

TM 9-2610-200-14

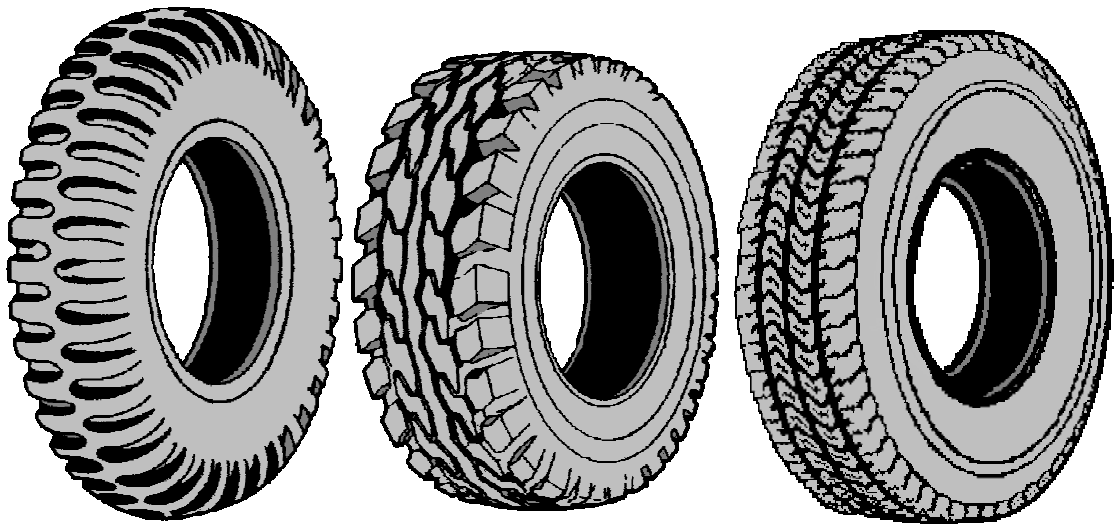
This manual supersedes TM 9-2610-200-14, 1 November 1990

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

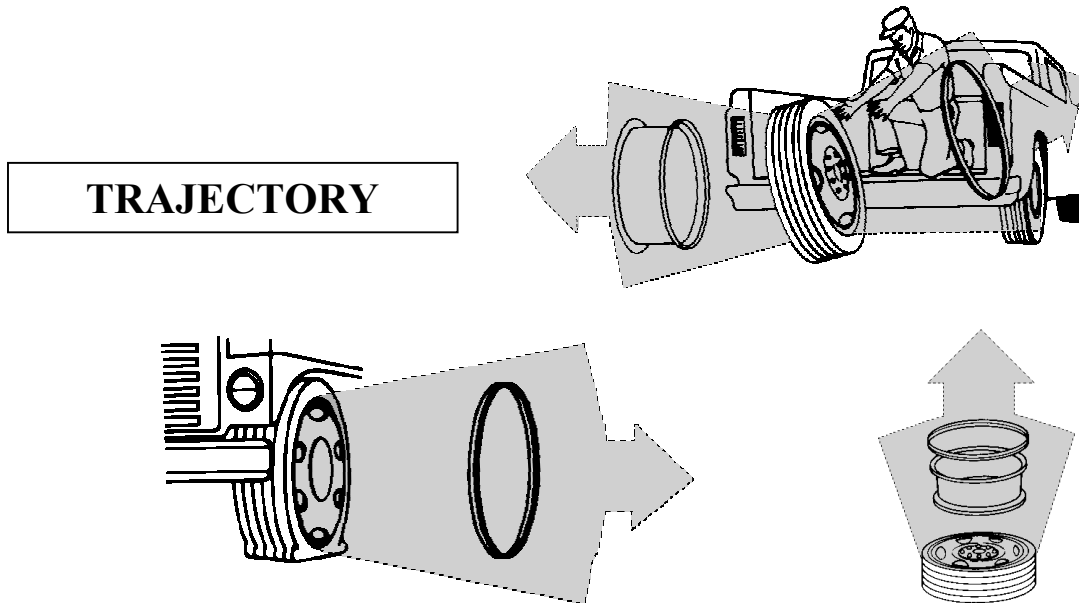
1 SEPTEMBER 2000

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.



