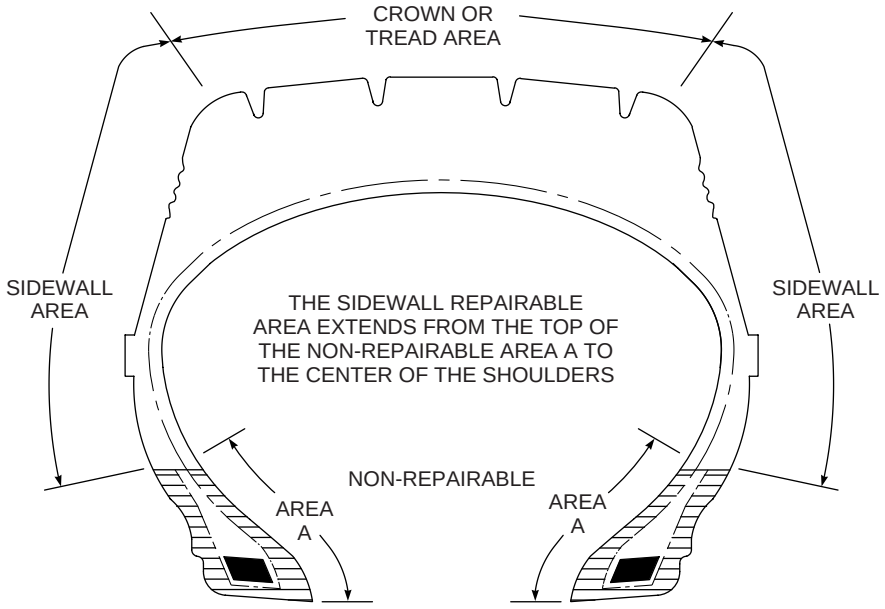


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Figure 2. Radial and Bias Tires Repair Area

TIRE REPAIR AND REPAIR LIMITS − CONTINUED

3. Non-Repairable Areas − Continued

Table 1. Non-Repairable Area A

TIRES	DIMENSION OF NON-REPAIRABLE AREA
All Passenger Car and All Light Truck Tire Sizes	2” (51 mm)
Truck Tires – Tube Type	
Up to 7.5 cross-section	3” (76.2 mm)
8.25 and above cross-section	3-1/2” (88.9 mm)
Truck Tires - Tubeless	
Up to 8.5 cross-section	3” (76.2 mm)
9 and above cross-section	3-1/2” (88.9 mm)
Off-Road Tires - Radial	
14.00R and smaller	3-1/4” (80 mm)
A5.5R, 17.5R, 20.5R	
15.00R – 24.00R 23.5R – 29.5R 25/65R – 30/65R	5” (125 mm)
27.00R – 33.00R	6” (150 mm)
33.25R – 37.5R 35/65R	6-1/4” (160 mm)
40.5R 40/65R – 50/65R, 40.5/75R	6-3/4” (171 mm)
36-00R	8” (203 mm)
37-00R – 40.00R 50.5R, 53.5R, 65.5R and larger	10” (254 mm)
Off-Road Tires - Bias	
14.00 – 15.00 15.5 – 17.5	4” (102 mm)
16.00 – 18.00 20.5 – 23.5	5” (127 mm)
21.00 – 24.00 26.5 – 33.25 30/65 27-56.5 – 30-56.5	6” (152 mm)
27.00 – 33.00 33.5 – 37.5 33-59.5 – 39-59.5 35/65	8” (203 mm)
53.5 – 58 41.25/70 40/65 – 65/65	10” (254 mm)
36.00 – 40.00	12” (305 mm)

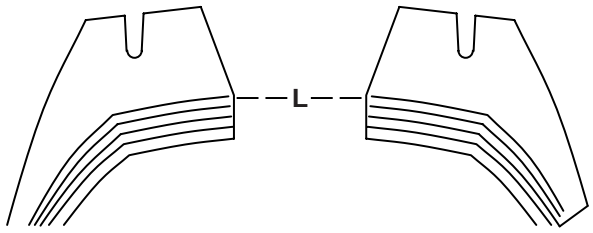
3. Non-Repairable Areas − Continued

Table 1. Non-Repairable Area A − Continued

TIRES	DIMENSION OF NON-REPAIRABLE AREA
Agricultural Tires – Radial	
13.6R – 16.9R	4” (102 mm)
18.4R	4-1/2” (114 mm)
20.8R	5-1/2” (140 mm)
Agricultural Tires – Bias	
13.9 and smaller	3” (76 mm)
14.9 – 20.8	4” (102 mm)
23.1 and larger	5” (127 mm)

4. Repair Area Measurements

a. Once the injury has been skived out, a measurement must be taken to ensure that the area to be repaired falls within repairable parameters. In bias ply tires, the largest measurement of cord damage, in any one direction is used (see Figure 3). In radial tires, the size of a sidewall injury is measured within a rectangle; the length of the damage is along the cords and the width of the damage is across the cords. The farthest points in both length and width are used. The size of a crown injury is determined by the maximum diameter of the damage (see Figure 4).



L = LARGEST MEASUREMENT OF CORD DAMAGE IN ANY ONE DIRECTION

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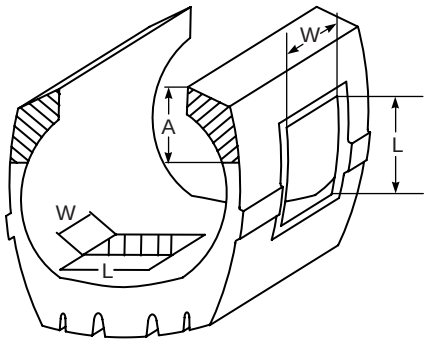
Figure 3. Bias Tire Repair Measurement

b. To determine if an injury is repairable, check the size and section width of the tire against Tables 2 and 3. Section width is the width of the tire from sidewall to sidewall, with the tire mounted and inflated but not loaded (see Figure 5). Section width is usually indicated in the first set of numbers of the tire size imprinted on the sidewall. For example, for a tire size of 11.00R22.5 the section width would be 11 inches.

4. Repair Area Measurements − Continued



A = NON-REPAIRABLE AREA
L = LENGTH OF THE INJURY WHEN MEASURED IN THE DIRECTION OF THE RADIAL PLY
W = WIDTH OF THE INJURY WHEN MEASURED ACROSS THE WIDEST LENGTH OF RADIAL PLIES

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Figure 4. Radial Tire Repair Measurement

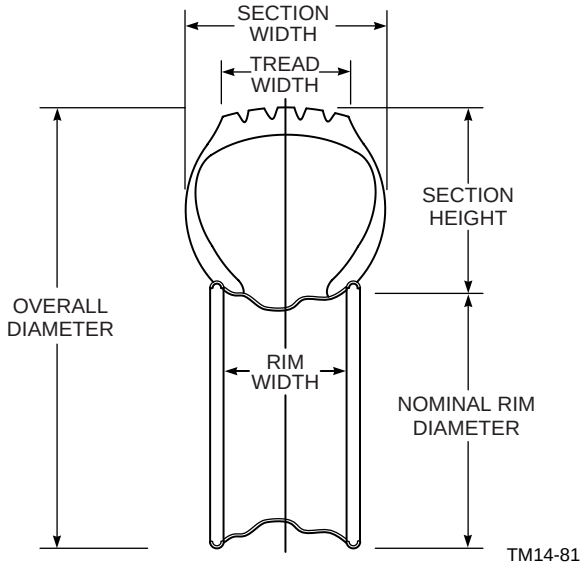

Figure 5. Section Width Measurement

TIRE REPAIR AND REPAIR LIMITS – CONTINUED

4. Repair Area Measurements − Continued

Table 2. Maximum Section Repair Limits for Radial Tires

Tire Cross Section Size	SIDEWALL Maximum Injury Dimensions		TREAD Maximum Injury Diameter
	Width	Length	
Light Truck: 7.50R or 85 cross section or smaller	3/8" (10 mm)	3-1/8" (83 mm)	1" (25 mm)
Any other LT size	1" (25 mm)	2" (51 mm)	1" (25 mm)
Medium/Heavy Truck/Trailer: 7.50R or 8R	3/8" (10 mm) 3/4" (19 mm) 1" (25 mm)	3-1/8" (10 mm) 2" (51 mm) 1" (25 mm)	1" (25 mm)
8.25R or 9R	3/8" (10 mm) 3/4" (19 mm) 1" (25 mm)	4" (102 mm) 3" (76 mm) 2" (51 mm)	1" (25 mm)
9.00R or 10R	3/8" (10 mm) 3/4" (19 mm) 1-1/2" (38 mm)	4-1/2" (114 mm) 3" (76 mm) 2" (51 mm)	1" (25 mm)
10.00R or 11R	3/8" (10 mm) 3/4" (19 mm) 1-1/2" (38 mm)	4-1/2" (114 mm) 3" (76 mm) 2" (51 mm)	1" (25 mm)
11.00R or 12R	3/8" (10 mm) 3/4" (19 mm) 1-1/2" (38 mm)	4-1/2" (114 mm) 3" (76 mm) 2" (51 mm)	1" (25 mm)
12.00R or 13R	3/8" (10 mm) 3/4" (19 mm) 1-3/4" (44 mm)	5" (127 mm) 4" (102 mm) 2" (51 mm)	1" (25 mm)
Military Tactical Tires: 37.00/12.50R	1" (25 mm)	2" (51 mm)	1" (25 mm)
14.00R, 14R 16.00R, 16R	3/8" (10 mm) 3/4" (19 mm) 1-3/4" (44 mm)	5" (127 mm) 4" (102 mm) 2" (51 mm)	1" (25 mm)

Note: Dimensions shown are for general guidance. Repair material manufacturer's recommendations may differ. If specific limits are provided with repair material/kits and they differ from the above, always follow the guidance of the repair material manufacturer.

TIRE REPAIR AND REPAIR LIMITS – CONTINUED

4. Repair Area Measurements − Continued

Table 3. Maximum Section Repair Limits for Bias Tires

TIRE SIZE	MAXIMUM INJURY SIZE In the Sidewall Area (length or width)	MAXIMUM INJURY SIZE In the Crown Area (length or width)	MAXIMUM NO. OF REPAIRS for Tires used on Tactical Vehicles (*see notes below)
Light Truck, Highway Tires:			
All Sizes, Load Range E (10 ply rating) or less	2" (51 mm)	2" (51 mm)	*
All Sizes, Load Range F (12 ply rating) or more	2-1/2" (64 mm)	2-1/2" (64 mm)	*
Medium/Heavy Truck Tires:			
7.50-20/8-22.5	7/6" (11 mm)	7/8" (22 mm)	1*
8.25-20/9-22.5	17/32" (13 mm)	1-1/16" (27 mm)	1*
9.00-20/10-22.5	5/8" (16 mm)	1-1/4" (32 mm)	1*
10.00-20/11-22.5	5/8" (16 mm)	1-1/4" (32 mm)	1*
10.00-22/11-24.5	3/4" (19 mm)	1-1/2" (38 mm)	1*
11.00-20/12-22.5	3/4" (19 mm)	1-1/2" (38 mm)	2*
11.00-22/12-24.5	3/4" (19 mm)	1-1/2" (38 mm)	2*
11.00-24	7/8" (22 mm)	1-3/4" (44 mm)	2*
12.00-20/12.00-24	1"(25 mm)	2" (51 mm)	2*
Military Tactical Light Truck and Special Application Tires:			
6.00-16, 7.00-16 LW,	(Not repairable)	(Not repairable)	*
7.50-10, 7.50-16	(Not repairable)	(Not repairable)	*
9.00-16	1	2-1/4" (57 mm)	1*
36.00/12.50-16.50	2" (51 mm)	2" (51 mm)	2*
Military Tactical Truck/Trailer Tires:			
	3-1/2 " (89 mm)	2-1/2" (64 mm)	2*
14.00-20	3-1/2" (89 mm)	2-1/2" (64 mm)	2*
14.00-24	3-1/2" (89 mm)	2-1/2" (64 mm)	2*
16.00-20			

***NOTE: Maximum number of repairs for tires mounted on vehicles with a tactical mission (on and off highway use). When two sectional repairs are permitted, they must be 1/3 the tire circumference apart.**

***NOTE: There are no total maximum amount limits established for standard highway tires, except that there should not be more than one repair per tire quadrant, and patches (repair units) must not overlap.**

***NOTE: The above standards apply to General Support tire repair facilities and are not intended to be imposed upon commercial retreaders who may have the capability to conduct repairs beyond these limits.**

TIRE REPAIR PROCEDURES, SELF-VULCANIZING SPOT REPAIR

1. Initial Setup

The equipment condition cited in paragraph 2, General, at the beginning of this WP, must be established prior to performing any tire repair.

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Vacuum Cleaner (Item 14, WP0011 00) or air nozzle
- Air-cooled finishing rasp (Item 44, WP0011 00)
- Cementing and vulcanizing stitcher (Item 47, WP0011 00)
- Wheel Assembly tool (Item 52, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Tire repair filler (Item 84, WP0012 00)
- Rubber buffer fluid (Item 100, WP0012 00)
- Cement primer (Item 97, WP0012 00)
- Rag (Item 98, WP0012 00)

4. Repair

WARNING

USE CLEANING FLUIDS AND VULCANIZING FLUIDS IN A WELL-VENTILATED AREA. READ ALL WARNINGS AND CAUTIONS ON CONTAINERS. PROLONGED INHALATION OF FUMES COULD BE A HEALTH HAZARD.

a. Using an air-cooled finishing rasp, remove all loose rubber and frayed cords from damaged area, being careful to remove a minimum of material.

b. Buff an area 2 inches (51 mm) larger than actual area being repaired

WARNING

WHEN USING COMPRESSED AIR, ALWAYS WEAR SAFETY GOGGLES TO PREVENT DIRT AND DEBRIS FROM GOING INTO EYES. COMPRESSED AIRSTREAM MUST BE LESS THAN 30 PSI (207 KPA).

c. Remove buffing dust with vacuum cleaner or air nozzle. Clean buffed area only with a rag wet with rubber buffer fluid.

TIRE REPAIR PROCEDURES, SELF-VULCANIZING SPOT REPAIR – CONTINUED

4. Repair − Continued

CAUTION

Do not contaminate repair area by touching applicator on uncleaned, unbuffed area around repair. If area becomes contaminated, repair may fail when tire is returned to service.

d. Brush one coat of primer cement onto buffed area. Primer cement may also be applied to cord body. Allow primer cement to dry for a minimum of 1 hour to a maximum of 24 hours. If allowed to dry more than 24 hours, clean area with rubber buffer fluid and repeat this step.

e. Mix approximately equal amounts of A and B tire repair filler together in sufficient quantities to fill damaged area.

f. Brush one coat of vulcanizing fluid over dried primer cement.

g. Apply mixed A and B tire repair filler by spreading over prepared area (1, Figure 6) in thin layers, stitching each layer thoroughly with hand stitcher, and building damaged area up to just above the outside surface of tire.

h. Self-vulcanization will be complete in approximately 20 hours at room temperature, 70°F (21°C). The time required for vulcanization can be reduced by using a spot press as described in the next paragraph.

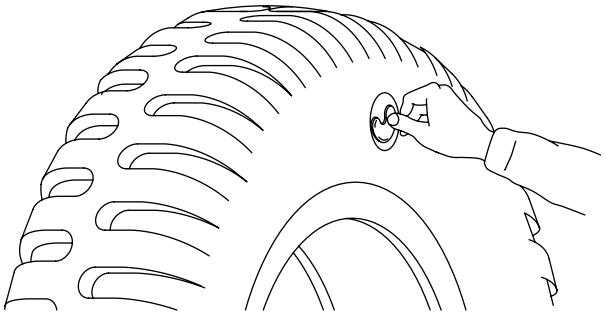

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Figure 6. Self-Vulcanizing Spot Repair

TIRE REPAIR PROCEDURES – SPOT REPAIR USING SPOTTER PRESS FOR HEAT AND PRESSURE

1. Initial Setup

The following equipment condition must be established prior to performing any tire repair.

- Tire prepared as described in the preceding paragraph, prior to mounting tire on spot press

3. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Air-cooled finishing rasp, 120-grit (Item 44, WP0011 00)
- Spot press vulcanizer (see note below)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Metal foil (Item 26, WP0012 00)

4. Repair

NOTE

Spot press vulcanizers are currently not available through the military supply system. The instructions below are provided for those General Support units that are authorized and have locally purchased spot press vulcanizers from commercial sources.

a. Pack metal foil into tread pattern and between lugs to prevent flow of repair material under heat and pressure of spotter press.

WARNING

IMPROPER USE OF POWER EQUIPMENT OR USE OF FAULTY OR DAMAGED POWER EQUIPMENT COULD CAUSE SERIOUS INJURY OR DEATH.

b. Set up spot press (2, Figure 7) with tread, shoulder, sidewall contour plates, or contour bags as applicable to the repair.

c. Mount tire (1) on spotter press (2).

TIRE REPAIR PROCEDURES – SPOT REPAIR USING SPOTTER PRESS FOR HEAT AND PRESSURE – CONTINUED

4. Repair − Continued

NOTE

If all-purpose rubber or tread rubber is applied to the repair, vulcanization from 280°F-300°F (138°C -149°C) will be 6 minutes per 2 inch (50.8 mm) depth of rubber used. If mixed A and B tire repair filler is used, vulcanization from 280°F-300°F (138°C-149°C) will be 1 minute per 2 inch (50.8 mm) depth of filler used.

d. Vulcanize repair at 280°F-300°F (138°C-149°C) for the period of time specified in note above.

e. When tire has cooled to room temperature, remove tire (1) from spotter press (2). Repair may be buffed smooth on the outside surface using an air-cooled finishing rasp.

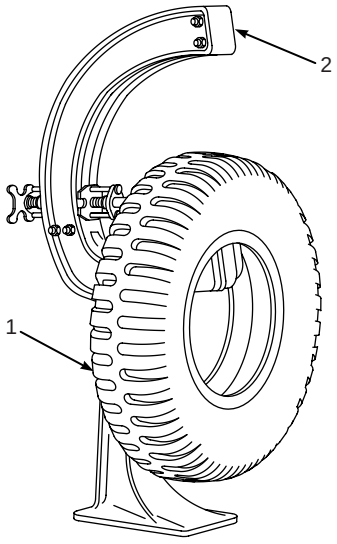

Figure 7. Spot Press Vulcanizer

TIRE REPAIR PROCEDURES – SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER

1. Initial Setup

The equipment condition cited in paragraph 2, General, at the beginning of this WP, must be established prior to performing any tire repair.

2. Tools and Test Equipment

The following list of tools and test equipment are required to perform tire repair:

- Drill cutter
- Awl, scratch (Item 4, WP0011 00)
- Vacuum Cleaner (Item 14, WP0011 00) or air nozzle
- Air-cooled finishing rasp, 36-grit (Item 44, WP0011 00)
- Cementing and vulcanizing stitcher (Item 47, WP0011 00)
- Wheel Assembly tool (Item 52, WP0011 00)

3. Materials and Parts

The following materials and/or parts are required to perform tire repair:

- Tee unit (Item 9, Table 5, WP0012 00)
- Marking Crayon (Item 18, Table 7, WP0012 00)
- Rubber buffer fluid (Item 30, Table 7, WP0012 00)
- Vulcanizing fluid (Item 19, Table 7, WP0012 00)
- Rag (Item 29, Table 7, WP0012 00)

4. Repair

WARNING

USE CLEANING FLUIDS AND VULCANIZING FLUIDS IN A WELL-VENTILATED AREA. READ ALL WARNINGS AND CAUTIONS ON CONTAINERS. PROLONGED INHALATION OF FUMES COULD BE A HEALTH HAZARD.

NOTE

Section repairs can be made on any size tire. This type of repair is commonly called a tee unit repair. The tee unit is available in a range of sizes that will repair injuries 1/4 inch (6.4 mm) to 2 inches (51 mm) in diameter. The tee unit method offers the greatest advantage in section repairs with respect to effort, tools, equipment, mobility, tire preservation, and repair time.

a. Probe damage (2, Figure 8) with awl, removing any glass, metal, or other debris, and determine angle of penetration.

b. Drill out all damaged material using smallest hollow drill cutter available, and select tee unit (1). See Tables 4 through 6 at the end of this procedure.