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

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

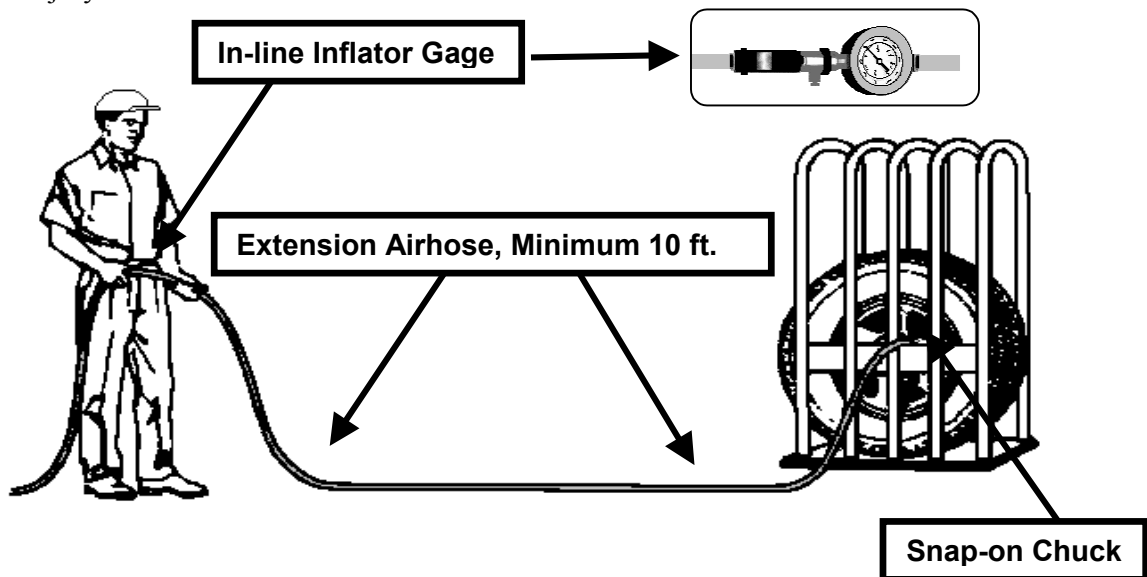
Never inflate a wheel assembly with wheel locknuts removed in an attempt to separate the inner and outer rim halves. The assembly will separate under pressure resulting in serious injury or death.

WARNING

Never re-inflate a tire that has been run flat 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 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 lockrings in an inflation safety cage or serious injury or death could result.
- When inflating tires in an inflation safety cage, always use an extension airhose (10 ft or 3.1 mm minimum), snap on chuck and a in-line pneumatic tire inflator-gage. Failure to do so could cause serious injury.



WARNING

- Improperly seated side flanges or lockrings may fly off during inflation. Never attempt to seat a side ring flange or locking ring during inflation or after inflation with a hammer or other tool. 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.

WARNING

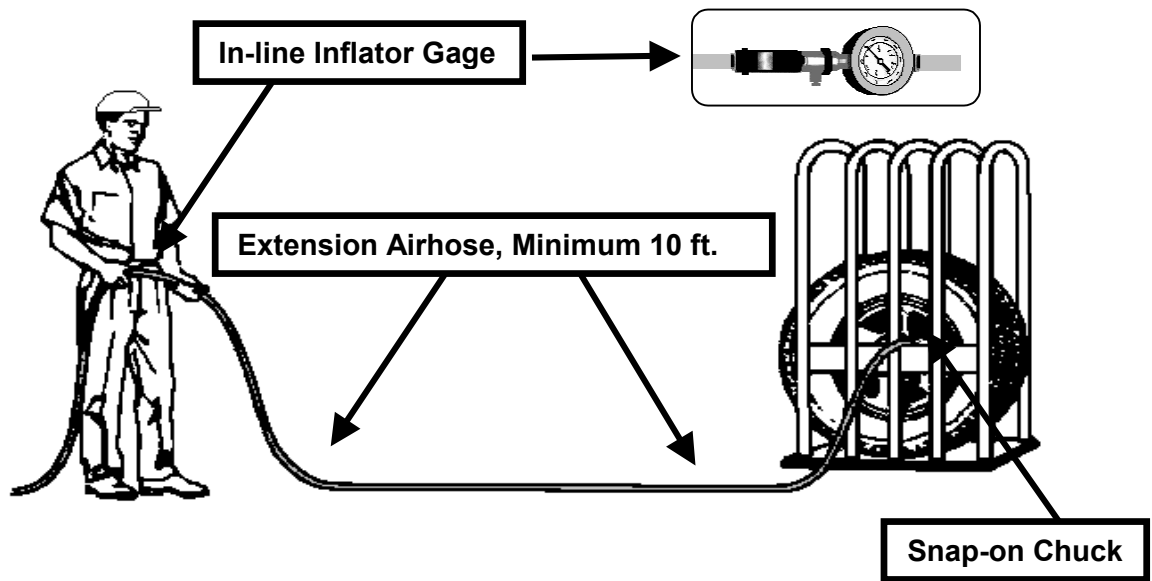
For information on artificial respiration and first aid, refer to FM 21-11.