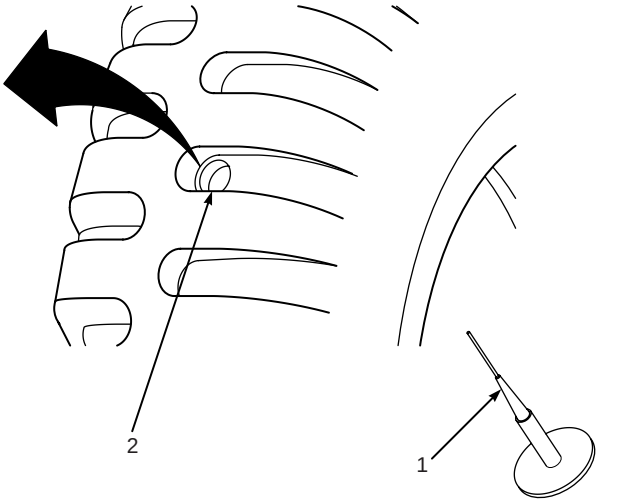

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Figure 8. Section Repair Using a Tee Unit

4. Repair – Continued

c. Using a marking crayon, draw two straight lines (2 and 3, Figure 9) through center of drilled hole (4). The lines should cross the center of hole at right angles, one parallel and one perpendicular to beads of tire.

d. Using tee unit (1) as a template, outline inside of tire 2 inches (51 mm) larger than the patch of the tee unit.

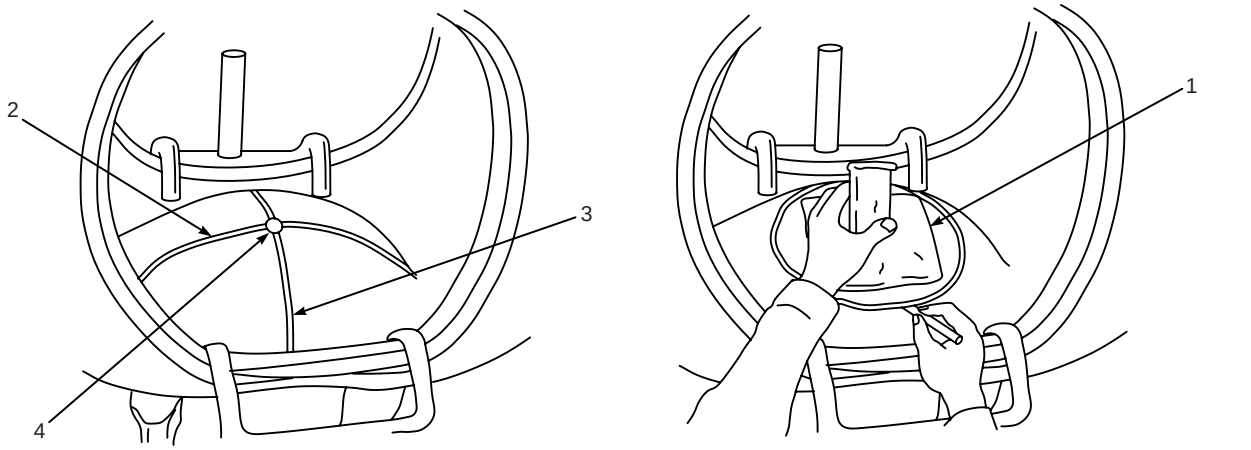

Figure 9. Marking Repair Area

WARNING

USE CLEANING FLUIDS AND VULCANIZING FLUIDS IN A WELL-VENTILATED AREA. READ ALL WARNINGS AND CAUTIONS ON CONTAINERS. PROLONGED INHALATION OF FUMES COULD BE A HEALTH HAZARD.

e. Using an air-cooled finishing rasp and, being careful not to buff through inner tire liner, buff patch area to a smooth velvet-like surface (see Figure 10).

WARNING

WHEN USING COMPRESSED AIR, ALWAYS WEAR SAFETY GOGGLES TO PREVENT DIRT AND DEBRIS FROM GOING INTO EYES. COMPRESSED AIRSTREAM MUST BE LESS THAN 30 PSI (207 KPA).

f. Using a vacuum cleaner or air nozzle, remove buffing dust. Clean only buffed area with a rag wet with rubber buffer fluid.

g. Brush one coat of vulcanizing fluid onto buffed area and inside drilled hole.

4. Repair – Continued

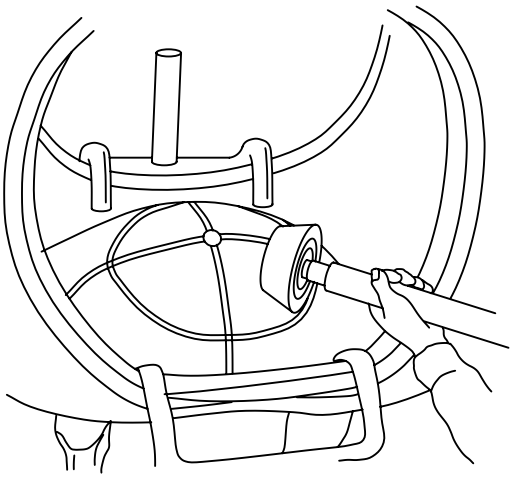

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Figure 10. Buffing Patch Area

h. After vulcanizing fluid has dried approximately 20 minutes, tee unit can be installed. Lubricate inner edge of drilled hole with vulcanizing fluid to ensure that patch seats firmly against prepared surface. Do not let any vulcanizing fluid become trapped under the patch.

i. Pull stem of tee unit with enough force to seat patch firmly against inner liner of tire.

j. Thoroughly stitch patch (repair unit) with hand stitcher, working progressively from center of patch to edge of patch (see Figure 11).

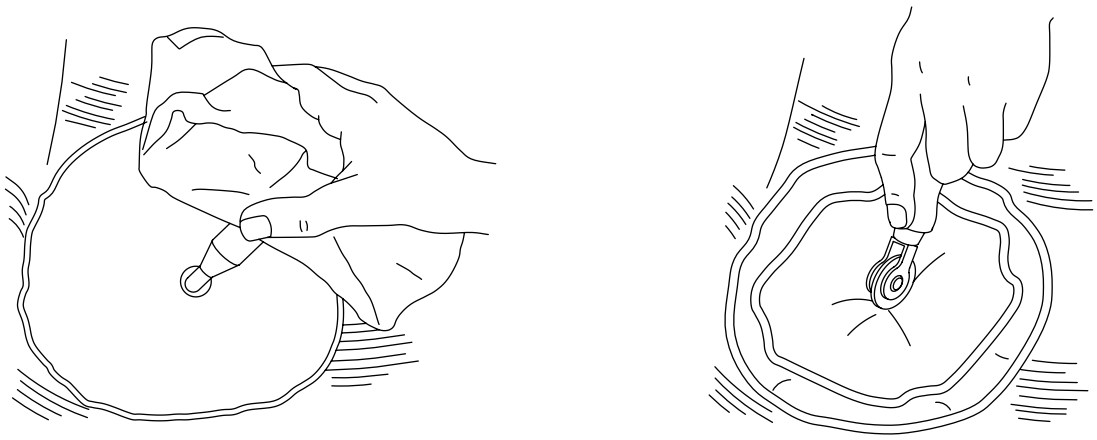

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Figure 11. Installing Tee Unit

4. Repair – Continued

k. Trim excess plug length to 1/8 inch (3.2 mm) above surface of tire.

l. After tee unit has been installed and excess plug length properly trimmed, tire may be returned to immediate service.

Table 4. Tee Units, Passenger Car and Light Truck Tires

CUTTER CODE	TEE UNIT CODE	TEE UNIT INCH(ES)	STEM DIAMETER cm	TEE UNIT INCH(ES)	TOP COVER SIZE cm
1C	T1P	5/16	0.79	2-3/8	6.03
3C	T3P	1/2	1.27	3	7.62
4C	T4P	5/8	1.59	3	7.62
3C	T3	1/2	1.59	3	7.62
4C	T4	5/8	1.59	4	10.16
5C	T5	13/16	2.06	5	12.70
6C	T6	1	2.54	5-1/2	13.97
7C	T7	1-1/4	3.17	7	17.78

TIRE REPAIR PROCEDURES – SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER − CONTINUED

4. Repair – Continued

Table 5. Tee Units, Large Truck and Grader Tires

CUTTER CODE	TEE UNIT CODE	TEE UNIT INCH(ES)	STEM DIAMETER cm	TEE UNIT INCH(ES)	TOP COVER SIZE cm
8AC	TBA/1O	1-3/8	3.49	10	25.40
8BC	TBC/1O	2	5.08	10	25.40
8CC	TBC/15	2	5.08	15	38.10

Table 6. Tee Units, Earthmover Tires

CUTTER CODE	TEE UNIT CODE	TEE UNIT INCH(ES)	STEM DIAMETER cm	TEE UNIT INCH(ES)	TOP COVER SIZE cm
10CT	T1OB/15	1-5/8	4.13	15	38.10
10CT	T1OE/2O	3	7.62	20	50.80
10CT	T1OE/24	3	7.62	24	60.96

PRELIMINARY INSPECTION AND CONDITION CLASSIFICATION OF TIRES

1. Purpose

These instructions are published for use by personnel responsible for inspection, classification, and assigning of Condition Readiness Codes (CRC) for pneumatic tires. This is a guide for:

a. Identifying tires not requiring repairing/retreading that should be returned to the supply system for reissue (CRC B for repaired tires). See note on next page and Table 2-12.

b. Identifying unserviceable and economically repairable tires (CRC F).

c. Identifying unserviceable (condemned) or uneconomically repairable tires (CRC H).

These instructions apply to Direct Support, General Support, and Depot Maintenance; however, all categories of maintenance personnel should familiarize themselves with the contents of this section.

Regardless of tire condition, installations should not return used tires to depots for disposal, retreading or re-issue. A depot will not issue credit to the installation turning in used tires, serviceable or unserviceable. Generally, there are only three actions to take with a used tire depending on the condition:

a. Used tires that are serviceable are to be retained and reused within the installation whenever possible (see note on next page and Table 7). If the used tire no longer has an application, it should be turned into the Defense Reutilization and Marketing Office (DRMO).

b. Used tires that are unserviceable but repairable are to be repaired, if within the repair criteria, and turned into DRMO if unrepairable.

c. Used tires that are worn beyond tread wear limits are to be retreaded. If they cannot be retreaded due to authorized restrictions, or they exceeded tread wear limits (non-retreadable), they should be turned into the DRMO as unserviceable, uneconomically repairable.

Depots do not have the responsibility for any of the above actions.

2. Condition Readiness Codes

The following condition readiness codes are applicable to pneumatic tires and are defined as follows:

a. Code A: New, unused tire or unused retread free of defects.

b. Code B:
- Serviceable used and repaired (not retreaded) tire free of defects. Refer to the note on the next page and Table 7.
- Any new, unused tire where the manufacture date cannot be determined.

c. Code F: Unserviceable, economically repairable tire that requires repair or retreading to become serviceable.

d. Code H: Unserviceable, uneconomically repairable tire. Any tire not used within 60 months from date of manufacture or since the last retread.

PRELIMINARY INSPECTION AND CONDITION CLASSIFICATION OF TIRES − CONTINUED

2. Condition Readiness Codes − Continued

NOTE

Appendix 11-33, AR 725-50, indicates that CRC B Code C is a serviceable item (issuable, with qualification). It further explains that it is new, used (with 50 percent or more tread remaining), repaired, or reconditioned material that is serviceable and issuable for its intended purpose, but which is restricted from issue to specific units, activities, or geographical areas by reasons of its limited usefulness or short service life expectancy. As a matter of clarification, a properly repaired/retreaded tire has a serviceable classification. Repair procedures and specifications have been established to ensure that repaired tires meet the standards of serviceability. Retreads, on the other hand, are tested and qualified to perform at the same level as new tires. To this end, the guidance of the Department of Transportation and the methods and techniques developed by industry are followed. The condition Code B is assigned to repaired tires and condition code A to retreads for control and identification purposes only and has no connection to the limited usefulness or short service life expectancy as defined in Appendix 11-33, AR 725-50.

Tires will not be retreaded if they have more tread than the minimum specified in Table 7 when measured at three equally spaced points around the circumference of the tire as close as practicable to tread center. This table is intended for supply personnel issuing tires. It does not apply to tires mounted on vehicles.

The minimum tread depths in this table are the equivalents of roughly 50 percent of new or retreaded tire tread depth, measured to the nearest 1/32 inch. This table is for ready to issue tires.

The minimum tread depths indicated apply to bias and radial tires of similar sizes and applications. Whereas a Truck, Highway Design, 11.00-20 (bias size) minimum tread depth would be the same as for a Truck, Highway Design, 11.00R20 (radial size).

2. Condition Readiness Codes − Continued

Table 7. Serviceable Used Tire Table

TIRE TYPE	TIRE SIZE (radial or bias)	MINIMUM TREAD DEPTH (inch)
Passenger Car Tires	6.00-13, (A-78-13) 9.50-14, 6.00-15 8.90-15, 6.00-16 8.90-16	6/32 (4.8 mm)
Light Truck, Highway Design	6.00-16, 7.00-16, 6 ply 9.00-16, 8 ply 7.00-20, 8.25-20	6/32 (4.8 mm)
Truck, Highway Design	9.00-20, 10.00-20, 11.00-20 12.00-20, 13.00-20, 14.00-20 9.00-22, 10.00-22, 11.00-22 12.00-22, 13.00-22, 14.00-22 9.00-24, 10.00-24, 11.00-24 12.00-24, 13.00-24, 14.00-24	8/32 (6.4 mm)
Nondirection Military Desert Sand (Flotation)	11.00-18, 12.50-20, 11.75-20	6/32 (4.8 mm)
Special Service. Earthmover	13.00-20, 13.00-24, 13.00-25	12/32 (9.5 mm)
Directional, M706	14.00-20, 26 ply sidewall 12 ply rated	13/32 (10.3 mm)
Grader, Tractor Industrial. Etc.	14.00-20, 14.00-21	
	14.00-24, 14.00-25	15/32 (11.9 mm)
	16.00-20, 16.00-21	
	16.00-24, 16.00-25	17/32 (13.5 mm)
	18.00-24, 18.00-25	19/32 (15.1 mm)
	21.00-24, 21.00-25	18/32 (14.3 mm)
Industrial, Earthmover Type Tread DRC	20.50-25,	21/32 (16.7 mm)
	24.00-25, 24.00-29	
	32.50-25	22/32 (17.5 mm)
	26.50-25	
	27.00-33	23/32 (18.3 mm)
	29.50-25, 29.50-29	24/32 (19.0 mm)
	33.53-33	25/32 (19.8 mm)
	30.00-33, 30.00-41	26/32 (20.6 mm)
	36.00-41	28/32 (22.2 mm)
	37.50-33, 37.50-39	8/32 (6.4 mm)
Low Platform Trailer, Highway Design	7.50-15, 8.25-15 9.00-15, 10.00-15	8/32 (6.4 mm)
Nondirectional Cross Country, Mud and Snow Design	6.00-16, 6.50-16, 7.00-16, 7.50-16,	10/32 (7.9 mm)

2. Condition Readiness Codes − Continued

Table 7. Serviceable Used Tire Table − Continued

Nondirectional Cross Country, Mud and Snow Design - Continued	9.00-16, 7.00-20, 7.50-20, 8.25-20, 9.00-20, 10.00-20, 11.00-20, 12.00-20, 10.00-22, 11.00-22, 12.00-22, 11.00-24,12.00-24, 10.50-18, 14.00-20, 14.00-24,16.00-25	10/32 (7.9 mm) 12/32 (9.5 mm)

3. Preliminary Inspection

The following are two types of visual preliminary inspections used to classify a tire:

a. The visual inspection is performed, as a preliminary survey, to select those tires that are obviously nonrepairable, or CRC H. These are tires that have worn excessively to the cord body, blown out, have been run flat, have nonrepairable injuries and/or are torn to pieces, or have been burned in a fire. If the tire is repairable and not completely destroyed, it should be classified CRC F, and turned in for repairing/retreading. It is the responsibility of the local command to establish procedures to authorize classification and disposal of these tires at unit or higher categories of maintenance.

b. Tires that do not show any obvious reason for CRC H classification as stated above should be placed on a tire inspection spreader. This tire will be thoroughly inspected for hidden injuries to determine the proper classification. Any tire not showing an evident reason for CRC H classification will be turned in to the repair facility as CRC F for further inspection, classification, and repair/retreading and/or disposal.

DEFINITIONS

Refer to Glossary, WP0014 00

TIRE INSPECTION CRITERIA

1. General

This section applies to those categories of maintenance authorized to repair or retread pneumatic tires or to determine the repairability/retreadability of tires.

2. Retread/Repair Methods

Refer to subparagraph 4, Inspection Marking of Tires, for inspection marking codes to be used on Code F tires. Remember, not all tires that come to Depot or General Support Maintenance are Code F.

3. Tips For The Inspector

a. Remove foreign objects using long-nosed pliers (Item 43, WP0011 00). The presence of foreign objects is dangerous during buffing.

b. Keep in mind that fabric fatigue is evident if discoloration or streaks are noted in the inside shoulder area.

c. The inner liner inspection of tubeless tires is most important. Tubeless tires must have airtight integrity. The smallest hole in the inner liner will cause failure of the tire. Locate every hole in the inner liner by visual inspection and by probing each and every defect. Using the best lighting available for visual inspection is essential.

d. Probe each tire for ply separation. Moisture is the primary cause of ply separation. Sometimes it appears as a blister or bulging at the shoulder. At other times it will be undetectable until the tire is buffed. Since a tire is classified Code H if a separation is found, the inspector will save money if ply separation is found prior to buffing.

e. Recognize that there is no substitute for a thorough primary inspection. The inspector must:

(1) Have adequate tools. Recommended tools and equipment:

- Awl, Saddler's Pad (Item 3, WP0011 00)
- Tire Crayon, Marking (Item 18, WP0012 00)
- Depth Gauge Rule (Item 22, WP0011 00)
- Pliers (Item 43, WP0011 00)
- Light, Extension (Item 39, WP0011 00)

(2) Have adequate lighting for the inspection spreader.

(3) Use proper markings in the classification of repairs/retreading.

(4) Know the characteristics of the tire being inspected to properly determine the type of repair/retreading required.

4. Inspection Marking of Tires

a. During inspection of tires, clearly mark with yellow marking crayon (Item 18, WP0012 00) the locations of deficiencies as stipulated in Table 8.

TIRE INSPECTION CRITERIA – CONTINUED

4. Inspection Marking of Tires – Continued

Table 8. Inspection Marking of Tires

METHOD	TYPE	INSPECTION MARKING
Retread – Hot Cured Method		
Full	Type I-A	R-3
Top	Type I-B	T-1
Relugged	Type I-C	R-2
Bead to bead	Type I-D	M-4
Repair		
Section	Type II-D	X
Spot	Type II-B	(Circle)
Reinforcement	Type II-C	R-4
Nail hole	Type II-A	X on each bead
Retread – Pre-cured Tread Method		
Top	Type III	T2

b. Tires classified by a qualified inspector as CRC H will be marked with a letter H on at least three places inside the tire and one place on the sidewall using marking crayon. Lettering should be as large as possible and at least 3 inches by 2 inches (7.6 cm by 5.1 cm).

c. Prior to submitting Code F tires to a commercial contractor for repair/retreading, the inspector will sign his name inside the tire with a yellow marking crayon. This will enable the using unit to identify the tire when it is returned, thereby protecting government property.

The Tire Inspection Checklist and criteria, Figure 12, provides the minimum requirements for the proper control in the classification of tires. It is recommended that this page be removed and copied for regular and frequent use.

TIRE INSPECTION CRITERIA – CONTINUED

4. Inspection Marking of Tires – Continued

TIRE INSPECTION CHECKLIST

Conduct inspection in order listed. If item is not evident or applicable, leave blocks blank. If item is evident or appropriate, check block accordingly — accept or reject. At first indication of reject, tire is coded H and no further inspection is necessary.

1. Commercial _____
2. Military _____
3. Oversize _____
4. Classification Code:
   - A _____
   - B _____
   - F _____
   - H _____
3. Size _____
4. Ply _____
5. NSN _____
6. Serial No. _____
7. Inspection Items:

		ACCEPT	REJECT
(a)	Tread depth	_____	_____
(b)	Ply separation and/or crease/buckle	_____	_____
(c)	Flex breaks, X breaks, or impact breaks	_____	_____
(d)	Injury to cord plies in bead area	_____	_____
(e)	Broken, bent, kinked, or exposed bead wires	_____	_____
(f)	Loose cords inner ply	_____	_____
(g)	Radial cracking into cord	_____	_____
(h)	Cord injury requiring repair or prev. repair	_____	_____
(i)	Tubeless tires and tube tires with holes	_____	_____
(j)	Tubeless tires damage in chafer fabric	_____	_____
(k)	Liner splice damage	_____	_____
(l)	Tread separation exposing fabric	_____	_____
(m)	Tire worn to fabric	_____	_____
(n)	Deformed tire	_____	_____
(o)	Fire or heat damage	_____	_____

8. Date _____
9. Inspector _____
10. Unit _____

Figure 12. Tire Inspection Checklist

TIRE INSPECTION CRITERIA – CONTINUED

5. Passenger Car Tire Inspection Criteria

Tires that contain any of the following deficiencies are not acceptable for repairing/retreading and will be classified CRC H.

a. Ply separation.

b. Tread, shoulder, or sidewall separation (between rubber and cord).

c. Weatherchecking that cannot be satisfactorily removed by buffing or with openings extending 2/32 inch (1.6 mm) or deeper or to the cord body or when 2 or more cracks join together to form a straight or arced line.

d. Radial split(s) that cannot be completely removed without damage to cord.

e. Any groove or shoulder cracking that cannot be satisfactorily removed by buffing.

f. Nonrepairable sidewall splits or cuts.

g. Loose cords on the inner ply or evidence of having been run flat.

h. Exposed, kinked, or damaged bead wires.

i. Generally weakened or deteriorated condition due to age, moisture, or exposure to other severely destructive influences.

j. Oil-soaked or permanently deformed due to faulty maintenance or storage conditions.

k. Casing that, when processed, will not meet dimensional requirements.

l. Any injury requiring a reinforcement or sectional repair or evidence of having had a previous repair of this type.

m. Less than full four-ply construction unless the original casing construction is reinforced with breaker strips or belt; a belted tire that has two plies in sidewall plus two belts (2 + 2) is retreadable.

n. Three or more adjacent cords broken in any ply: old injuries, including nail hole repairs, shall be investigated and, if compliance with this requirement cannot be determined, the casing shall be rejected.

o. Tubeless tires incapable of providing air retention equal to that of a conventional tire and tube; porous liner; splices that show exposed fabric or can be suspected of opening to the fabric during the new tread life of the tire.

p. Wear extending to the fabric or so close to the fabric that the top cord ply (or breaker, or belt) will be exposed by buffing.

TIRE INSPECTION CRITERIA − CONTINUED

6. Light, Medium, And Heavy Truck/Trailer (Including Military) And Industrial Tire Inspection Criteria

All tires to be considered for repair and retreading shall be free from all of the following defects:

a. Ply separation that, in the opinion of the inspector, will exceed 25 percent of the tire's cross section after skiving measured at the widest ply (see Tire Repair and Repair Limits paragraph this WP).

b. Beads with fabric cut or damaged more than 25 percent of the body plies in depth on tube tires.

c. Chafer fabric injuries in tubeless tires.

d. Broken, kinked, or exposed bead wires.

e. Fabric flex break (this defect is indicative of progressive fatigue and failure of body structure and will not be repaired regardless of size).

f. Loose cords on the inner ply or evidence of having been run underinflated or overloaded.

g. Tread separation, other than that which can be removed by buffing.

h. Generally weakened condition or brittleness, reversion, or deterioration due to service, age, moisture, or exposure; the policy on inspection for repair and retreading will be based on defects rather than age.

i. Tubeless tires with nonrepairable liner.

j. Any type of casing injury requiring what is commonly known as a section repair or reinforcement repair in excess of the number, size, and location of the permissible repairs shown in Tire Repair and Repair Limits paragraph, this WP.

k. Any groove cracks in excess of number of injuries indicated by the maximum size of permissible repairs and affecting more than 25 percent of the body plies or if two radial cracks are close enough that reinforcement patches overlap.

l. Any tire so worn that buffing to the proper contour will damage outer body plies.

INSPECTION OF REPAIRED OR RETREADED TIRES

1. General

All incoming shipments of retreaded and repaired tires must be examined to verify satisfactory workmanship and to ensure that only dependable, safe retreaded tires are accepted and used. The following instructions provide standard criteria for acceptance inspection of retreaded or repaired tires. Any of the defects listed below are cause for rejection of tires.

2. Markings

a. Retread identification markings missing or not legible (not applicable to Group 4, Off-Road, Low Speed Tires, Industrial Tires and Agricultural Tires).

NOTE

Each tire will be permanently marked with the contractor/vendor's identification mark, the week and year of retread, and a number or name indicating the type of retreading performed (see Figure 13). The DOT Code identification and the date of manufacture shall conform to the requirements of Section 574.5 of the Department of Transportation Tire Identification and Record Keeping procedures. When the type of retreading is indicated by a number, the number shall be as specified in the table Inspection Marking Codes. For example, a full bead-to-bead retread shall be marked I-A, a top (shoulder to shoulder) retread 1-B, etc. The number or name shall also be molded into the tread shoulder area of the tire as prescribed above. Marking symbols shall not be less than 5/32 inch (4.0 mm) in height.

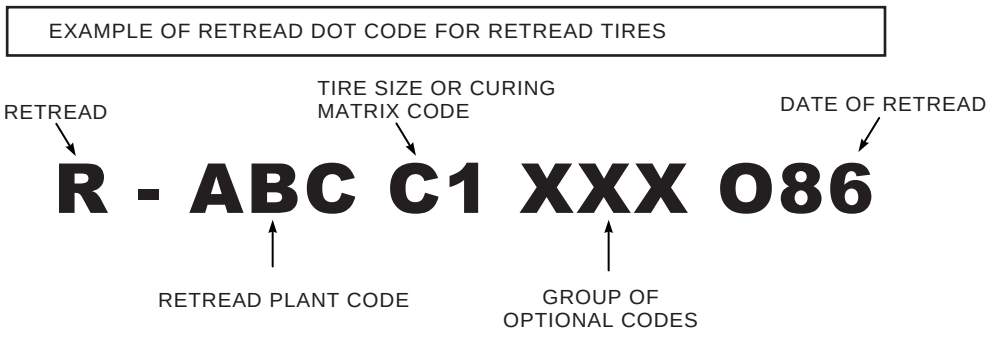


Figure 13. Retread Identification Markings

b. Nail hole repairs (Type II-A) are exempt from the permanent marking. When tires are retreaded in a plant other than the contractor's own facility, the subcontractor will comply with the requirements set.

3. Other Defects

a. **Sidewall Separation:** Separation of tread from sidewall along the circumference more than 1/4 inch (6.3 mm) into joint.

b. **Sidewall Cracks:** Exposed cords or sidewall cracks extending to the cord body.

c. **Tread Craters:** Any visible evidence of craters or voids.

d. **Bulges:** Bulges that are indications of ply or tread separations, improper repairs, or improper molding techniques.

e. **Buckles:** Buckles or creases inside tire surface.

f. **Open Splice:** Open splices in retread area.

g. **Open Liner Splice:** Open liner splice in tubeless tires that expose ply fabric.

h. **Nail Holes:** Nail holes and cuts not repaired or improperly repaired as indicated by dimples, buckles, or separation of patch.

i. **Damaged Plies:** Any visible evidence of cuts and loose or damaged plies or cords.

j. **Foreign Material:** Foreign material cured into inside or outside surface of tire.

k. **Damaged Beads:** Exposed or damaged bead wires.

l. **Damaged Chafer Strip:** Damaged or missing bead chafer strip on tubeless tires.

m. **Bead Kinks:** Bead kinks horizontally or vertically more than:

(1) 1/16 inch (1.6 mm) - passenger car tires

(2) 1/8 inch (3.2 mm) - light truck tires

(3) 1/4 inch (6.2 mm) - truck, bus, or trailer tires

n. **Off Register Treads:** Lug tread pattern off register more than:

(1) 1/16 inch (1.6 mm) - tire rim size 8.55 or less

(2) 1/8 inch (3.2 mm) - tire rim size over 8.55

o. **Tread Design Rounding:** Any evidence of imperfectly formed tread elements or rounded lug edges.

p. **Mold Misalignment:** Tire halves in misalignment by more than:

(1) 1/16 inch (1.6 mm) - tire rim size 8.55 or less

(2) 1/8 inch (3.2 mm) - tire rim size over 8.55

q. **Obvious Physical Defects:** Defects such as cuts, flat surfaces, or other distortions of the tire that could affect tire performance or safety.

INSPECTION OF REPAIRED OR RETREADED TIRES − CONTINUED

4. Disposition of Defective Tires

a. If defects are found during receiving inspection, the defective tires will be returned to the contractor for repair or rework if feasible, or proper disposition will be obtained from the contracting officer in accordance with the provisions of the contract. Inspection records of the defects noted will be maintained for each contractor or contract.

b. A Quality Deficiency Report (QDR) SF 368 must be submitted, reporting all defective or prematurely failing tires to the U.S. Army, Tank Automotive and Armaments Command, Warren, MI 48397-5000. Instructions for submission of EIRs are contained in DA Pam 738-750.

5. Tires on Vehicles Scheduled for Disposal

When it has been determined that a vehicle is not economically repairable, all serviceable (Code B) and repairable (Code F) tires will be removed. If uneconomically repairable tires (Code H) capable of supporting a vehicle are available, they will be mounted prior to turn-in of the vehicle to property disposal channels.

END OF WORK PACKAGE

VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES 0008 00

THIS WORK PACKAGE COVERS:
Visual Guide For Inspection and Classification of Tires

GENERAL

This work package provides a series of illustrations showing common defects found on pneumatic tires during classification. It is intended to provide inspectors with visual guidance to distinguish between repairable and non-repairable defects.

NOTE

Some of the illustrations in this work package represent tires sent in by users.

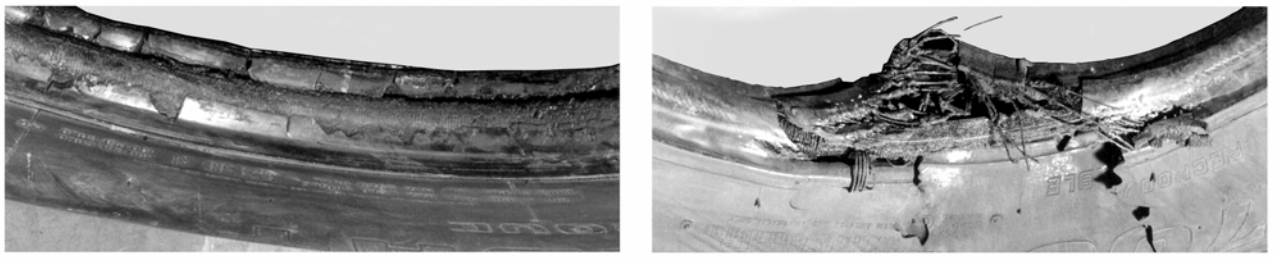
If the tire being classified is a high-dollar off-the-road tire, such as one used on earthmover equipment, a bead-to-bead repair may be authorized by TACOM. This repair entails replacing the sidewall rubber and is performed as an exception only.

Primary inspection is intended to separate those tires that should be retreaded from those that should be discarded. A mistake either way is costly -- it is expensive to throw away a reusable casing and expensive to process non-reusable casing. The inspector or classifier of tires must be qualified by training and experience. This visual guide is a guide only, and not a substitute for formal training through the U.S. Army Tank Automotive and Armaments Command (TACOM). Refer to WP0001 00 for more information about TACOM's tire training program.

BEAD AREA CONDITIONS

1. Burnt Beads

Figure 1 shows examples of burnt beads. This is usually caused by a heat build up from frequent hard braking or improperly adjusted brakes. The first indications of this type of the problem are rough, brittle, and discolored rubber in the bead area as the first example shows. Advanced stages will distort the beads and cause the tire to completely fail as shown in the second example. Both examples are considered unserviceable and non-repairable, CRC-H.



TM14P-1

Figure 1. Examples of Burnt Beads

BEAD AREA CONDITIONS – Continued

2. Torn Beads

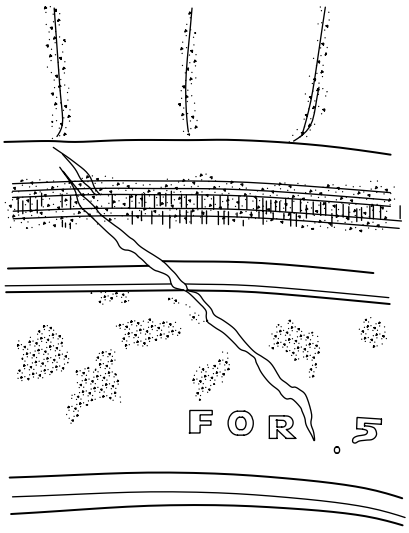
Figure 2 shows a bead destroyed by removing the tire from the rim without using a proper demounting tool and tire lubricant. If the bead wire is exposed, rusted, kinked, or broken it cannot be repaired and should be classified CRC H.

TM14P-2

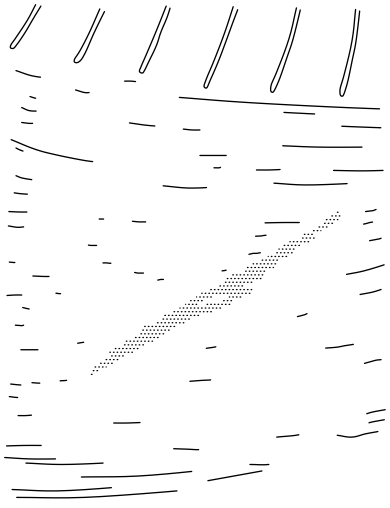
Figure 2. Example of a Torn Bead

3. Cuts or Punctures Too Close to Beads

The injuries shown on the left or right in Figure 3 can not be repaired as they run into the non-repairable bead area. Correct classification is CRC H.



TEAR IN BEAD AREA (OUTSIDE)



TM14-85

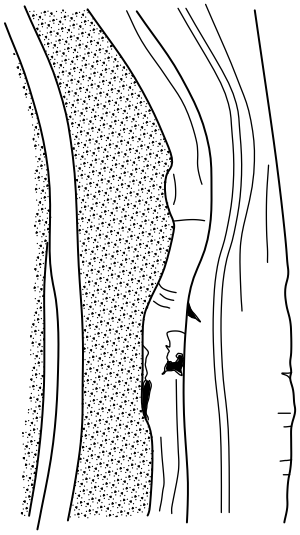
TEAR IN BEAD AREA

Figure 3. Cuts Too Close to Bead

BEAD AREA CONDITIONS – Continued

4. Kinked Bead

Removal of the tire from its rim without proper lubrication, improper demounting procedures, or shipping and handling damage can bend, kink, or distort the beads as shown in Figure 4. The bead rubber does not have to be torn. Any bends or deformations in the bead are non-repairable. Correct classification is CRC H.



TM14-86

Figure 4. Kinked Bead Damage

5. Bead Chafer Separation

As shown in Figure 5, this type of damage is identified by circumferential cracks just above the bead area with cord material exposed. This type of damage is usually caused by improper rim size, overload conditions, underinflation, impacts, and sometimes a manufacturing defect. This damage is non-repairable and the correct classification for this tire would be CRC H.

TM14P-3

Figure 5. Bead Chafer Separation

BEAD AREA CONDITIONS – Continued

6. Bead Area Flow Cracks

Not to be confused with bead chafer separation, flow cracks are distinguished by a circumferential crack that is a cleaner crack with no bead wire exposed as illustrated in Figure 6. This is caused by a manufacturing process problem. The tire is non-repairable and correct classification would be CRC H.

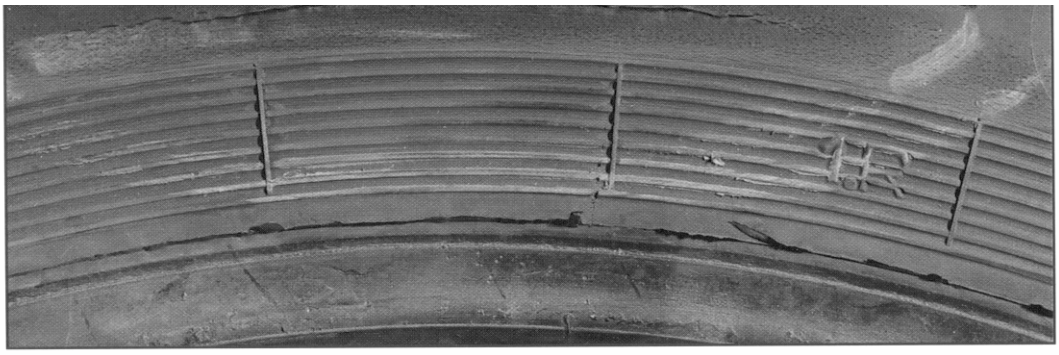
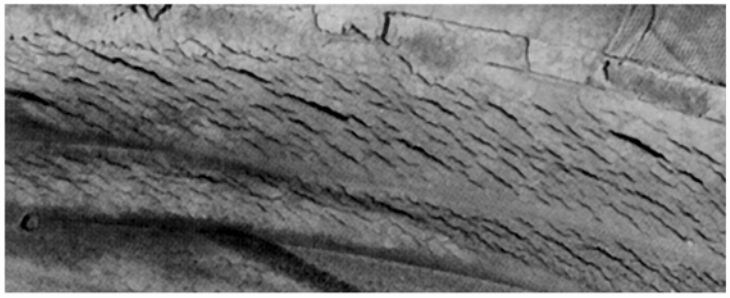


Figure 6. Bead Area Flow Cracks

SIDEWALL AREA CONDITIONS

1. Ozone Cracking or Weatherchecking on Sidewall

The cracks in these tires extend down over the sidewalls. Retreading either tire should not be conducted using conventional methods because the damaged area will not be removed during the buffing process. Weatherchecked tires may be retained in service provided the cracks are not 2/32 inch (1.6 mm) deep or deeper, or do not join together in a straight or arced line as shown in Figures 7 and 8. Because of the extent of weatherchecking, both examples would be classified CRC H.

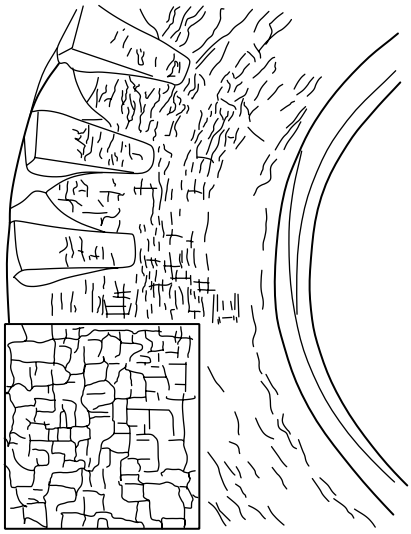


TM14P-5

Figure 7. Weatherchecking on Sidewall

SIDEWALL AREA CONDITIONS − CONTINUED

1. Ozone Cracking or Weatherchecking on Sidewall – Continued

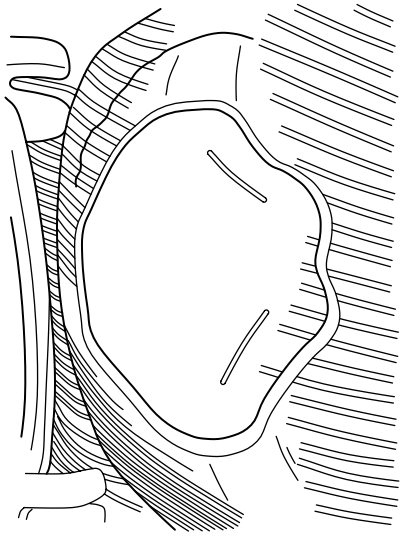


TM14-87

Figure 8. Oxidation of Sidewall

2. Previous Tire Repair

The tire shown in Figure 9 was repaired once, then worn to the permissible maximum and again submitted for repair/retread. The previous repair has not failed and the tire is still retreadable. Correct classification is CRC F.



TM14-88

Figure 9. Previously Repaired Tire

SIDEWALL AREA CONDITIONS – CONTINUED

3. Spread or Damaged Cord

This is indicated by a pencil shape bulge on the sidewall of a radial tire (see Figure 10). It is the result of wider than normal wire spacing and may show up soon after a repair or from other body ply damage. This type of bulge should not be confused with normal sidewall waviness common with some radial tires. If the bulge height does not exceed 3/8" (10 mm) when inflated, the tire can be used on a dual position but monitored closely. The tire should not be retreaded or repaired, and when turned in with this condition, it should be classified CRC H.

TM14P-6

Figure 10. Example of a Pencil-Shaped Bulge

4. Diagonal Cracking or Flexbreak Injury

This type of injury, which looks like a series of breaks as shown in Figure 11, is caused by the excessive flexing and bending of the tire. It is caused by excessive torque transfer, underinflation, and overloading. It cannot be repaired and must be classified CRC H.