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. Compresses airstream must be less than 30 psi (207 kPa).

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 cause health hazards.

TM 9-2610-200-14

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Page/WP* No.	Change No.	Page/WP No.	*Change No.	Page/WP No.	*Change No.
Title.....	0				
a - c.....	0				
i - iv.....	0				
1-1 – 1-28.....	0				
2-1 – 2-122.....	0				
A-1 – A-2.....	0				
B-1 – B-6.....	0				
C-1 – C-10.....	0				
D-1 – D-4.....	0				
E-1 – E-6.....	0				
Index 1 – Index 9.....	0				

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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://aeprs.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.

TABLE OF CONTENTS

Chapter/Section/Paragraph	Page
CHAPTER 1. INTRODUCTION	1-1
SECTION I. GENERAL INFORMATION	1-1
1-1. SCOPE.....	1-1
1-2. MAINTENANCE FORMS, RECORDS, AND REPORTS.	1-1
1-3. EQUIPMENT IMPROVEMENT REPORT AND MAINTENANCE DIGEST.....	1-1
1-4. REPORTING FIELD FAILURES.....	1-1
1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).	1-1
1-6. DIRECT EXCHANGE.	1-2
1-7. TRAINING COURSES.....	1-2
SECTION II. EQUIPMENT DESCRIPTION AND DATA	1-3
1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.....	1-3
1-9. TIRE MARKINGS AND CODES.....	1-19
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION	2-1
SECTION I. GENERAL INFORMATION	2-1
2-1. COMMON TOOLS AND EQUIPMENT.....	2-1
2-2. SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.	2-1
2-3. INFLATION SAFETY.....	2-1

TABLE OF CONTENTS

Chapter/Section/Paragraph	Page
2-4.	MULTI-PIECE RIMS/WHEEL GENERAL MAINTENANCE PROCEDURES. . 2-5
2-5.	SINGLE-PIECE RIMS/WHEELS GENERAL MAINTENANCE PROCEDURES.2-5
2-6.	REFERENCE INFORMATION FOR SAFE MAINTENANCE PROCEDURES FOR DEMOUNTING, MOUNTING AND INFLATING TIRES. 2-6
2-7.	TUBE AND FLAP USAGE. 2-6
2-8.	EXTREME COLD WEATHER CONDITIONS. 2-7
2-9.	VALVE POSITIONING. 2-7
2-10.	MARKING OF TIRES. 2-7
2-11.	MATCHING OF TIRES. 2-7
2-12.	TIRE INJURIES AND OZONE DAMAGE. 2-8
2-13.	TIRE ROTATION. 2-9
2-14.	ROTATION OF BIAS, BELTED BIAS, AND RADIAL TIRES. 2-9
2-15.	EFFECTS OF VEHICLE OPERATION. 2-10
2-16.	EFFECTS OF VEHICLE MAINTENANCE. 2-10
2-17.	IRREGULAR AND EXCESSIVE TIRE WEAR. 2-11
2-18.	TIRE WEAR PATTERNS. 2-11
SECTION II.	OPERATOR INSPECTIONS AND SERVICES 2-13
2-19.	OPERATOR INSPECTIONS AND SERVICES. 2-13
SECTION III.	UNIT MAINTENANCE 2-15
2-20.	GENERAL 2-15
2-21.	TIRE REPAIR LIMITS. 2-16
2-22.	UNIT INSPECTION. 2-18
2-23.	TIRE INSPECTION. 2-18
2-24.	TREAD DEPTH MEASUREMENT 2-20
2-25.	RETREADING. 2-23
2-26.	VALVE CORE REPLACEMENT. 2-24
2-27.	AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE. 2-25
2-28.	FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS). 2-31
2-29.	RUNFLAT TIRE MAINTENANCE (HMMWV). 2-39
2-30.	BOLT TOGETHER RIMS REPAIR (M939A1 SERIES). 2-47
2-31.	TIRE REPAIR PROCEDURES -TEMPORARY STRING REPAIR. 2-52
2-32.	TIRE REPAIR PROCEDURES - COMPLETE TIRE REPAIR. 2-55
2-33.	INNER TUBE REPAIR PROCEDURES. 2-57
SECTION VI.	DIRECT SUPPORT MAINTENANCE 2-59
2-34.	GENERAL. 2-59
2-35.	NONDEMOUNTABLE FLAT BASE RIM TUBE TIRE MAINTENANCE. 2-60
2-36.	DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE.2-66
2-37.	NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE. 2-70
SECTION VII.	GENERAL SUPPORT MAINTENANCE 2-79
2-38.	GENERAL. 2-79
2-39.	TIRE REPAIR AND REPAIR LIMITS. 2-79
2-40.	TIRE REPAIR PROCEDURES, SELF-VULCANIZING SPOT REPAIR. 2-85
2-41.	TIRE REPAIR -SPOT REPAIR USING PRESS FOR HEAT & PRESSURE. 2-87
2-42.	TIRE REPAIR PROCEDURES, SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER. 2-88
2-43.	PRELIMINARY INSPECTION & CONDITION CLASSIFICATION OF TIRES.2-92
2-44.	TIRE INSPECTION CRITERIA. 2-96
2-45.	INSPECTION OF REPAIRED OR RETREADED TIRES. 2-102
SECTION VI.	VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES 2-105
2-46.	GENERAL. 2-105
2-47.	BEAD AREA CONDITIONS. 2-106
2-48.	SIDEWALL AREA CONDITIONS. 2-108
2-49.	TREAD CROWN AREA CONDITIONS. 2-111
2-50.	INSIDE TIRE/INNER LINER CONDITIONS. 2-114