TM14P-7

Figure 11. Diagonal Cracking or Flexbreak Injury

SIDEWALL AREA CONDITIONS – CONTINUED

5. Tires Run Flat

The tire on the left in Figure 12 was run flat for a few miles. If the tire had been run flat much longer, the whole crown would have been sheared off. The tire damage still renders it non-repairable. Note the signs of shearing on the outside. Correct classification is CRC H. The tire on the right was also run flat for a few miles. Note the long chain of internal cuts along the inside of the sidewall. Correct classification is CRC H.

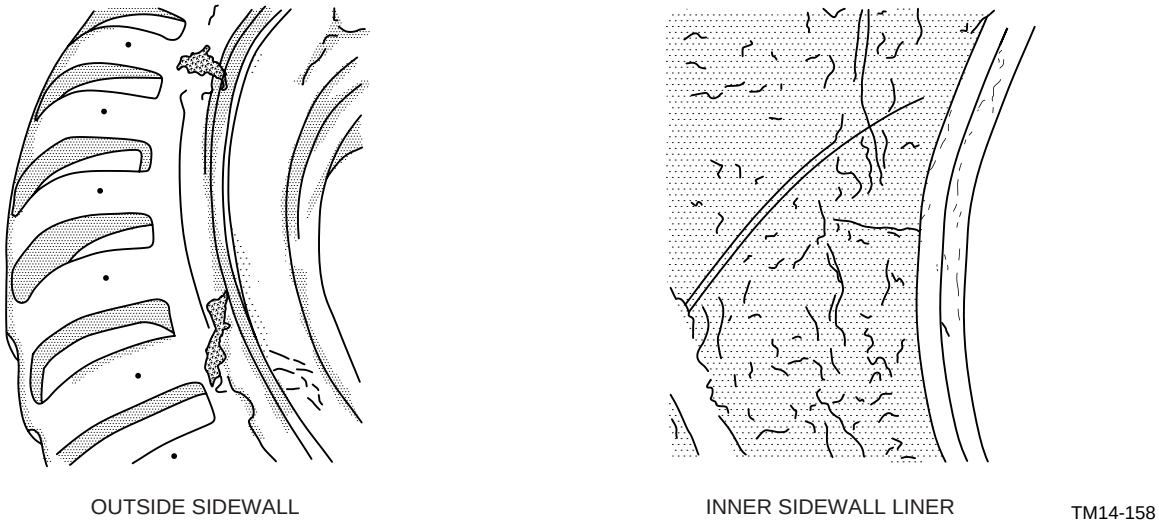


Figure 12. Examples of Damaged Tire When Run Flat

6. Tires Sitting Flat

The tire shown in Figure 13 went flat while the vehicle was parked and remained flat for some time. Unlike the damage done when tires are run flat, the sidewall was not sheared, but it has been bent out of shape and many cords could be broken or permanently deformed. The tire is non-repairable. Correct classification is CRC H.

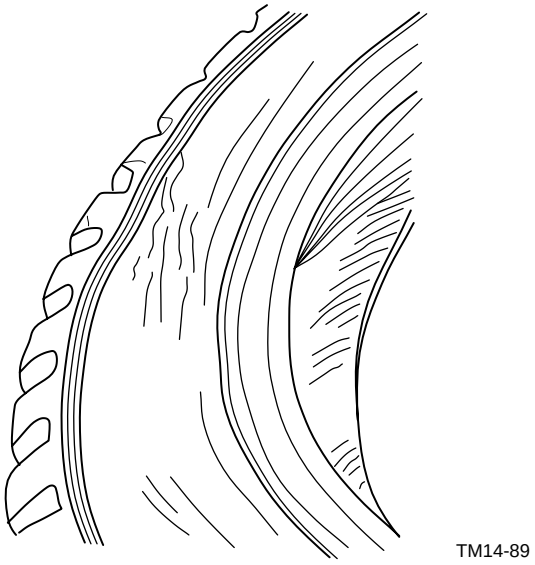
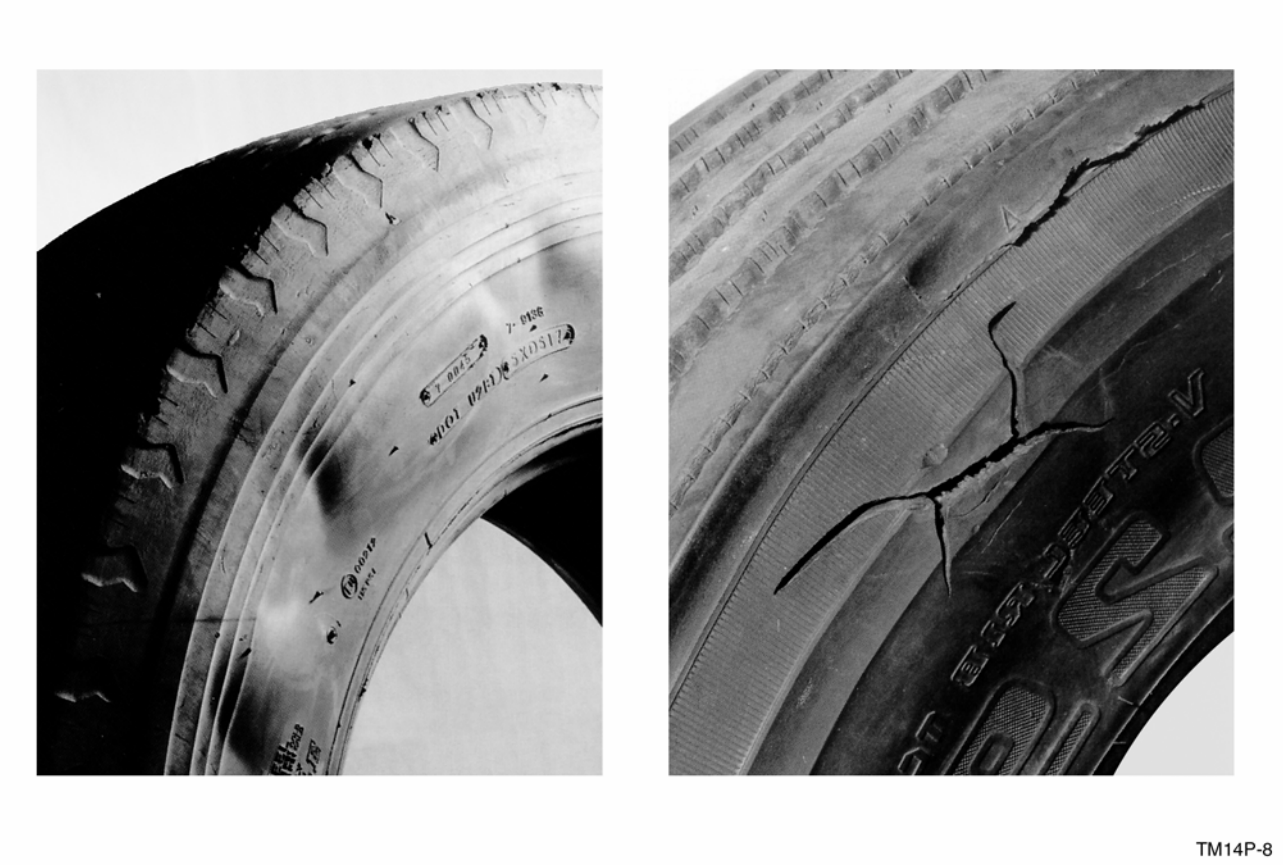


Figure 13. Tire Sitting in Flat State Too Long

SIDEWALL AREA CONDITIONS – CONTINUED

7. Sidewall Separation

Figure 14 shows two different indications of sidewall separations. Separations usually begin with an irregular shaped bulge in the mid to upper sidewall, as shown in the example on the left, or breaks in the sidewall as shown in the example on the right. Eventually, the damage may progress to complete separation of the sidewall rubber. This type of damage is caused by lack of adhesion between the sidewall rubber and body ply. Punctures, severe impacts, damage to the inner liner, bead damage or a manufacturing defect may cause separations. Sidewall bulges should not be confused with the normal sidewall waviness that some radial tires have. Any separation should be reason to scrap the tire and the correct classification would be CRC H.



TM14P-8

Figure 14. Examples of Sidewall Separation

SIDEWALL AREA CONDITIONS – CONTINUED

8. Circumferential Fatigue Rupture (Zipper)

This is a phenomenon that has become more frequent with radial tires in recent years. It is caused by cord fatigue and results in the cords breaking (or unzipping) suddenly in a circumferential direction (see Figure 15). The main reason for this type of tire failure is operating in severe underinflation. The early signs of this type of failure are very subtle ripples in a circumferential pattern in the upper sidewall area. These ripples are very hard to detect. An experienced inspector may find these ripples by holding a light offset and gently feeling the upper sidewall with a hand. Tires with the early stages of zipper fatigue have been known to unzip with explosive force during inflation. That is why it is very important to use a tire safety cage, and to keep personnel out of the trajectory (front or back of either sidewall) during inflation. This tire or any tire with the early signs of zipper fatigue would be classified CRC H.

TM14P-9

Figure 15. Example of Zipper Fatigue

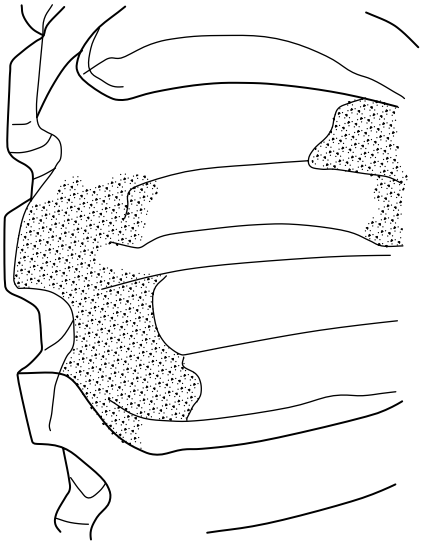
TREAD CROWN AREA CONDITIONS

1. Burned Tire Tread

The tire tread, shown in Figure 16 was damaged by fire, but not badly enough to require repair. Note that the damage is small and does not penetrate very deeply. The tire is still serviceable and should be returned to the user. Correct classification is CRC B.

TREAD CROWN AREA CONDITIONS − CONTINUED

1. Burned Tire Tread − Continued



TM14-90

Figure 16. Surface Burns to Tire

2. Ozone Cracking or Weatherchecking on Tread

The cracks in the tire shown in Figure 17 extend down into the tread. If the cracks do not extend too far or down onto the sidewall, the tire may be retreaded. Tires which are weatherchecked in the tread only, may be retained in service provided the cracks do not extend to the tread lug base or are not 2/32 inch (1.6 mm) deep or deeper in the tread groove area. In most cases, if the tread is weatherchecked, so are the sidewalls. Because of the extent of weatherchecking, this tire would be classified CRC H.

TM14-91

Figure 17. Oxidation of the Tire Tread

TREAD CROWN AREA CONDITIONS − CONTINUED

3. Tread Area Tears and Penetration of Foreign Objects

The tire shown in Figure 18 is torn in the tread area close to the tire crown. The insert shows what the tear looks like inside the tire. The tire shown in Figure 19 has a nail stuck in a tread groove. Both examples are probably repairable with a section repair and probably can be retreaded later. Both tires should be examined more carefully by checking the inner liner and the extent of cord or ply damage. If the injuries fall within repairable standards, the correct classification would be CRC F.

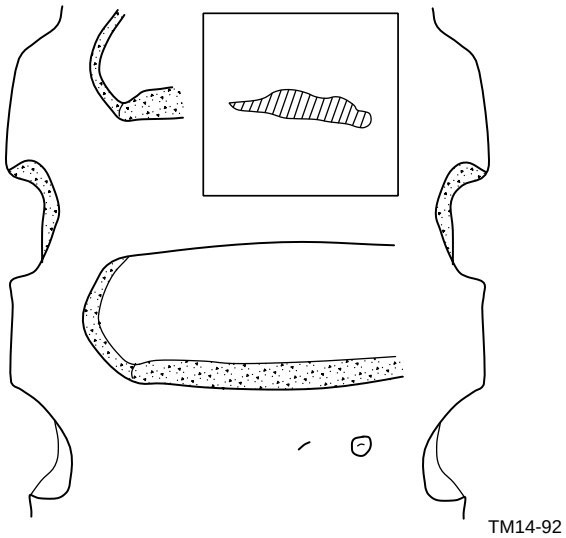


Figure 18. Torn Area in Tread

Figure 19. Foreign Object in Tread Groove

4. Heel and Toe Wear

The damage shown in Figure 20 is the result of vehicle mechanical deficiencies. If these conditions had been corrected and the tire rotated in time, premature removal could have been avoided. If the irregular wear did not cause damage to the casing, the tire is retreadable. Correct classification is CRC F.

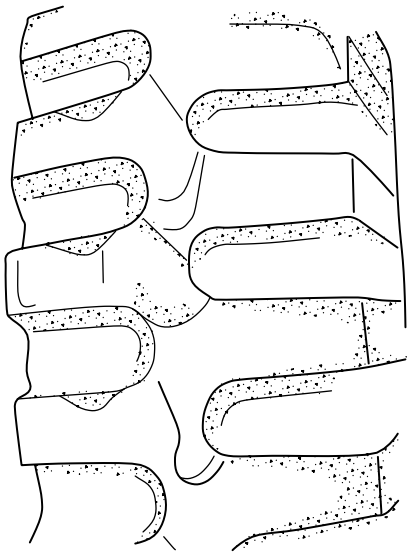


Figure 20. Irregular Tread Wear

TREAD CROWN AREA CONDITIONS − CONTINUED

5. Plies Worn Through

The tire shown to the left in Figure 21 has been used too long and is destroyed beyond repair. The wear has progressed into the cord body. Correct classification is CRC H.

6. Uneven Wear

The condition shown to the right was caused by front end misalignment. There are still traces of tread visible and the tire can be retreaded. Correct classification is CRC F.

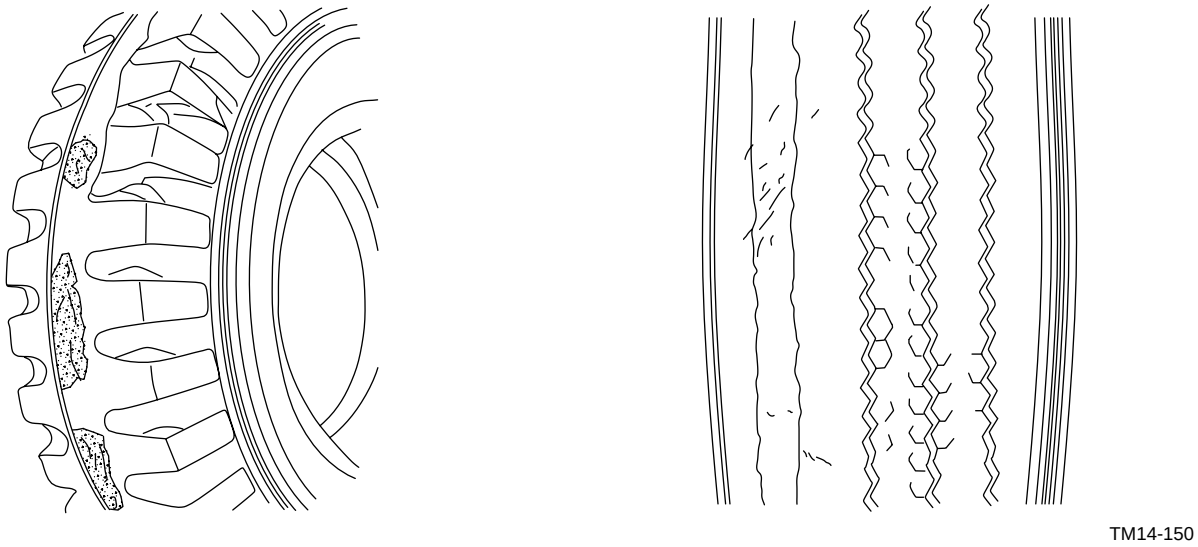


Figure 21. Examples of Plies Worn Through and Uneven Tread Wear

7. Excessive Tire Wear

The tire on the left in Figure 22 has been worn smooth and is a borderline case for the classification inspector. It was correctly classified CRC F and should be sent to the retreader who will attempt to buff it, without biting into the cord plies. If this operation is successful, the tire can be retreaded without a problem. Since the classification inspector cannot see how deeply the wear extends, it would be better to let the retreader try to save the tire rather than to discard it.

8. Premature Removal

Less than 50 percent of the tread has been worn on the tire shown on the right. Instead of sending the tire to the retreader as CRC F, the inspector should have classified it as CRC B and returned it to the user.

8. Premature Removal – Continued

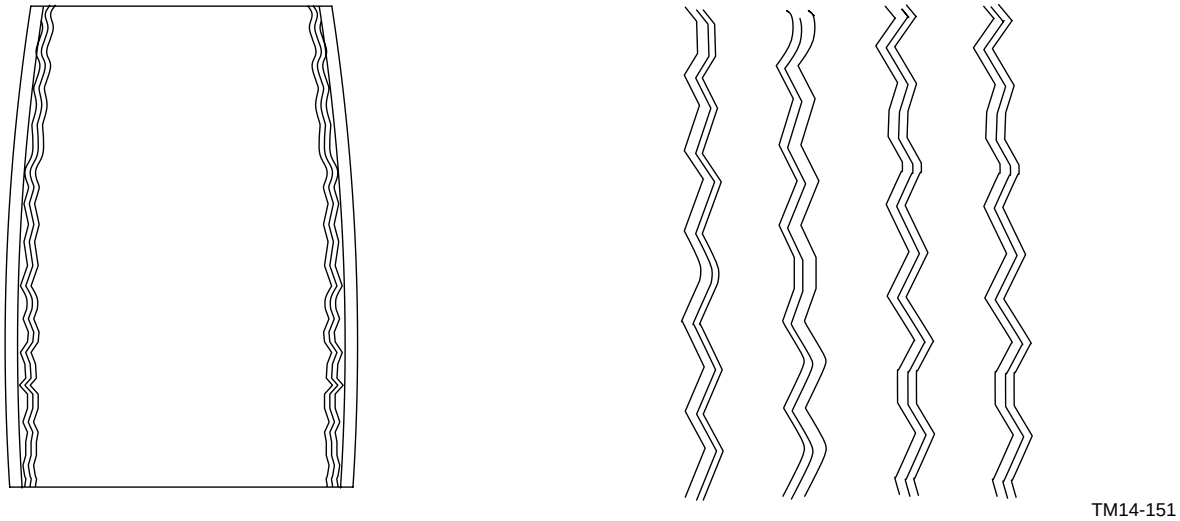


Figure 22. Examples of Excessive Tire Wear and Premature Removal

9. Proper Timing for Tire Turn-in

Illustrations in Figure 23 are typical examples of what military and commercial treads will look like when they are worn sufficiently to be turned into maintenance for retread but before the wear becomes dangerous. Correct classification is CRC F.