TABLE OF CONTENTS

Chapter/Section/Paragraph		Page
2-51.	RETREAD CONDITIONS.....	2-116
SECTION VII.	STORAGE OF TIRES AND TUBES	2-122
2-52.	GENERAL.....	2-122
2-53.	STORAGE OF MOUNTED TIRES.....	2-122
2-54.	STORAGE OF UNMOUNTED TIRES AND TUBES.....	2-122
2-55.	TIRE SHELF LIFE.....	2-122

APPENDICES

APPENDIX A:	REFERENCES	A-1
APPENDIX B:	TOOLS AND SUPPORT EQUIPMENT LIST.....	B-1
APPENDIX C:	EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST.....	C-1
APPENDIX D:	OSHA STANDARD 29 CFR 1910.177 (SERVICING MULTI-PIECE AND SINGLE PIECE WHEELS).....	D-1
APPENDIX E:	GLOSSARY	E-1

LIST OF TABLES

Table No.	Title	Page
Table 1-1.	Tire Categories and Groups.....	1-5
Table 1-2.	Tire Size Conversions.....	1-22
Table 1-3.	Ply Rating Vs. Load Range	1-24
Table 1-4.	Off-Road Tire Codes.....	1-27
Table 2-1.	Permissible Measurement Differences for Dual Tires.....	2-8
Table 2-2.	Puncture Repair Limits for Tread Crown Area ONLY.....	2-16
Table 2-3.	Tire Non-Repairable Area.....	2-17
Table 2-4.	Military Tire Tread Depth Location Measurements.....	2-22
Table 2-5.	Permissible Inner Tube Repairs.	2-57
Table 2-7.	Maximum Section Repair Limits For Radial Tires.....	2-83
Table 2-8.	Maximum Section Repair Limits for Bias Tires	2-84
Table 2-9.	Tee Units, Passenger Car and Light Truck Tires	2-91
Table 2-10.	Tee Units, Large Truck and Grader Tires.....	2-91
Table 2-11.	Tee Units, Earthmover Tires.....	2-91
Table 2-12.	Serviceable Used Tire Table.....	2-94
Table 2-13.	Replacement and Repair Valves for Inner Tubes.....	C-2
Table 2-14.	Replacement and Repair Valves for Tubeless Tire Rims.....	C-2
Table 2-15.	Chemical Cure Section Patches	C-4
Table 2-16.	Chemically Vulcanizing Units.....	C-5
Table 2-17.	AAA Chemical Cure Repair Units.	C-5
Table 2-18.	Tee Units.....	C-6
Table 2-19.	Tire and Tube Repair Kits	C-7
Table 2-20.	Cleaners, Lubricants, Preservatives, and Bulk Items.....	C-8

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 two chapters. A subject index is located at the beginning of each section to help you find the exact paragraph you are looking for.

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. INTRODUCTION

SECTION I. GENERAL INFORMATION

Paragraph Number	Paragraph Title	Page Number
1-1.	SCOPE.....	1-1
1-2.	MAINTENANCE FORMS, RECORDS, AND REPORTS.	1-1
1-3.	EQUIPMENT IMPROVEMENT REPORT & MAINTENANCE DIGEST	1-1
1-4.	REPORTING FIELD FAILURES.....	1-1
1-5.	REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).	1-1
1-6.	DIRECT EXCHANGE.	1-2
1-7.	TRAINING COURSES.....	1-2

1-1. 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 does 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.

1-2. 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)*.

1-3. 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 your 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.

1-4. 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.

1-5. 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.

SECTION I. GENERAL INFORMATION (Con't)

1-6. 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.