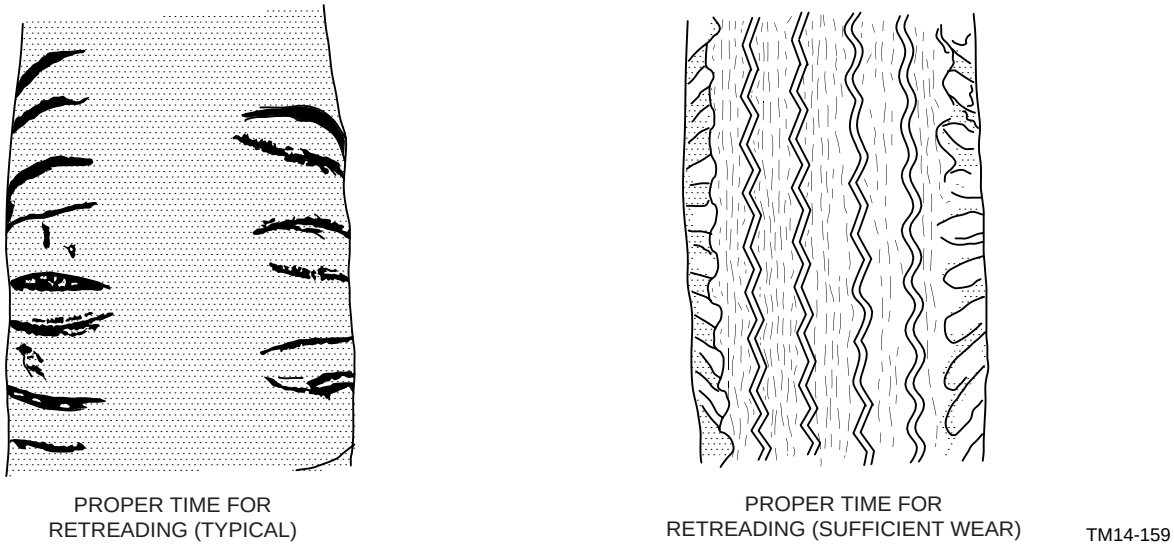
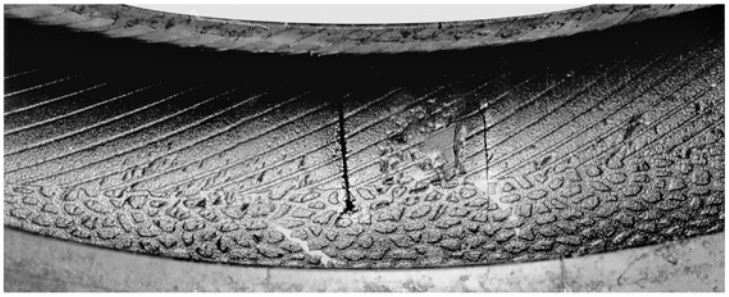


Figure 23. Proper Timing for Tire Turn-in

INSIDE TIRE/INNER LINER CONDITIONS

1. Inner Liner Cracks

The example in Figure 24 shows two diagonal cracks in an area other than the inner liner splice area. This is caused from heat buildup as a result of underinflation or a manufacturing problem. These cracks are not repairable and the tire should be classified CRC H.



TM14P-11

Figure 24. Inner Liner Cracks

2. Open Splice, Inner Liner

The condition shown in Figure 25 should not be confused with other inner liner cracks previously described. It is a split in the inner liner, and is localized where the inner liner material is joined during the manufacturing process. This condition may be manufacturer related or due to loss of adhesion at the splice as a result of excessive flexing from running underinflated. If ply cords are exposed, the tire should be CRC H and scrapped. If ply cords are not evident, it may or may not be repaired during the retread and should be CRC F to give to the retreader for repair.

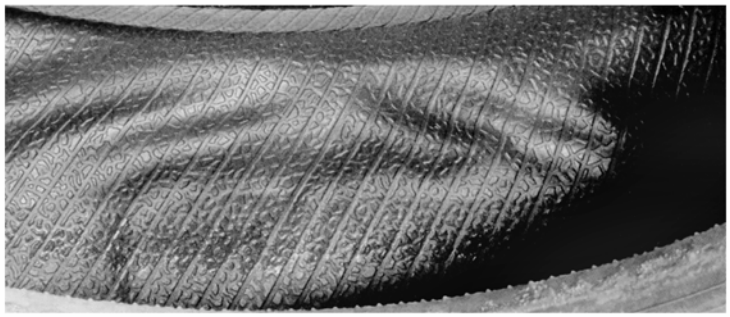
TM14P-12

Figure 25. Inner Liner Open Splice

INSIDE TIRE/INNER LINER CONDITIONS − CONTINUED

3. Bubbles, Blisters, or Discoloration in Inner Liner

Bubbles or blisters with discoloration are an indication that the tire has been run to long after loss of inflation pressure and the tire should be scrapped, CRC H (see Figure 26). If there are just bubbles and blisters without discoloration it is an indication that there has been an adhesion loss of the inner liner to the casing. This may be a result of running the tires underinflated over time or a manufacturing defect. If the blisters are small and few, the tire may be repaired and CRC F. If the blisters are many or have developed into bubbles as shown in the example below, the tire should be CRC H.



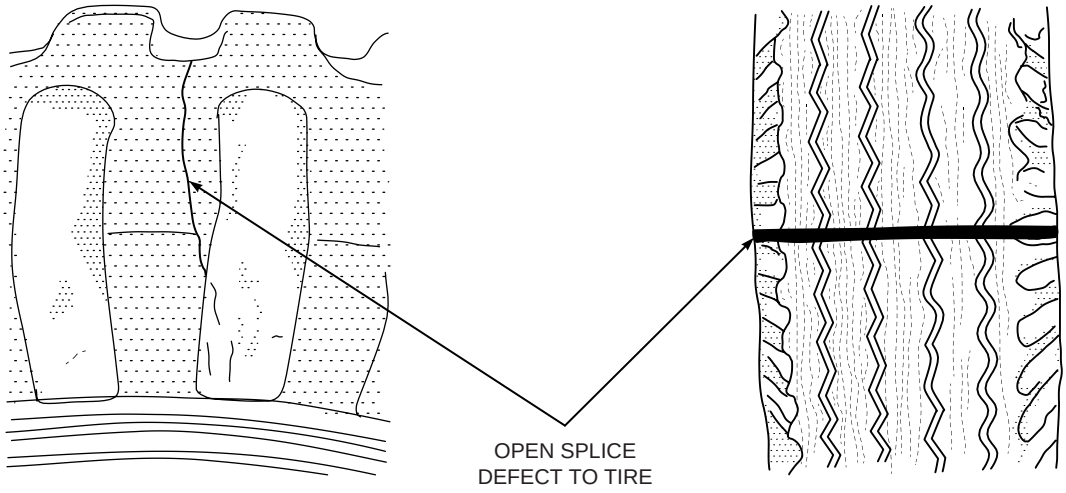
TM14P-13

Figure 26. Inner Liner Bubbles, Blisters, or Discoloration

RETREAD CONDITIONS

1. Open Tread Splice

This type of defect is peculiar to retreads and is a gap between the tread joint. Tread splices are normal with pre-cured, top-cap retreads but most retreaders will butt the ends up tightly and evenly so the gap is not that evident. It is a result of poor retread workmanship as the tread was cut too short when applied to the casing. In most cases, this will not cause any problems unless the crack goes deeper than the tread rubber, at any location. Even if the crack does not go deeper than the tread rubber, if the gap is obviously too big, as with the example in Figure 27, it should be returned to the retreader for correction and the tire classified CRC F until fixed.

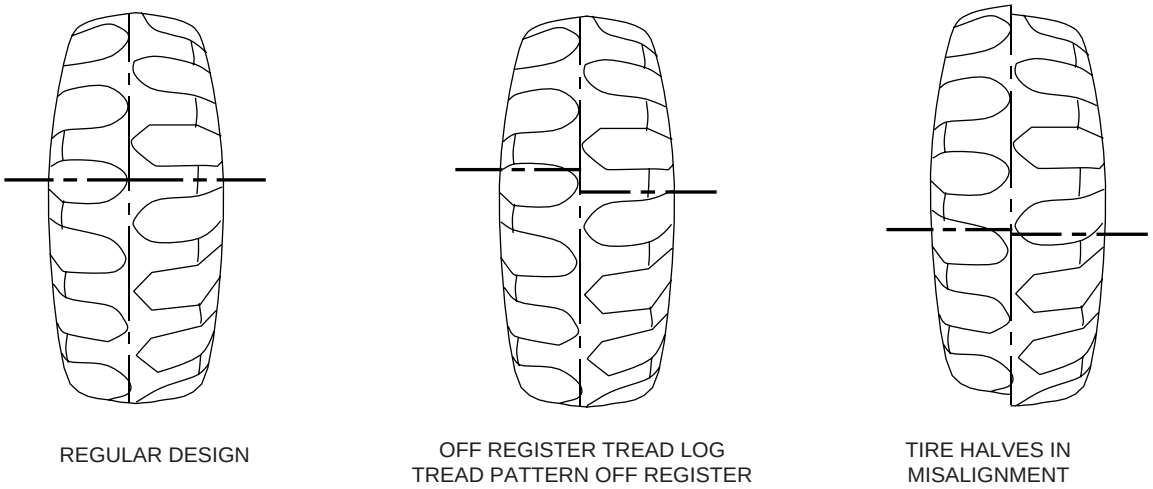


TM14-160

Figure 27. Example of Open Tread Splice

2. Off-Center Tread/Mold Misalignment

Off-center tread is one of the most common defects produced by careless retreaders (see Figure 28). It is caused by improper alignment of the retread mold. In most cases, the tire is probably marginal. Nevertheless, it should be returned to the retreader for adjustment under terms of contract.

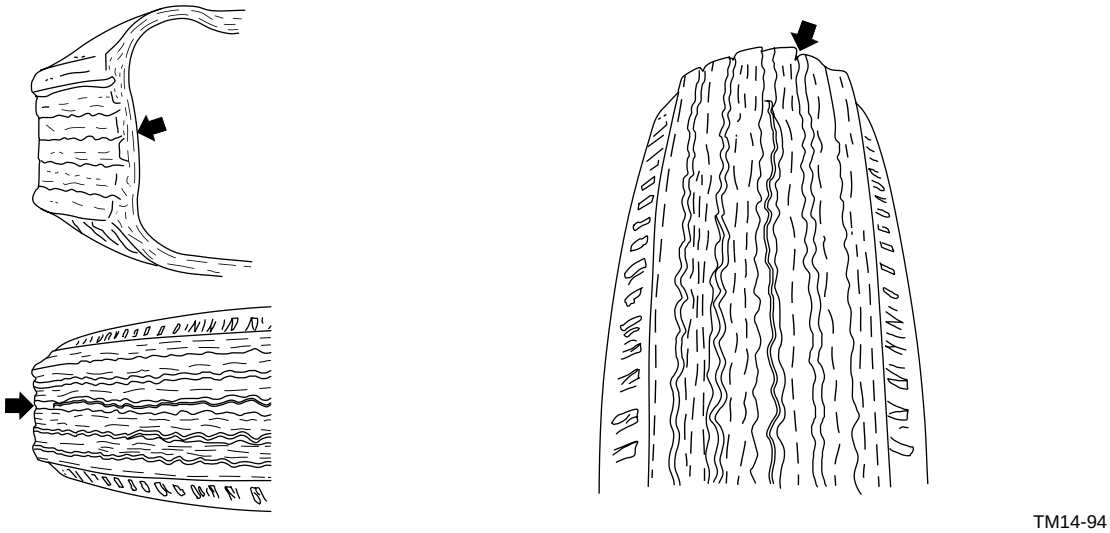


TM14-161

Figure 28. Off-Center Tread and Mold Misalignment

3. Buckled Crown (Mounted)

Some tires are manufactured with a concave crown while deflated but assume a flat shape when inflated. Figure 29 shows a buckled crown with the tire mounted and unmounted. When inflated, the crown assumes a convex shape as if the tire were overinflated. Note that the tread is distorted with wide grooves in the center and narrow grooves near the shoulders of the tire. Tires that are buckled during retread cannot be reworked and should be classified CRC H.



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CROWN OF TIRE BUCKLED (UNMOUNTED) CROWN OF TIRE BUCKLED (MOUNTED)

Figure 29. Examples of Buckled Crown

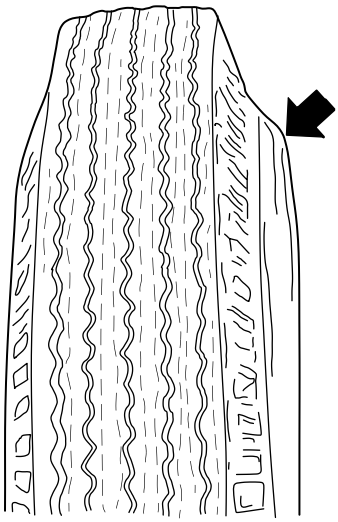
4. Buckled Crown (Unmounted)

A buckled crown destroys a tire. The retreader has failed to leave enough matrix sizes on hand to do a proper job for the tire above and on the left. The tire has been squeezed into a matrix/mold combination that is too small and the tire has been permanently deformed. The illustrations above show the most common type of buckling (on the crown). Return the defective tire to the retreader. Tires that are buckled during retread cannot be reworked and should be classified CRC H.

5. Buckled Sidewall

Sidewall buckling, as shown in Figure 30, is far less common. It is an extreme result of poor workmanship and can easily be recognized. Once buckled, the tire has been permanently deformed and should never again be retreaded or used and be classified CRC H.

5. Buckled Sidewall − Continued



TM14-95

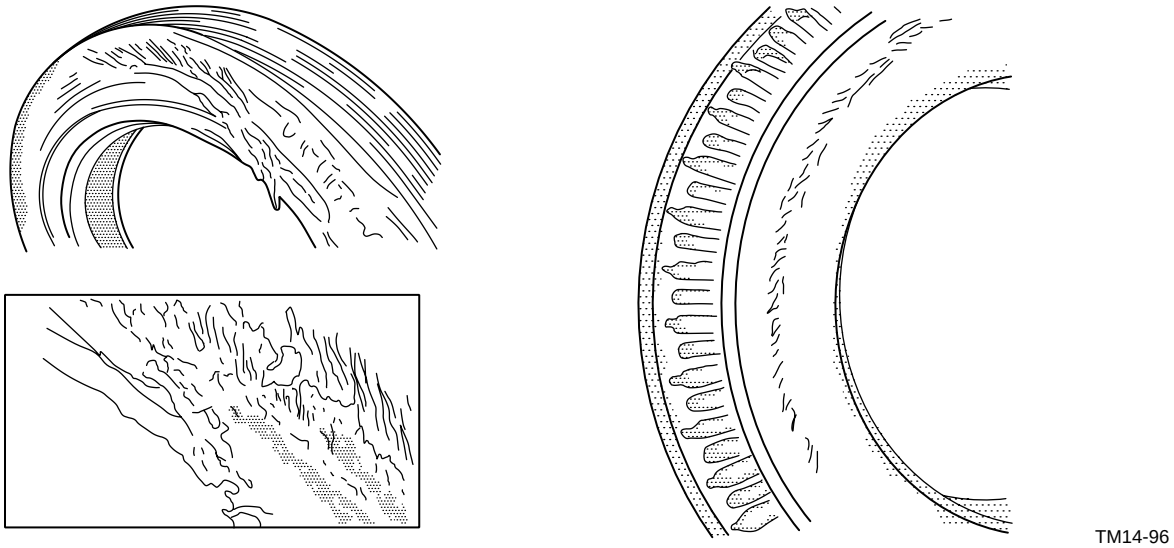
Figure 30. Sidewall of Tire Buckled

6. Excessive Buffing

The tire shown on the left in Figure 31 lost its tread because the retreader buffed too deeply into the sidewall, causing inadequate bonding of the new tread. This tire cannot be reworked because of exposed body plies.

7. Tire Slightly Overbuffed

The tire below and on the right was buffed slightly into the sidewall fabric. In most cases, this is only a minor cosmetic deficiency. However, make sure that the overbuffed area does not extend to the body plies.



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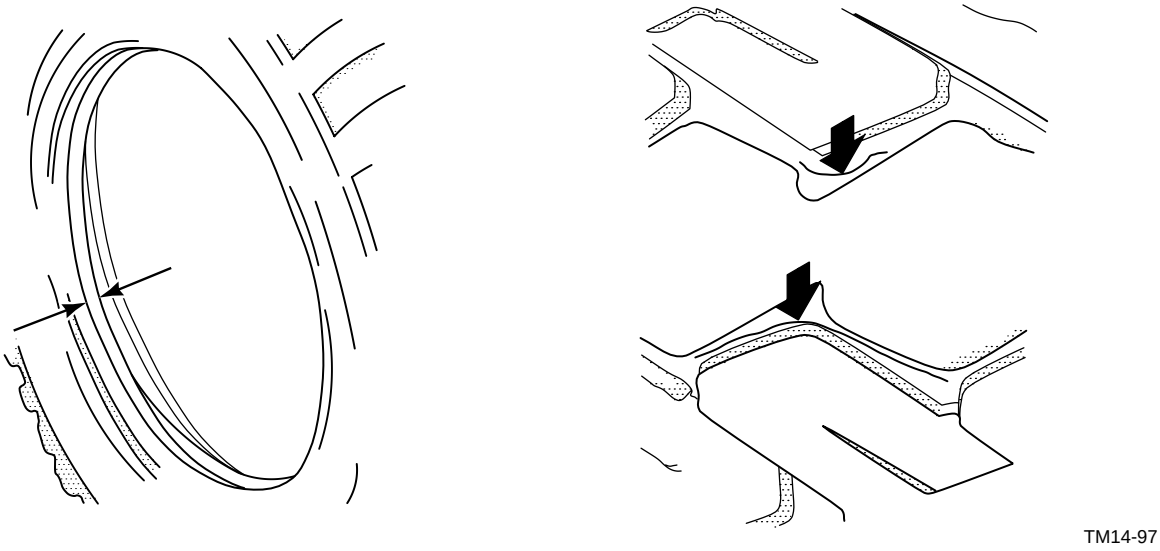
EXCESSIVE BUFFING OF SIDEWALL

SLIGHT OVERBUFFING OF SIDEWALL

Figure 31. Examples of Excessive Buffing and Slight Overbuffing

8. Compressed Beads

This condition, shown on the left in Figure 32, may be permanent or temporary. If the beads deformed in the retreading (molding) process, it is permanent; if it is the result of tires being piled on top of each other after curing, it is temporary. If the tire is extremely difficult to mount, assume it was compressed in the mold and should be returned to the retreader.



TM14-97

BEADS OF TIRE ARE SQUASHED

TIRE REFLECTING CRACKS IN UNDERTREAD

Figure 32. Example of Compressed Beads and Cracks in Rib Groove

9. Cracks in Rib Groove

These cracks, shown above and on the right, occurred on a new retread tire immediately after inflation. The tire was too large for the mold or over cured and should be returned to the retreader.

10. Vent String Protruding

Vent or bleeder strings are sometimes put into a tire to vent off air during the molding operation. The protruding string, as shown in Figure 33, causes no harm, but should be clipped off flush to the tire surface.

10. Vent String Protruding − Continued

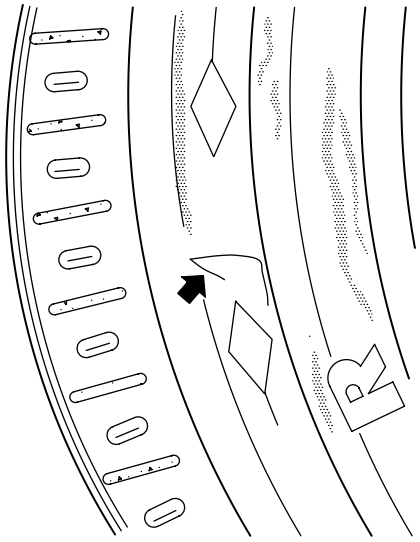


Figure 33. Example of Vent String Protruding

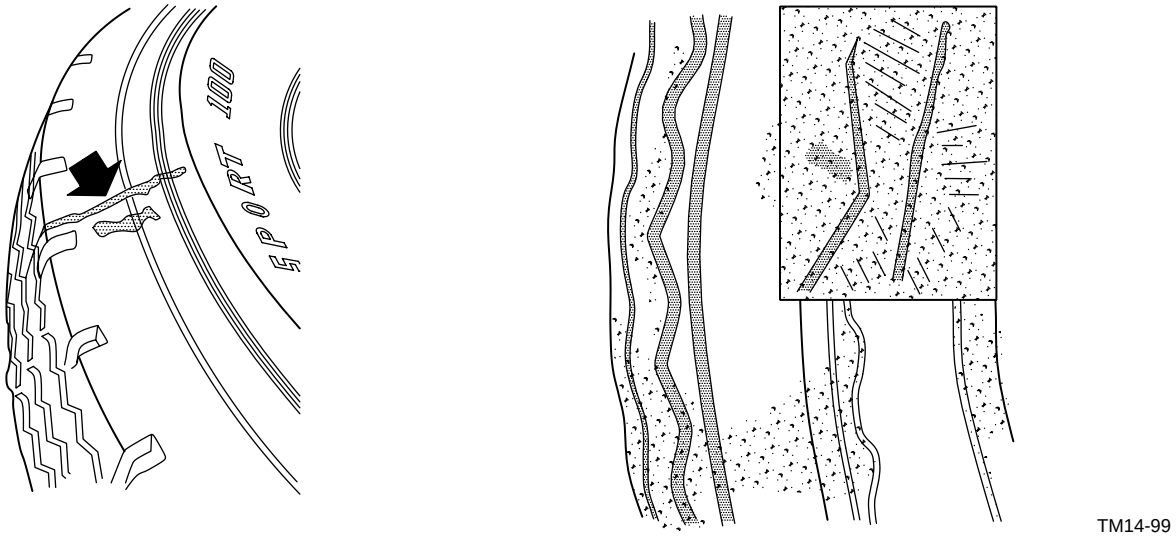
11. Spongy (Porous) Cure

This condition is caused by an unacceptable combination of pressure, temperature, and time during the curing process. The spongy, porous condition is more apparent when a thin layer is cut from the tire, as shown in the insert on the right of Figure 34.

12. Improper Rubber Flow at Splice

The left side of Figure 34 shows improper buildup prior to retread molding and should be returned to the retreader for rework.

12. Improper Rubber Flow at Splice − Continued



INSUFFICIENT FLOW OF RUBBER AT SPLICE POROUS CONDITION

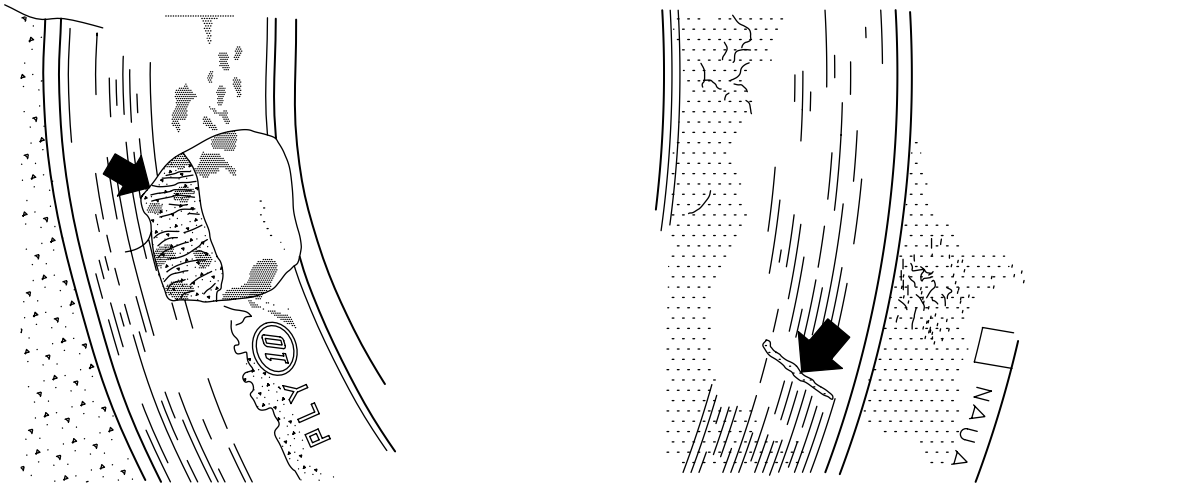
Figure 34. Example of Spongy (Porous) Cure and Insufficient Flow of Rubber at Splice

13. Improper Spot Repair

The repair, on the left in Figure 35, is too close to the bead and the tire should have been deemed non-repairable by the inspector or the retreader.

14. Cut in Sidewall

This defect, below on the right, was not readily spotted by the retreader but should have been.



SIDEWALL SHOWING PATCH CUT IN SIDEWALL

Figure 35. Example of Improper Spot Repair and Cut in Sidewall

RETREAD CONDITIONS – CONTINUED

15. Insufficient Undertread

a. The undertread of the tire in Figure 36 should be about 1/4 inch (6.2 mm) thick and part of the tread itself. When this is insufficient, it means that the retreader did not build up enough rubber or else the mold was open and the rubber flowed out.

b. This defect is often present when the tire buckles in the mold due to squeezing. When this happens, the tire is permanently deformed.

Figure 36. Insufficient Amount of Tread

16. No Design on Spacer

This condition will not cause a tire failure, but will result in loss of traction. The tire should be returned to the retreader.

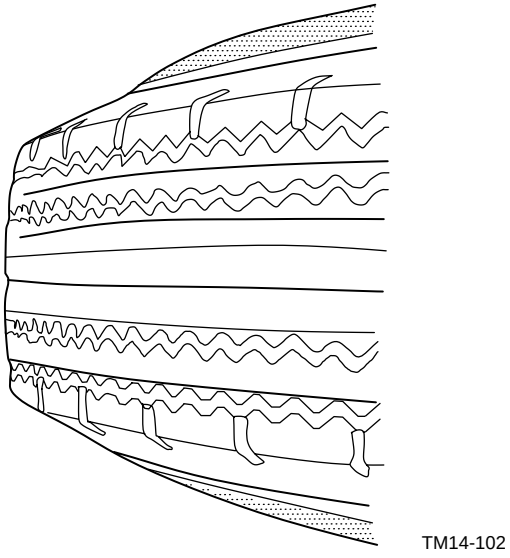


Figure 37. Lack of Design on Spacer

RETREAD CONDITIONS – CONTINUED

17. Retread Over Retread

The tire shown on the left in Figure 38, the retreader failed to remove all of the old rubber prior to building the tire. This tire needs to be returned to the retreader for rework.

18. Tire Injured During Retreading

The tire on the right shows an injury that was caused by improper retreader handling and was missed by the retreaders final inspection.

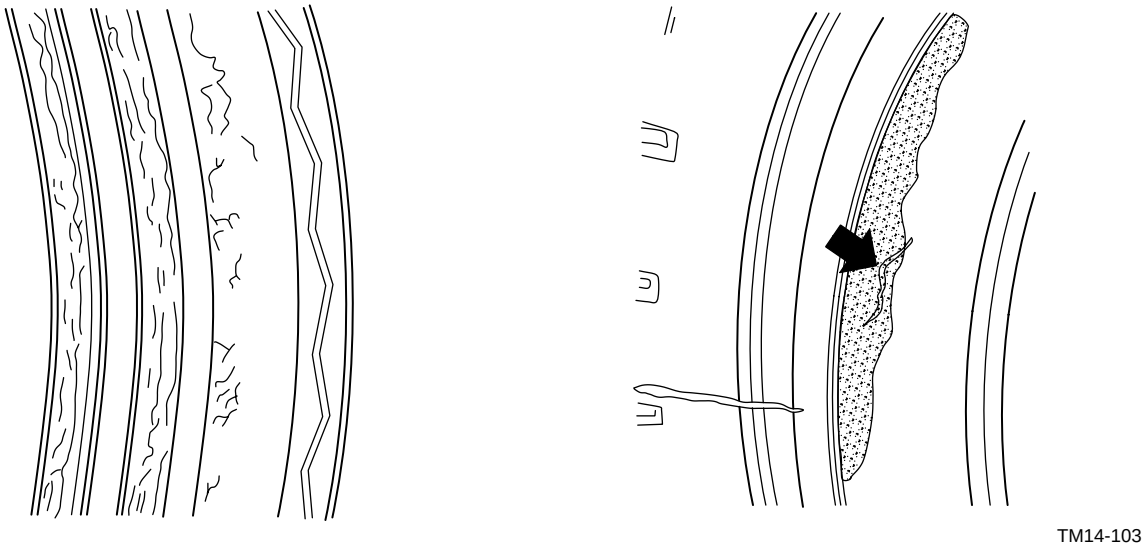


Figure 38. Examples of Improper Retreader Handling

19. Tread Separation

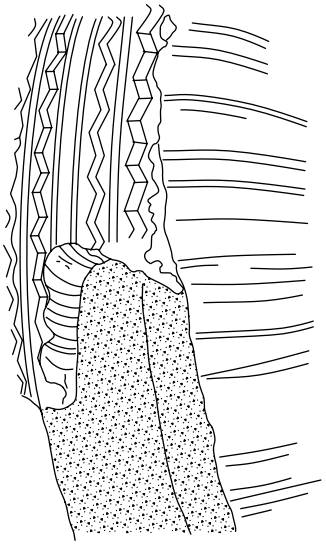
With the example on the left in Figure 39, the tread rubber was not bonded successfully onto the casing during retreading and was thrown off in use. The tread cushion is undamaged and the casing remains sound. The tire should be classified CRC F and should be returned to the retreader.

20. Cushion Separation

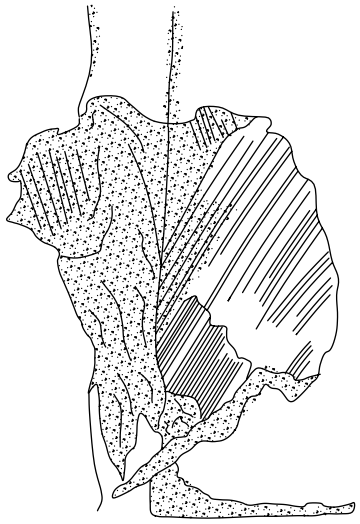
Compare the illustration on the right to the one on the left. The tire on the right has a break in the tread cushion rubber, which has separated from the casing, exposing the cord body. The classification is CRC H.

RETREAD CONDITIONS – CONTINUED

20. Cushion Separation − Continued



TREAD SEPARATION



TREAD SEPARATION FROM CASING

TM14-104

Figure 39. Example of Tread and Cushion Separation

END OF WORK PACKAGE

STORAGE OF TIRES AND TUBES 0009 00

THIS WORK PACKAGE COVERS:
Storage of Tires and Tubes

GENERAL

Factors contributing to deterioration of tires in storage include sunlight, heat, air in motion, ozone, oil, grease, dust and dirt, and water. Ozone is a gas found in the atmosphere that is very harmful to rubber. Tires are specified to contain certain oils and waxes known as antioxidants, which migrate to the surface of the tire when it is flexed in operation. These substances protect the rubber from ozone. When the tire is in storage, there is no migration and the tire deteriorates.

NOTE

Unmounted tires should be stored inside a building, preferably off the ground in a clean, cool, dry, dark and well ventilated area.

Sunlight is especially degrading to tires. Extensive exposure to sunlight can cause severe cracks, rendering the tire unserviceable. It is particularly harmful for those vehicles that remain stationary for long periods of time and are exposed to highly reflective surfaces such as ground covered snow or sand, or heat absorbent surfaces such as black asphalt.

STORAGE OF MOUNTED TIRES

Block up the vehicle in accordance with the applicable vehicle TM. Wrap each tire and wheel assembly with plastic sheet (Item 28, WP0012 00). Secure with twine or pressure-sensitive tape. Inspect semiannually to ensure that the cover is in good condition, deterioration has not begun, and each tire is properly inflated. Tires should not be dormant for more than 60 months. A schedule for occasional exercise of vehicles and tires, at recommended operating pressures, should be established and implemented.

For those vehicles exposed to severe sunlight conditions, the tires should be protected by blocking out the sun with a barrier. Any means can be employed, as long as it effectively blocks the sun. One way is to use a fabric cover rather than the plastic sheet mentioned in the preceding paragraph. Any variety of fabric covers can be designed but, as a minimum, they should be tailored to cover the outside or exposed side of the tire and contain a means of securing them such as with twine cord, velcro or elastic. Refer to FM 10-16, General Fabric Repair, for construction guidance and parts.

STORAGE OF UNMOUNTED TIRES AND TUBES

Tires and tubes should be stored in areas that are clean, dry, out of direct sunlight, and away from electrical machinery (which emit harmful ozone). For additional information and guidelines relating to the storage of tires and tubes, refer to TM 743-200-1 and applicable vehicle TMs. Unmounted tires or tires and wheel assemblies will be enclosed in polyethylene material NSN 8135-00-579-6487 and secured with twine or pressure sensitive tape when stored in sheds or open for periods exceeding 90 days.

TIRE SHELF LIFE

Even in optimum storage conditions, tires cannot last forever. Eventually, over time, the tire material will deteriorate, which affects the integrity of casing. As such, tires stored at supply points should be issued on a first-in, first-out basis. Standard tires which will be used on the highway, should never be stored more than 60 months after date of manufacture or the last retread or use. Consult the TACOM Item Manager for disposition instructions for any tire not issued and used within 60 months of date of manufacture, retread, or last use.

END OF WORK PACKAGE

CHAPTER 3

SUPPORT INFORMATION

REFERENCES **0010 00**

THIS WORK PACKAGE COVERS:
References

SCOPE

This work package lists all field manuals, forms, pamphlets, regulations, standards, technical bulletins, technical manuals, and other publications referenced in or required for use with this publication.

PUBLICATION INDEX

Consult DA Pam 25-30, Consolidated Index of Army Publications and Blank Forms, for latest changes or revisions and for new publications relating to materiel covered in this manual.

FIELD MANUALS

First Aid for Soldiers……FM 21-11

FORMS

Recommended Changes to Publications and Blank Forms……..……DA Form 2028-2
Maintenance Request……DA Form 2407
Quality Deficiency Report……..SF 368

PAMPHLETS

Consolidated Index of Army Publications and Blank Forms……..……DA Pam 25-30
The Army Maintenance Management System (TAMMS)……...…DA Pam 738-750

REGULATIONS

Requisitioning. Receipt and Issue System……..AR 725-50

TECHNICAL BULLETINS

Equipment Improvement Report and Maintenance Digest……TB 43-0001-62

TECHNICAL MANUALS

Operator's Manual for Truck, 5 Ton, 6x6, M939 and M939A1 Series ……..……TM 9-2320-272-10
Organizational Maintenance Repair Parts and Special Tools Lists for
Truck, 5 Ton, 6x6, M939 and M939A1 Series……TM 9-2320-272-24P
Operator's Manual for Truck, 1 1/4 Ton, 4X4, M998 Series……..…TM 9-2320-280-10
Organizational Maintenance Manual for Truck, 1 1/4 Ton, 4x4, M998 Series:
TM 9-2320-280-20-1,
TM 9-2320-280-20-2 &
TM 9-2320-280-20-3
Organizational Maintenance Repair Parts and Special Tools Lists for
Truck, 1 1/4 Ton, 4X4, M998 Series……...……TM 9-2320-280-24P-1 & 24P-2
Storage and Materials Handling……TM 743-200-1

REFERENCES − CONTINUED **0010 00**

OTHER PUBLICATIONS

Army Medical Department Expendable/Durable Items……CTA 8-100
Expendable/Durable Items (Except Medical, Class V. Repair Parts,
and Heraldic Items)……..……CTA 50-970

END OF WORK PACKAGE

TOOLS AND SUPPORT EQUIPMENT LIST 0011 00

THIS WORK PACKAGE COVERS:
Tools and Support Equipment

SCOPE

This work package lists tools and other support equipment required for pneumatic tire and inner tube maintenance (see Figure 1 for tool and support equipment illustrations).

EXPLANATION OF COLUMNS

a. COLUMN (1) − ITEM NUMBER

This column is the sequential number of the listing.

b. COLUMN (2) − LEVEL

Identifies the lowest level of maintenance that requires the listed item.
Maintenance level codes are:

C − Operator or Crew
O − Unit Maintenance
F − Direct Support Maintenance
H − General Support Maintenance

c. COLUMN (3) − NATIONAL STOCK NUMBER

The National Stock Number assigned to the item; use it to request or requisition the item.

d. COLUMN (4) − DESCRIPTION

This column lists the Federal item name.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description
1	O	4910-00-754-0654	Shop Equipment, Automotive Maintenance and Repair, Organizational Maintenance, Common No.1
2	O	5120-01-367-3582	Adapter, Torque Wrench
3	H	5120-00-223-8191	Awl, Saddler's Pad
4	O	5120-00-221-1542	Awl, Scratch
5		4910-01-093-0167	Balancer, Vehicle Wheel
6		4910-00-773-9341	Bead Breaker, Pneumatic Tire
7		4910-01-325-2974	Bead Breaker, Pneumatic Tire
8	O	5180-01-355-2166	Tool Kit, Tire Servicing (Gaither Bead Saver System)
9		4910-01-022-9721	Bead Seater, Tire
10	O	5120-00-308-3807	Bending Tool, Pneumatic Tire Valve
11		5210-00-605-7656	Caliper, Slide
12		4730-00-277-6948	Chuck, Air, Inflating (On Female)
13		4730-00-729-7076	Chuck, Air, Inflating (On Male)
14		7910-00-530-6260	Cleaner, Vacuum, Electric
15		4910-00-138-1819	Constrictor, Bead Expanding, Pneumatic Tire
16		4910-00-437-7215	Constrictor, Bead Expanding, Pneumatic Tire

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description
17		4910-01-132-4933	Constrictor, Bead Expanding, Pneumatic Tire
18		5130-00-293-1849	Drill, Electric, Portable, 1/2 Inch Reversible
19		5130-01-087-6835	Drill, Electric, Portable, 3/4 Inch
20	O	5110-00-234-6557	File, Hand
21	O	5120-00-516-4220	Fishing Tool, Pneumatic Tire Valve
22	O	5210-00-019-3050	Gauge, Depth, Rule
23		4910-00-204-3170	Gauge, Tire Pressure, Self-contained
24		5130-01-038-1451	Grinder, Pneumatic
25		3415-00-517-7754	Grinding Machine, Utility
26		4940-00-333-5541	Gun, Air Blow
27		5120-00-242-3915	Hammer, Hand
28	O	5110-00-263-0349	Handle, File
29	O	4910-00-441-8685	Inflator-gauge, Pneumatic Tire (in-line, with 10' hose)
30	O	4910-00-522-3778	Inflator-gauge, Pneumatic Tire

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description
31	O	5120-00-545-4370	Iron, Tire
32	O	5120-00580-8924	Iron, Tire, Curved Bead Breaker: 33 Inch Overall Nominal Length
33	O	5120-00-277-4071	Iron, Tire, Curved Flat Type: 24 Inch Overall Nominal Length
34	O	5120-00-765-8536	Iron, Tire, Lockring: 40 Inch Long
35	O	5120-00-313-3036	Iron. Tire (Rim)
36	O	5120-00-422-8558	Iron, Tire: 18 Inch Overall Nominal Length
37	O	5120-00-449-7073	Iron, Tire: 18 Inch Overall Nominal Length
38		5110-00-240-7073	Knife, Craftsman's (Skiving Knife)
39	H	6230-00-729-9259	Light, Extension
40		5120-00-222-2220	Mallet, Rawhide
41		4910-01-370-9855	Mounter and Demounter, Pneumatic Tire
42	H	5120-00-247-5177	Pliers
43		5120-00-595-9551	Pliers, Retaining Ring

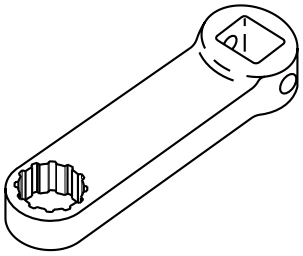
<table>
<tr><th>(1)
Item
Number</th><th>(2)
Level</th><th>(3)
National
Stock Number</th><th>(4)
Description</th></tr>
<tr><td>44</td><td></td><td></td><td>
NOTE
➢ The following rasps are only available commercially. Requisition in accordance with AR 725-50.
➢ These rasps are available in a variety of grit textures and arbor sizes. Specify desired grit and arbor size when requisitioning.