1-7. 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: (810) 574-4271

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

SECTION II. EQUIPMENT DESCRIPTION AND DATA

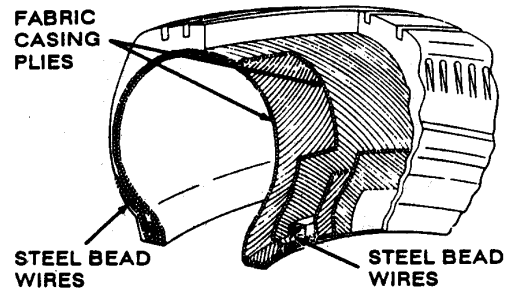
Paragraph Number	Paragraph Title	Page Number
1-8.	EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.	1-3
a.	STANDARD TIRE CONSTRUCTION	1-3
b.	TIRE CATEGORIES AND GROUPS.....	1-4
c.	TIRE TREAD TYPES – HIGHWAY TIRES.....	1-6
d.	TIRE TREAD TYPES – OFF ROAD/LOW SPEED TIRES.....	1-8
e.	TIRE TREAD TYPES – INDUSTRIAL AND AGRICULTURAL TIRES.....	1-9
f.	TIRE TREAD TYPES – MILITARY TACTICAL TIRES.....	1-10
g.	RIM AND WHEEL COMPONENTS.....	1-11
h.	RIM TYPES AND VARIATIONS.....	1-12
i.	TUBES AND FLAPS.....	1-15
j.	VALVE STEMS.....	1-15
k.	VALVE STEM COMPONENTS.....	1-18
1-9.	TIRE MARKINGS AND CODES.....	1-19
a.	GENERAL.....	1-19
b.	TIRE SIZE DESIGNATIONS.....	1-20
c.	TIRE SIZE CONVERSION.....	1-21
d.	PLY RATING AND LOAD RANGE.....	1-24
e.	DOT CODES AND DATE OF MANUFACTURE FOR NEW AND RETREADED TIRES.....	1-25
f.	BALANCE MARK.....	1-26
g.	MATERIAL CODES.....	1-26
h.	SPECIAL PURPOSE CODES.....	1-26

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. STANDARD TIRE CONSTRUCTION

(1) Bias Ply.

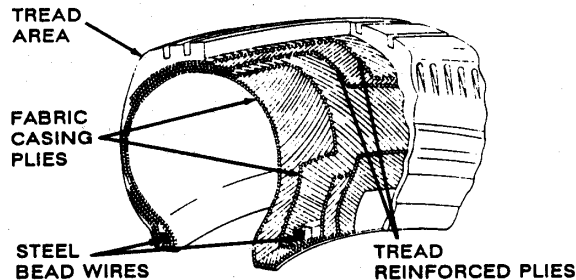
Bias ply tires are constructed of rayon, nylon, or polyester casing plies in a crisscross pattern wrapped around steel bead wires. The bead wires prevent the tire from opening up and separating from the rim at high speeds. The casing plies give the tire its shape. This construction is used for standard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



BIAS PLY

(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.



BELTED BIAS PLY

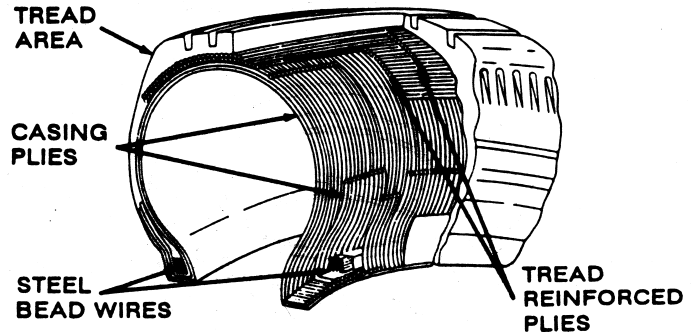
SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

a. STANDARD TIRE CONSTRUCTION (Con't).

(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.



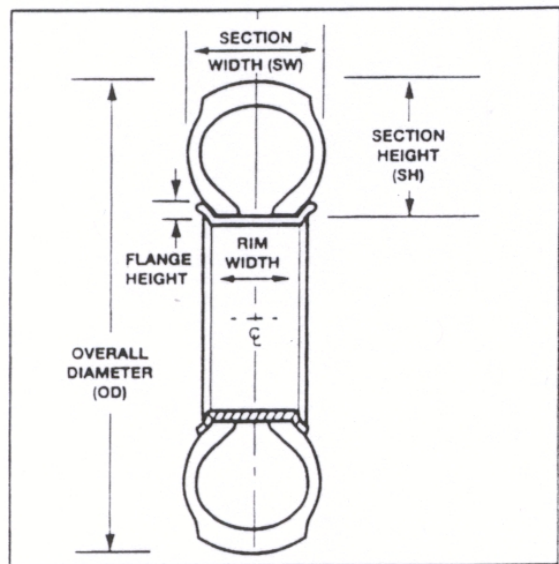
RADIAL TIRE

(4) Tube and Tubeless Tires.