Rasp, Air Cooled Finishing:
<table>
<tr><th>Model Number</th><th>Size (inches)</th></tr>
<tr><td>T-318</td><td>3 od x 1/8 wd</td></tr>
<tr><td>T-314</td><td>3 od x 1/4 wd</td></tr>
<tr><td>T -338</td><td>3 od x 3/8 wd</td></tr>
<tr><td>T -350</td><td>3 od x 1/2 wd</td></tr>
<tr><td>T-35-C*</td><td>3 od x 1/2 wd</td></tr>
<tr><td>T -358</td><td>3 od x 5/8 wd</td></tr>
<tr><td>T-358-C*</td><td>3 od x 5/8 wd</td></tr>
<tr><td>T -360</td><td>3 od x 6/10 wd</td></tr>
<tr><td>T-360-C*</td><td>3 od x 6/10 wd</td></tr>
<tr><td>T -375</td><td>3 od x 3/4 wd</td></tr>
<tr><td>T-375-C*</td><td>3 od x 3/4 wd</td></tr>
<tr><td>T-310</td><td>3 od x 1 wd</td></tr>
<tr><td>T-310-C*</td><td>3 od x 1 wd</td></tr>
<tr><td>T-315</td><td>3 od x 1 1/2 wd</td></tr>
<tr><td>T-315-C*</td><td>3 od x 1 1/2 wd</td></tr>
<tr><td>T -320</td><td>3 od x 2 wd</td></tr>
<tr><td>T -33</td><td>3 od x 3 wd</td></tr>
<tr><td>T-418</td><td>4 od x 1/8 wd</td></tr>
<tr><td>T-414</td><td>4 od x 1/4 wd</td></tr>
<tr><td>T-4-316</td><td>4 od x 3/16 wd</td></tr>
<tr><td>T-4-516</td><td>4 od x 5/16 wd</td></tr>
<tr><td>T -438</td><td>4 od x 3/8 wd</td></tr>
<tr><td>T-450</td><td>4 od x 1/2 wd</td></tr>
<tr><td>T-450-C*</td><td>4 od x 1/2 wd</td></tr>
<tr><td>T-458</td><td>4 od x 5/8 wd</td></tr>
<tr><td>T-458-C*</td><td>4 od x 5/8 wd</td></tr>
<tr><td>T -460</td><td>4 od x 6/10 wd</td></tr>
<tr><td>T-460-C*</td><td>4 od x 6/10 wd</td></tr>
<tr><td>T-475</td><td>4 od x 3/4 wd</td></tr>
<tr><td>T-475-C*</td><td>4 od x 3/4 wd</td></tr>
<tr><td>T-478</td><td>4 od x 7/8 wd</td></tr>
<tr><td>T-478-C*</td><td>4 od x 7/8 wd</td></tr>
<tr><td>T-410</td><td>4 od x 1 wd</td></tr>
<tr><td>T-410-C*</td><td>4 od x 1 wd</td></tr>
<tr><td>T-415</td><td>4 od x 1 1/2 wd</td></tr>
<tr><td>T-415-C*</td><td>4 od x 1 1/2 wd</td></tr>
<tr><td>TBN-415**</td><td>4 od x 1 1/2 wd</td></tr>
</table>
*C – Concave Rasp **TBN – Curved Rasp
</td></tr>
</table>

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description
45	O	5120-00-308-3809	Repair Tool, Pneumatic Tire Valve
46	H	5110-00-203-9642	Shears, Bent Trimmers
47	O	5120-00-293-0392	Stitcher, Cementing and Vulcanizing
48		5340-00-980-9277	Strap, Webbing
49		4910-00-554-8004	Tank, Testing, Tire and Tube
50		5210-00-221-1875	Tape, Measuring, 3/8 Inch Wide
51		6635-00-962-6229	Tester, Material Hardness (Durometer)
52	O	4910-01-218-4490	Wheel Assembly Tool
53		4910-01-373-0267	Guard, Safety, Tire Inflation (Small Tire Cage, DLA Managed)
54		4910-00-025-0623	Guard, Safety, Tire Inflation (Large Tire Cage, A/F Managed)

NOT ILLUSTRATED

ITEM 1



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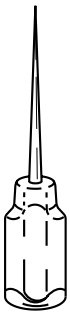

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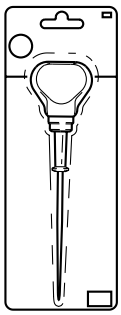

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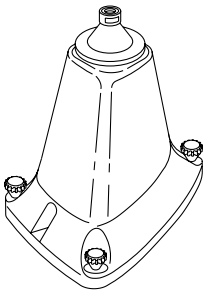

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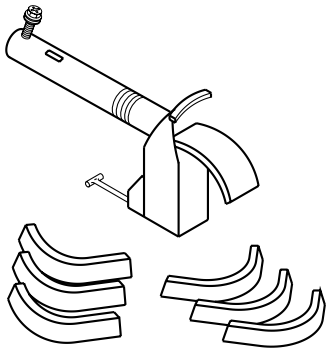


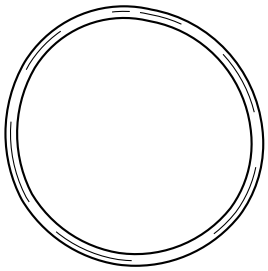
ITEM 6

NOT ILLUSTRATED

ITEM 7

NOT ILLUSTRATED

ITEM 8



ITEM 9

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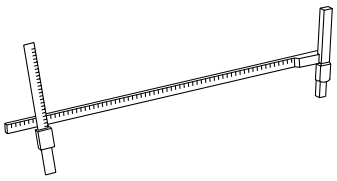
ITEM 10



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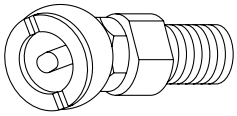


ITEM 12

TM14153

Figure 1. Tools and Support Equipment (Sheet 1 of 5)

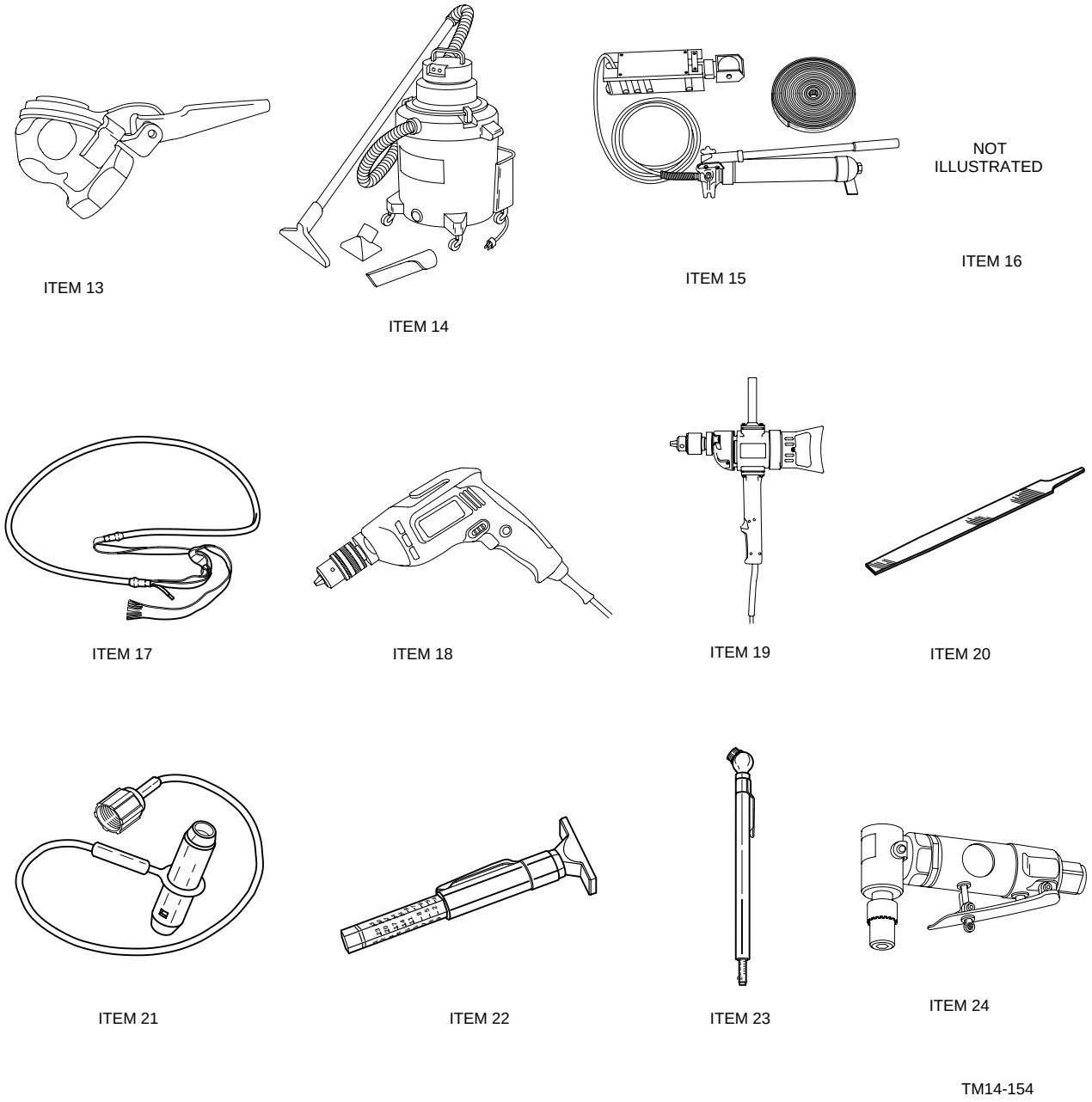


Figure 1. Tools and Support Equipment (Sheet 2)

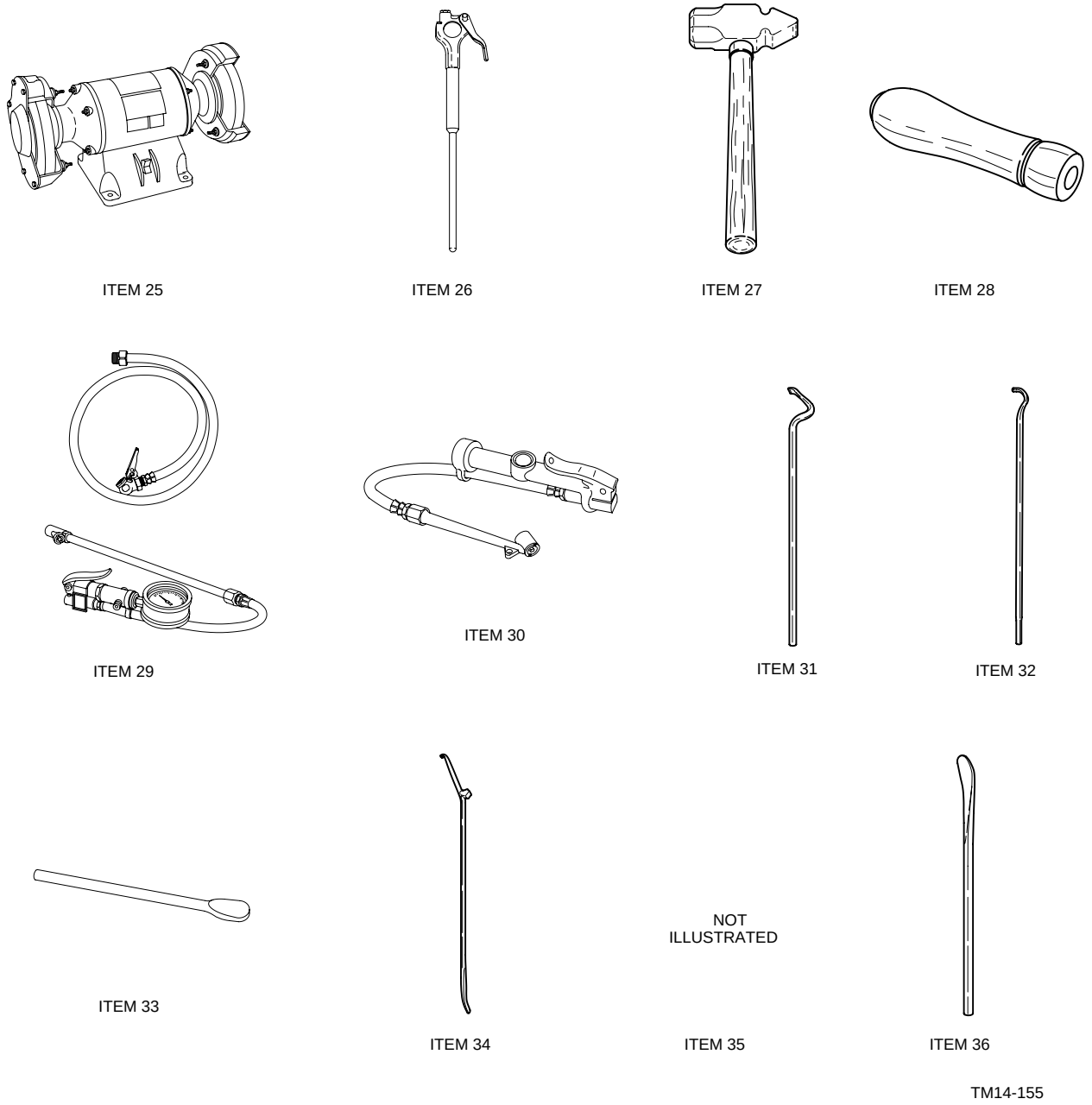
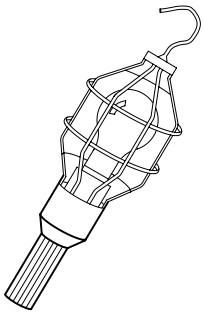


Figure 1. Tools and Support Equipment (Sheet 3)

NOT ILLUSTRATED

ITEM 37

ITEM 38



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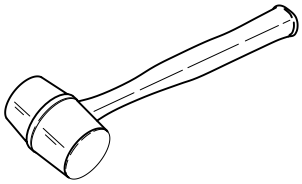

ITEM 40

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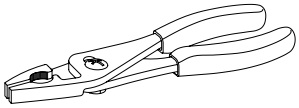
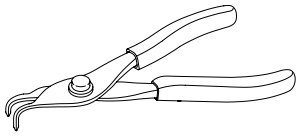
ITEM 41



ITEM 42



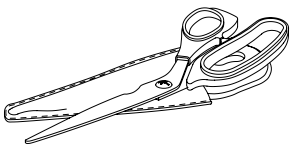
ITEM 43

NOT ILLUSTRATED

ITEM 44

NOT ILLUSTRATED

ITEM 45



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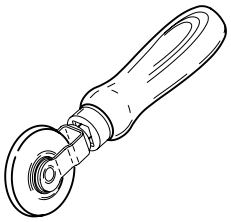

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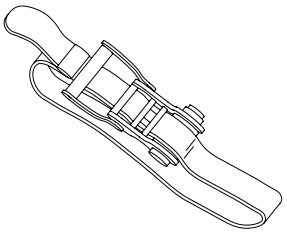
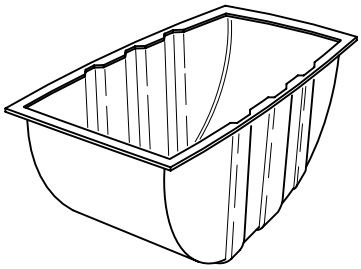


ITEM 48

TM14-156

Figure 1. Tools and Support Equipment (Sheet 4)



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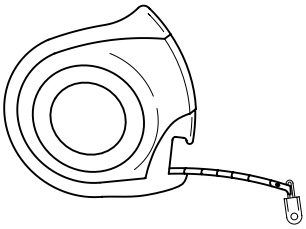
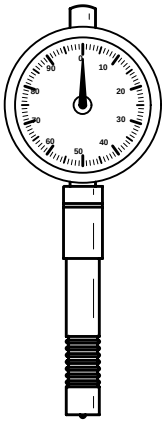
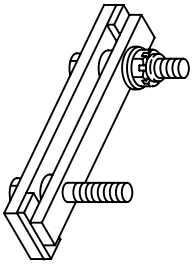


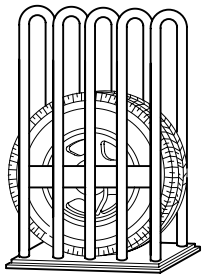
ITEM 50



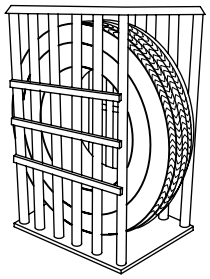
ITEM 51



ITEM 52



ITEM 53



ITEM 54

TM14-157

Figure 1. Tools and Support Equipment (Sheet 5)

END OF WORK PACKAGE

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST 0012 00

THIS WORK PACKAGE COVERS:
Expendable/Durable Supplies and Materials List

SCOPE

This work package lists expendable/durable supplies and materials you will need to repair and maintain tires. These items are authorized by CTA 50-970. Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items. Expendable/Durable Supplies and Materials List is divided into the following tables:

EXPLANATION OF COLUMNS

1. **COLUMN (1) − ITEM NUMBER.** This number is referenced in the narrative instructions to identify the material.

2. **COLUMN (2) − LEVEL.** Identifies the lowest level of maintenance that requires the listed item. Maintenance level codes are:

   C − Operator/Crew
   O − Unit Maintenance
   F − Direct Support Maintenance
   H − General Support Maintenance

3. **COLUMN (3) − NATIONAL STOCK NUMBER (NSN).** This is the National stock number assigned to the item; use it to request or requisition the item.

4. **COLUMN (4) – DESCRIPTION.** Indicates the Federal item name and, if required, a description to identify the item.

5. **COLUMN (5) − UNIT OF MEASURE (UIM).** Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Table 1. Replacement and Repair Valves for Inner Tubes

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
			REFER TO THE SPECIFIC VEHICLE TECHNICAL MANUAL FOR INNER TUBE VALVE INFORMATION	

Table 2. Replacement and Repair Valves for Tubeless Tire Rims

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
			REFER TO THE SPECIFIC VEHICLE TECHNICAL MANUAL FOR TIRE VALVE INFORMATION	

Table 3. Chemical Cure Section Patches

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1		2640-00-138-8367	Patch, Pneumatic Tire Repair (3” x 3” square)	BX
2		2640-00-489-5996	Patch, Pneumatic Tire Repair (1.625” round)	BX

Table 4. Chemically Vulcanizing Units

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
3		2640-00-138-8327	Patch, Inner Tube Repair (1.250” round)	BX
4		2640-00-138-8328	Patch, Inner Tube Repair (1.5625” round)	BX
5		2640-00-138-8329	Patch, Inner Tube Repair (1.8125” round)	BX
6		2640-00-138-8331	Patch, Inner Tube Repair (3” round)	BX
7		2640-00-138-8332	Patch, Inner Tube Repair (3.750” round	BX
8		2640-00-138-8335	Patch, Inner Tube Repair (1.750” x 4.167” rectangular)	BX

Table 5. Tee Units

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
9		2640-00-157-0097	Plug and Patch, Tire (1-piece T-Unit), Plug Diameter = 1/2", Patch Diameter = 3" (For Bias Truck Tire Only)	BX

Table 6. Tire and Tube Repair Kits

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
			RADIAL TIRE SIDEWALL PATCHES	
10		2640-01-016-5917	Patch, Pneumatic Tire Repair (10" x 5")	BX
			TEMPORAY REPAIR KITS, PUNCTURE (TUBELESS TIRES ONLY)	
11		2640-00-404-0754	Repair Kit, Puncture, Pneumatic Tire	EA
12		2640-00-922-6921	Repair Kit, Puncture, Pneumatic Tire (Barnes Kit – contains the following items)	EA
		2640-00-922-6919	Leak Detector	
		2640-00-922-6917	Bonding compound	
		2640-00-922-6915	Repair Material	
		2640-00-922-6922	Injector Tool	
		5110-01-101-8355	Reamer Tool	
		2640-00-922-6918	Applicator	
		2640-00-922-6916	Box	
		5110-00-595-8402	Knife	
13		2640-01-373-3539	Tire Repair Kit (Safety Seal Truck – contains the following items)	EA
		2640-01-374-6041	Plugs, Repair (8")	
		2640-01-373-8903	Lubricant	
		P/N 140T-SP CAGE: 1HS99	Spiral Probe	
		P/N 108-T CAGE: 1HS99	Insertion Tool	
		P/N 102-T CAGE: 1HS99	Needle	
14		2640-01-443-6158	Tire Repair Kit (Safety Seal Passenger and Light Tire – contains the following items)	
		2640-373-8903	Lubricant	
		P/N 120C-60 CAGE: 1HS99	Plugs, Repair (4")	
		P/N 140T-SP CAGE: 1HS99	Spiral Probe	

Table 6. Tire and Tube Repair Kits − Continued

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
		P/N 108-T CAGE: 1HS99	Insertion Tool	
		P/N 102-T CAGE: 1HS99	Needle	
15		2640-00-849-0537	Plug, Pneumatic Tire Repair (5/16" Diameter Mushroom Head Plug) (Plug installed with Insertion Tool – NSN 4910-01-286-9414)	BX
			TUBELESS TIRE PLUGS	
16		2640-01-028-5316	Plug, Pneumatic Tire (1/4")	BX

Table 7. Cleaners, Lubricants, Preservatives, and Bulk Items

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
17		7510-00-282-6924	Chalk Assortment, Marking, Colored	AT
18		7510-00-281-4849	Crayon, Marking	DZ
19		2640-00-242-3467	Fluid, Vulcanizing	CN
20		4240-00-269-7912	Goggles, Industrial	PR
21		2640-00-256-5527	Lubricant, Tire and Rim	GL
22		2640-00-256-5529	Lubricant, Tire and Rim	CN
23		2640-01-282-2849	Lubricant, Tire and Rim	CN
24		2640-01-419-6200	Lubricant, Run-Flat	EA
25		2640-00-264-6642	Lubricant, Inner Tube	BX
26		9530-00-684-4668	Metal Foil	RO
27		7510-00-264-4612	Pencil	DZ
28		8135-00-579-6487	Plastic Sheet (*100 ft. roll)	RO
29		7920-00-205-1711	Rag, Wiping (50 lb. Bale)	BE
30		2640-00-138-8324	Solution, Buffing	CN
31		7920-00-900-3577	Brush, Wire	EA
32		8030-01-314-2213	Preservative, Tire Rubber	QT
33		8030-01-282-5626	Preservative, Tire Rubber	GL
34		8030-01-314-2214	Preservative, Tire Rubber	CN

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

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; the Shipyard Standards, 29 CRF part 1915; or the Longshoring Standards, 29 CRF part 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.