Construction of tube and tubeless tire 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.

b. TIRE AND RIM MEASUREMENT NOMENCLATURE.

The diagram to the right shows the nomenclatures that are used for tire and rim measurements. Note that 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. Also Section Width does not include protective side ribs, bars, or tire decorations.



Cross-Section of Tire and Rim

c. TIRE CATEGORIES AND GROUPS.

There are basically five major categories of ground vehicle tires. Within each category there are various groups which identify the specific group of vehicles that the tires would be applied to. The table on the next page explains the major tire categories and groups.

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

c. TIRE CATEGORIES AND GROUPS (Con't).

Table 1-1. Tire Categories and Groups

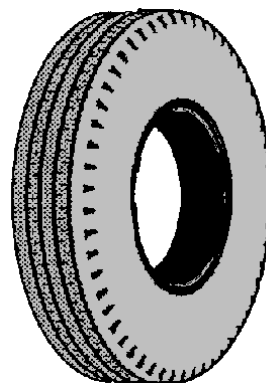
TIRE CATEGORIES	TIRE GROUPS
<i>Highway Tires:</i>	<p>Passenger Car Tires. Passenger car tires are of standard construction. Most passenger car tires have a regular rib tread but can be a more aggressive lug tread design. Regular rib tread provides adequate traction and long life on highways. Passenger 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.</p> <p>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.</p> <p>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).</p> <p>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 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.</p>
<i>Off Road/Low Speed Tires:</i>	<p>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.</p> <p>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.</p> <p>Mobile Crane and Forklift Tires. These tires are designed to operate off-road on Cranes and Forklifts at low speed.</p>
<i>Industrial Tires:</i>	<p>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.</p>
<i>Agricultural Tires:</i>	<p>This category includes tires used on Farming and Agricultural type vehicles and equipment.</p>
<i>Military Tactical Tires:</i>	<p>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.</p>

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

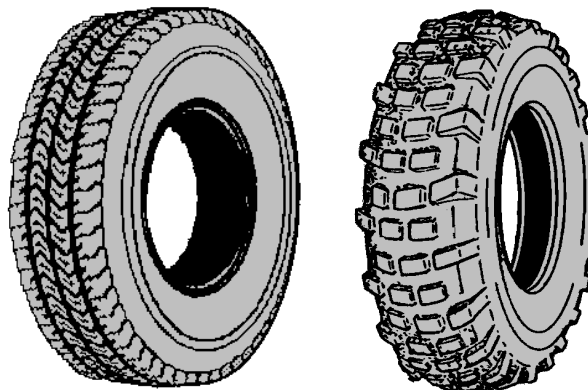
d. TIRE TREAD TYPES – HIGHWAY TIRES.

(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 Car, Light Trucks and All-Terrain Vehicles only. These tires can provide excellent mileage and good steering and traction on pavement.



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.



ALL-TERRAIN TIRES

(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.



MUD & SNOW TIRE

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

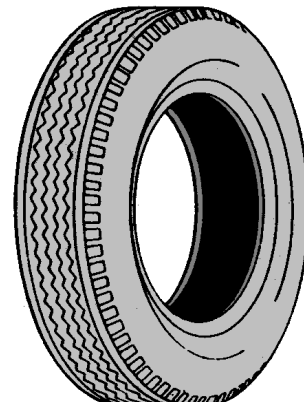
d. TIRE TREAD TYPES – HIGHWAY TIRES (CON'T).

(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.



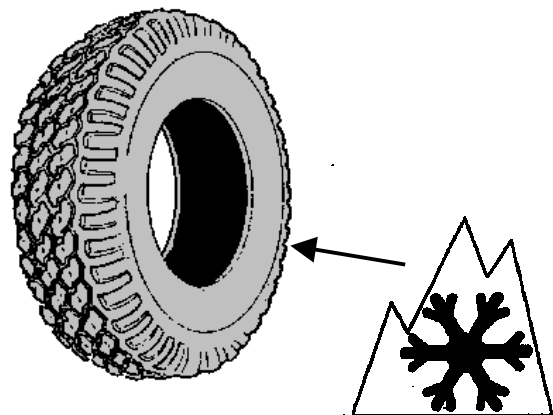
ON/OFF HIGHWAY TIRE

(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.



REGULAR RIB TIRE

(6) **Snow Tread.** Some newer manufactured tires are marked similar to Mud and Snow Tires 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. 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 order from the Rubber Manufacturers Association, c/o Mail Room, PO Box 3147, Medina, OH 44258-3147.



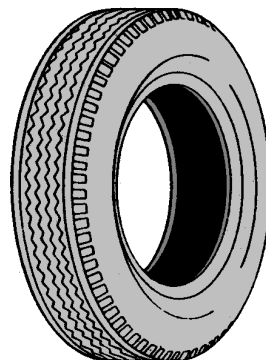
SNOW TIRE

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

d. TIRE TREAD TYPES – HIGHWAY TIRES (CON'T).

(7) **Trailer Tires.** These tires are designed to be used 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.



TRAILER OR TRUCK STEER TIRE

(8) **Truck/Bus Front Steer Tires.** Truck/Bus front tires are usually medium size, standard construction, and rib tread 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.

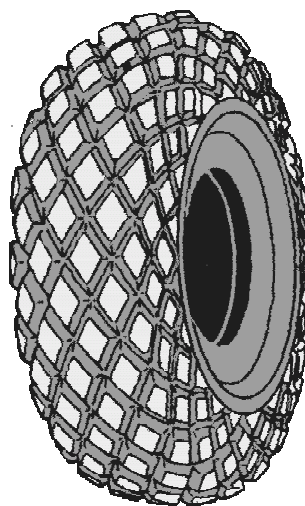


TRUCK/BUS DRIVE AXLE TIRE

(9) **Truck/Bus Drive Axle Tires.** Truck/Bus rear tires are usually standard construction with more aggressive lug treads. The lug tread design provide important driving traction for drive axles.

e. 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.



EARTHMOVER,
NON-DIRECTIONAL TREAD TIRE

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

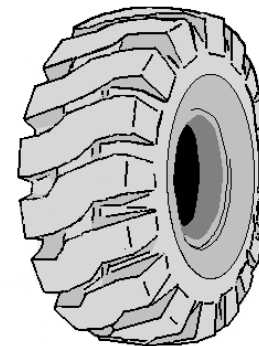
e. TIRE TREAD TYPES – OFF ROAD/LOW SPEED TIRES (CON'T).

(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.



GRADER, DIRECTIONAL TREAD TIRE

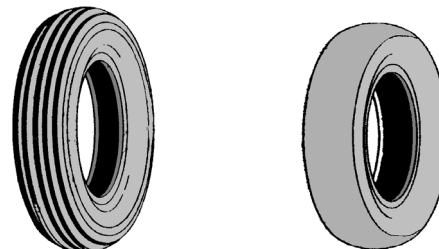
(3) **Rock Service Tires.** Rock service tires are large size tires of standard construction used on commercial vehicles for off-road service and on unpaved roads. These tires are characterized by narrow voids so that loose rock cannot be caught and tear the tread lugs loose from the tire body. This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



ROCK SERVICE TIRE

f. TIRE TREAD TYPES – INDUSTRIAL AND AGRICULTURAL TIRES.

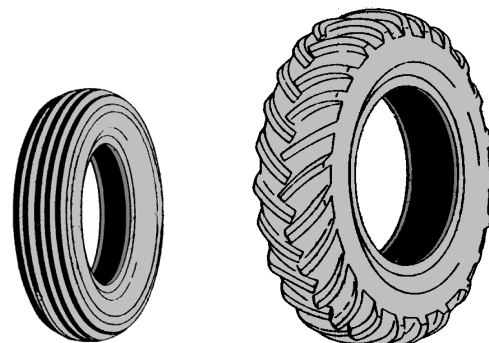
(1) **Implement Tires.** Implement tires are similar to tractor front tires except they are designed for towed vehicles. The smooth tread is used when neither steering nor traction are important.



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.

(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.



TRACTOR FRONT AND REAR

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

g. 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 the 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.



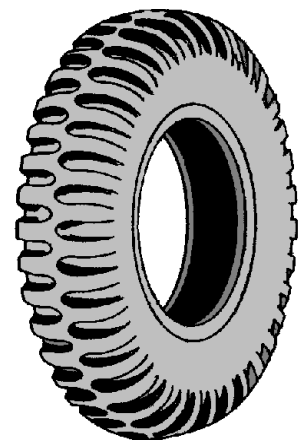
HMMWV TIRE

(2) **HEMTT Tires.** As with many military tires, the HEMTT tire is available with various tire designs, tire brands and from various manufactures. 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 test have proven them to work well in either direction.



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.