DEFINITIONS

1. **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.

2. **Charts** means the U.S. Department of Labor, Occupational Safety and Health Administration publications entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-piece Rim Matching Chart," the National Highway Traffic Safety Administration (NHTSA) publications entitled "Demounting and Mounting Procedures Truck/Bus Tires" and "Multi-piece Rim Matching Chart," or any other poster which contains at least the same instructions, safety precautions and other information contained in the charts that is applicable to the types of wheels being serviced.

3. **Installing a rim wheel** means the transfer and attachment of an assembled rim wheel onto a vehicle axle hub.

4. **Removing** means the opposite of installing.

5. **Mounting a tire** means the assembly or putting together of the wheel and tire components to form a rim wheel, including inflation.

6. **Demounting** means the opposite of mounting.

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

8. **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.

9. **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.

10. **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.

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

DEFINITIONS − CONTINUED

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

13. **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.

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

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

16. **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 air blast from a single piece rim wheel may be released. The trajectory may deviate from paths that are perpendicular to the assembled position of the rim wheel at the time of separation or explosion. (See OHSA Appendix A of this work package for examples of trajectories.)

17. **Wheel** means that portion of a rim wheel that 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).

EMPLOYEE TRAINING

1. The employer shall provide a program to train all employees that service rim wheels in the hazards involved in servicing those rim wheels and the safety procedures to be followed.

    a. 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 Safe Operating Procedure – Multi-Piece Rim Wheels and Safe Operating Procedure – Single Piece Rim Wheels paragraphs, this work package.

    b. 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.

    c. 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 that 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:

    a. Demounting of tires (including deflation).

    b. Inspection and identification of the rim wheel components.

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

    d. Use of the restraining device or barrier, and other equipment required by this section.

    e. Handling of rim wheels.

EMPLOYEE TRAINING − CONTINUED

f. Inflation of the tire when a single piece rim wheel is mounted on a vehicle.

g. 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.

h. 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.

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:

a. 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.

b. 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:

c. 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:

(1) Cracks at welds.

(2) Cracked or broken components.

(3) Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation.

(4) Pitting of components due to corrosion.

(5) Other structural damage that would decrease its effectiveness.

d. Restraining devices or barriers removed from service shall not be returned to service until they are repaired and re-inspected. Restraining devices or barriers requiring structural repair such as component replacement or re-welding 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 3.a. 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:

TIRE SERVICING EQUIPMENT

a. A clip-on chuck;

b. An in-line valve with a pressure gauge or a pre-settable regulator; and 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 or rim manuals containing instructions for the type 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.

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.

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:

a. When the tire has been driven underinflated at 80% or less of its recommended pressure, or

b. 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.

SAFE OPERATING PROCEDURE − MULTI-PIECE RIM WHEELS − CONTINUED

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 are 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 lockrings 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.

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.

SAFE OPERATING PROCEDURE − SINGLE PIECE RIM WHEELS − CONTINUED

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.

OHSA APPENDIX A

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

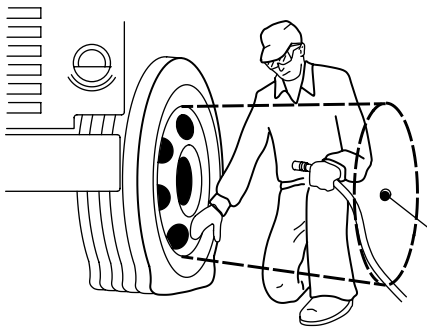


FIGURE 1

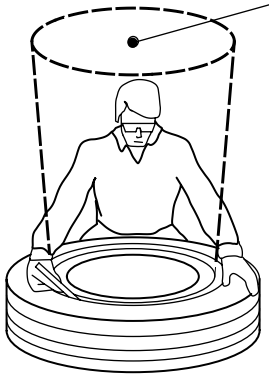


FIGURE 2

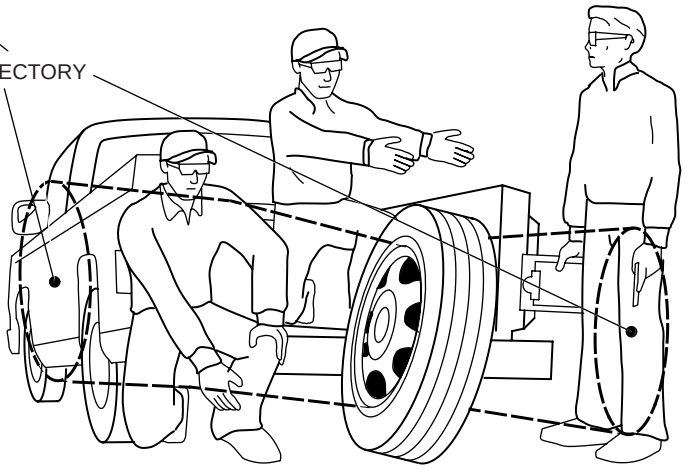


FIGURE 3

TM14-26

APPENDIX B − ORDERING INFORMATION FOR THE OSHA CHARTS

OSHA has printed two charts entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-piece Rim Matching Chart," as part of a continuing campaign to reduce accidents among employees who service large vehicle rim wheels. Reprints of the charts are available through the Occupational Safety and Health Administration (OSHA) Area and Regional Offices. The address and telephone number of the nearest OSHA 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 single or multiple copies of these charts may order them from the OSHA Publications Office, U.S. Department of Labor, Room N-3101, Washington, DC 20210. Telephone 1-800-321-6742.

END OF WORK PACKAGE

GLOSSARY **0014 00**

THIS WORK PACKAGE COVERS:

Glossary of Terms

Accelerator	A chemical that affects the rate of vulcanization of the tread rubber compounds.
Adhesion	A bond between materials.
Analysis	Inspection to determine the condition or state of repair.
Atmospheric Cracking	See Ozone.
Awl	A pointed or flat tool used to probe nail holes and injuries.
Backing	A removable protective material used on the application side of retread rubber and repair materials to preserve cleanliness and tackiness.
Band Ply	The inner cord ply of a tire.
Bead	The anchoring part of the tire that is shaped to fit the rim. The bead is heat treated, rubber cushioned, high carbon steel wires wrapped and reinforced by the plies.
Bead Filler	A semi hard base rubber wrapped around the bead seats and cured as an integral part of the tire. It holds the bead cables firmly and rigidly in place and prevents moisture from attacking the metal bands.
Bead Heel	The lower outside edge of the bead that rests against the rim flange.
Bead Separation	A breakdown of the bond between components in the bead area.
Bead-to-Bead Measurement	The distance from the heel of one bead measured 90° straight up over the crown and down the other side to a position on the heel of the other bead directly opposite the starting point.
Bead Toe	The lower inside edge of the bead that rides on the rim.
Bloom	A powdered coating generated on raw rubber stock due to age in storage. Usually the first sign of deterioration. See Ozone.
Blowout	See Ply Separation.
Bonding	Sticking two materials together using adhesives or other means.
Bowed Bead	A bead deformed into an elliptical (oval) shape.
Break	A crack extending into or through the fabric. An impact break is usually in the shape of an "X" or star and can be seen from the inside of the tire. A flex or circumferential break runs parallel to the beads.
Breaker Strip	A band or strip of rubber-coated bias cut tire cord placed circumferentially around the tire between the last ply of casing fabric and tread. Sometimes called the impact or shock ply.

Brittleness	Tendency to crack or snap when subjected to deformation. Buckled tread tire distortion caused by improper molding, evidenced by wrinkling on the inside
Buffed Surface	The prepared surface of a tire casing that provides proper adhesion between the previously vulcanized casing and the new rubber.
Buffer	A machine used to file or scrape the old tread from the tire.
Buffing	Removing knife marks from skived tires or rubber, and preparing surface areas for application of uncured rubber stocks.
Buildup	The application of retread or repair rubber.
Bulge	An uneven or swelled place in an inflated tire that may indicate that the tire has an inside break, ply separation, or tread separation. In tubeless tires, a bulge could indicate that the inner liner or seal is not holding the air, which is migrating through the body plies to the outer surface, causing a separation between the body plies and rubber. If tire is not inflated, check for separations
Carcass	See Casing.
Casing	The tire structure, excepting tread and sidewall rubber.
Cavity	The skived out portion of a tire repair (nail holes, cuts, breaks, etc.); the hollow portion of a vulcanizing mold, where tires are placed for curing.
C-clamp	A device designed for the vulcanizing of nail holes, spots, and plug portions of section and reinforcement repairs.
Cement	An adhesive rubber compound dissolved in solvent used to provide building tack and cured adhesion. May be brushed or sprayed on the buffed surface.
Chafer Fabric	The layer of fabric covering the bead in the area between the bead and rim, designed to protect the bead against abrasion from contact with the rim flange.
Checking	Cracks that develop in tire treads and sidewalls in the process of deterioration. See Ozone.
Chemical Cure	Vulcanization at room temperature or above; activated by chemical agents, without the application of heat from an outside source. See Self-vulcanization.
Chunking	The breaking away of pieces of the tread from the casing. Pieces may range from a very small size to several inches in area.
Classification Codes	The status code in which items are placed when received or inspected that identifies their state of repair.
Coding	Identification marks on component parts (tires, inner tubes, etc.) before processing, during processing, and after completion.
Condition Readiness Codes (CRC)	The same as Classification Codes. It's the status code in which items are placed when received or inspected that identifies their state of repair.

GLOSSARY − CONTINUED **0014 00**

Cords	The strands forming the plies in a tire.
Cord Separation	Cords parting away from adjacent rubber compounds.
Cross Section	The maximum width of a tire.
Crown Width	The shoulder-to-shoulder distance measured along the buffed contour.
Cure Time	The time required at a specified temperature for a compound to reach optimum physical properties.
Cure Soft	A degree of cure less than the optimum, where the desired physical properties have not been reached.
Cure Sponge	A defective cure that gives a pin hole appearance to rubber; caused by insufficient mold pressure or volume of rubber.
Cushion Gum	A tacky rubber compound used for adhesion, undertread repair, and buildup.
Deformation	Any noticeable change of form or shape.
Fabric	Cord stock constructed of rayon, nylon, polyester, fiberglass, or wire and used to make up the casing of pneumatic tires. Also used in section and reinforcement repair patches.
Fabric Fatigue	Fabric degradation and resultant tire cord breakdown due to repeated flexing. Caused by overload or underinflation.
Filler Strip	A free-flowing rubber used under the tread when added thickness is needed.
Film, Plastic (Polyethylene)	Soft plastic film sheeting used as a protective backing for tread rubber and tire repair materials.
Groove	Space between two adjacent tread ribs.
Groove Cracking	Cracking that occurs at the bottom of a tread groove.
Growth	In tires, any dimensional increase during service.
Kinked Bead	A bead deformed from its original shape to such an extent that inflation of the tire will not restore it to its original configuration.
Liner	The tubeless tire inner surface used to form an airtight seal with the rim.
Lug Tearing	Rupture of the lug, sometimes resulting in its removal, caused by violent operational or mechanical interference.
Mandrel	A curved support inserted in a tire to prevent the casing from collapsing while building a repair.
Moisture Blows	Ply separations caused by the presence of moisture in the casing that, when subjected to heat, becomes steam and expands.

GLOSSARY − CONTINUED **0014 00**

Mold	Equipment in which the new tread is cured to the worn tire. Mold includes the steam chamber, matrix, and adjusting devices.
Optimum Cure	That state of cure at which the rubber compound exhibits the most satisfactory physical properties. Usually expressed in minutes curing time at a specified temperature.
Overbuff	Removal of too much material by buffing. Buffing an area too large for reinforcement patch or die size of rubber to be used.
Over Cure	Vulcanizing longer than necessary. Can result in the deterioration of certain physical properties.
Ozone	Active form of oxygen, usually caused by static electricity, that is very harmful to rubber. Causes checking and cracking often attributed to aging or weathering.
Ozone Resistant	A formulation of rubber resistant to the cracking effect of ozone in the atmosphere. Although the ozone resistance of natural rubber is poor, it can be improved by compounding with anti-ozone chemicals and waxes.
Pin Holes	Minute circular voids in cured or uncured rubber.
Plug	A piece of new rubber vulcanized into tread or sidewall injury.
Ply	A layer of rubber coated parallel cores, several of which, laid one across the other, make up the casing of the tire.
Ply Separation	A parting of rubber compound between adjacent plies.
Potentiometer	A multivoltmeter calibrated to sense temperature in a desired range (usually direct reading).
Premature Vulcanization	Uncontrolled curing or setup (loss of flow qualities) in material before final cure.
Pyrometer	An instrument used to measure temperatures, usually by the generation of electrical current by a thermocouple when acted on by direct heat. Commonly used to measure surface mold temperatures or, if a penetrating needle is used, tread rubber temperatures.
Radial Cracking	Cracking, usually near or in the rib area, resulting from underinflation or ozone exposure.
Rasp	A tool used for roughening rubber surfaces.
Reinforcement	Any material, usually rubber and fabric, vulcanized to the tire to add strength to the cord body at an injury point.
Repair Gum	Material used for filling voids or covering reinforcing material in a tire repair.
Repaired Tire	Any tire with punctures, cuts, or other types of injuries that has been reconditioned, as required, to provide additional safe service life.

GLOSSARY − CONTINUED **0014 00**

Repair Patch	The reinforcing material used to strengthen the area around an injury in a tire.
Repair Plug	The rubber material that fills the cavity of an injury in a tire.
Retread Tire	A casing to which tread rubber has been affixed to extend the usable life of the tire.
Reversion	Excessive heating of a cured rubber compound leading to deterioration of its physical properties.
Rim	A metal support for a tire or a tire and tube assembly upon which the tire beads are seated.
Rim Diameter	The diameter (conventionalized) of the rim corresponding to the tire bead heel.
Rim Flange	That part of the rim that supports the bead heel and resists lateral pressure.
Roller	A hand or power operated roller used for applying pressure to uncured rubber stocks, thereby removing air and ensuring a better bond during buildup operations.
Scorching	Premature vulcanization or setup of raw stock during processing.
Scorch Point	The beginning of vulcanization. When rubber reaches the scorch point it will not flow enough to fill out a mold.
Section Repair	Repairs made to the casing when an injury has extended through the tread or sidewall of a tire. The damaged cord is removed and new cord is installed in the form of a repair unit or patch. See Chemical Cure.
Self-vulcanization	Vulcanization at room temperature or above; activated by chemical agents without the application of heat from an outside source. See Chemical Cure.
Separation	Any parting or void within the tire body structure, indicated by bubbles, blisters, or other unusual deformation of the regular inner or outer tire surface.
Setup	Premature vulcanization of a rubber compound during processing or storage.
Shoulder Radius	Small radius (generally) that joins the primary tread radius to the shoulder contour.
Sidewall	That portion of a tire between the tread and bead.
Size Factor	The size factor of a tire is the sum of its section width on its measuring rim and its outer diameter.
Sizing	Measuring the tire casing to determine proper matrix fit. Usually a combination of bead-to-bead, or cross section and tire circumference is used.

GLOSSARY − CONTINUED **0014 00**

Skid Depth (Tread Depth)	The distance, measured near the centerline of the tire, from the base of the tread design to the top of the tread.
Skiving	Removal of damaged material prior to making a repair.
Slab Stock	Tread compound cut from a rubber mill in wide, thick strips.
Spot Press	A heat vulcanizing unit used in spot repairs and built with a metal curing place on one side.
Spreader	A device used to force the tire beads apart to give access to the inside of the tire.
Standard Rim	A rim that has been calibrated and found to meet the precise measurements specified by the Tire and Rim Association, Inc. or, where applicable, by the European Tire and Rim Association.
Stitching	A hard rolling method used to both remove trapped air and improve rubber contact for better adhesion.
Tack	A term used to describe tackiness.
Tempil Sticks	A type of crayon used in checking surface temperatures of various degrees.
Tread	That portion of a tire that comes in contact with the road.
Tread Depth	The distance, measured near the centerline of the tire, from the base of the tread design to the top of the tread.
Tread Design	The nonskid pattern on the tread portion of the tire.
Tread Gum	A rubber compound used primarily to build up the tread when making a repair.
Tread Radius	A measure of tread surface curvature from shoulder to shoulder.
Tread Rib	A tread section running circumferentially around a tire.
Tread Separation	Pulling away of the tread from the tire casing.
Under Cure	A condition that describes less than acceptable vulcanization or curing.
Viscosity Test	Testing the flow rate of chemicals.
Vulcanization	A chemical change in the physical properties of rubber from a plastic or elastic state; occurs under proper conditions of temperature and pressure, and appropriate curing time, and develops usable tire characteristics.
Vulcanizing Cement	A rubber cement containing additives to provide building tackiness.
Weathering	Checking. See Ozone.

END OF WORK PACKAGE

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By Order of the Secretary of the Army:

PETER J. SCHOOMAKER
General, United States Army
Chief of Staff

Official:

SANDRA R. RILEY
Administrative Assistant to the
Secretary of the Army

0522001

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 340197, requirements for TM 9-2610-200-14.

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PART I – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 9-2610-200-14	30 June 2005	

ITEM	PAGE	PARA	LINE	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON
0052 00-4						Inspection Step 1 WP reference should be (WP 0003 00)

**Reference to line numbers within the paragraph or subparagraph.*

TYPED, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

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PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE
TM 9-2610-200-14		Unit, Direct Support and General Support Maintenance Repair Parts and Special Tools List

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed).*

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RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
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PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM	PAGE	PARA-*	LINE*	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25-30; the proponent agency is OAASA	Use Part II *(reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM).	DATE
TO: *(Forward to proponent of publication or form) (Include ZIP Code)*	**FROM:** *(Activity and location) (Include ZIP Code)*	

PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM	PAGE	PARA-*	LINE*	FIGURE NO.	TABLE	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

TO: *(Forward direct to addressee listed in publication)*	FROM: *(Activity and location) (Include ZIP Code)*	DATE

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PART III - REMARKS *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1,000 Millimeters = 39.37 Inches
1 Kilometer = 1,000 Meters = 0.621 Miles

SQUARE MEASURE

1 Sq Centimeter = 100 Sq Millimeters = 0.155 Sq Inches
1 Sq Meter = 10,000 Sq Centimeters = 10.76 Sq Feet
1 Sq Kilometer = 1,000,000 Sq Meters = 0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter = 1,000 Cu Millimeters = 0.06 Cu Inches
1 Cu Meter = 1,000,000 Cu Centimeters = 35.31 Cu Feet

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1,000 Milliliters = 33.82 Fluid Ounces

TEMPERATURE

Degrees Fahrenheit (F) = °C • 9 ÷ 5 + 32
Degrees Celsius (C) = F° - 32 • 5 ÷ 9
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius

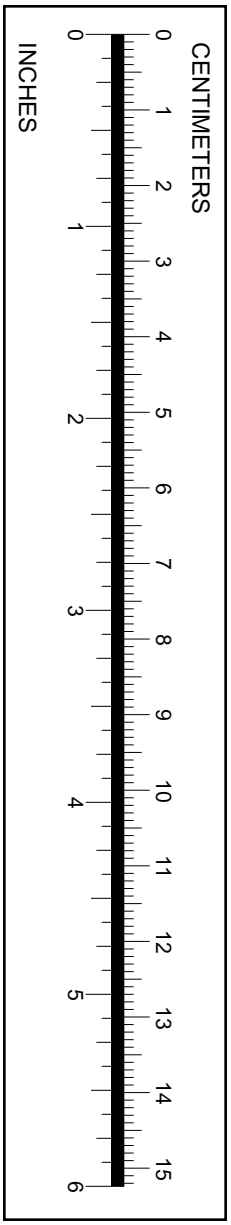
WEIGHTS

1 Gram = 0.001 Kilograms = 1,000 Milligrams = 0.035 Ounces
1 Kilogram = 1,000 Grams = 2.2 Lb
1 Metric Ton = 1,000 Kilograms = 1 Megagram = 1.1 Short Tons

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Millimeters	25.4
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.4536
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds Per Square Inch	Kilopascals	6.895
Miles Per Gallon	Kilometers Per Liter	0.425
Miles Per Hour	Kilometers Per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Millimeters	Inches	0.03937
Centimeters	Inches	0.3937
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.2046
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds Per Square Inch	0.145
Kilometers Per Liter	Miles Per Gallon	2.354
Kilometers Per Hour	Miles Per Hour	0.621



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