NDCC TIRE

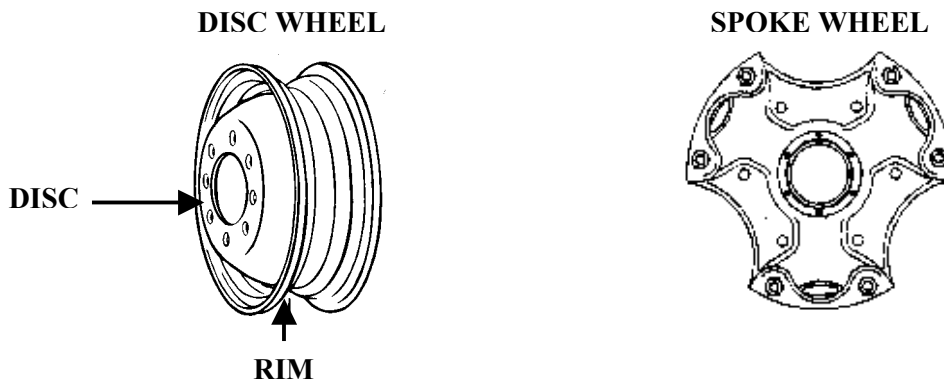
SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

h. RIM AND WHEEL COMPONENTS.

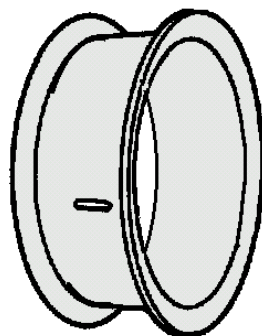
General. Sometimes the terms "wheel" and "rim," are used out of content even though there are major differences. A wheel is not a rim and a rim is not a wheel. The following definitions will help you understand the differences between these components.

(1) **Wheel.** Wheels are either a "disc wheel" type or "spoke wheel" type. A disk wheel, which is common with military vehicles, is a combination of a disc and rim and illustrated below. 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 consist of a hub and either 3, 5, or 6 spokes with clamps which attach to demountable type rims.



(2) **Rim.** The rim is the part which supports the tire. By definition the rim does not include the disc portion of a wheel which 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 lock ring. A single piece rims is a continuous, one piece assembly without side or lock rings.

RIM



SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

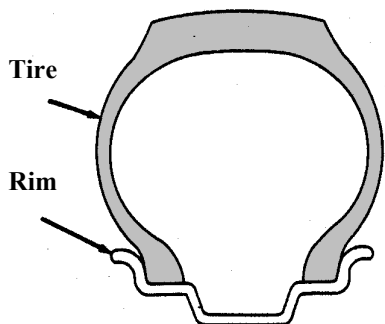
1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

i. RIM TYPES AND VARIATIONS.

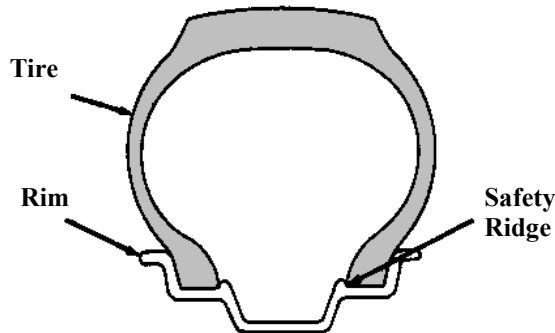
(1) **General to Multi-Piece Rims, with Lockrings or Siderings.** Any time a tire is changed, or during regular inspections, the rim components should be inspected for cracks, breaks or excessive rust. When mounting rim/wheel combinations with a split locking or sidering make sure the gap is aligned 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 and if they were incorrectly lined up the wheel could distort. There is no maximum locking/sidering gap for two and three piece assemblies. However there are minimum gap tolerances. For two-piece rims with a locking/sidering, the gap, when assembled should not be less than 3/8 inch. The ends on the locking/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, which might cause the tire to separate from the wheel sooner.

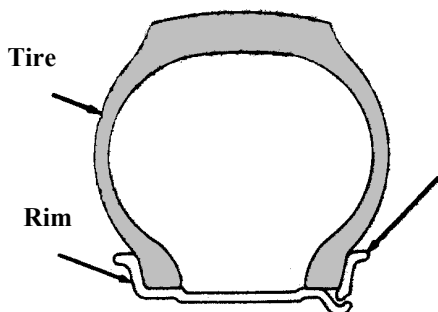


DROP-CENTER RIM

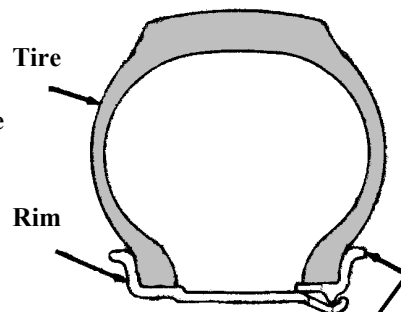


SAFETY RIM

(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.



SEMIDROP-CENTER RIM



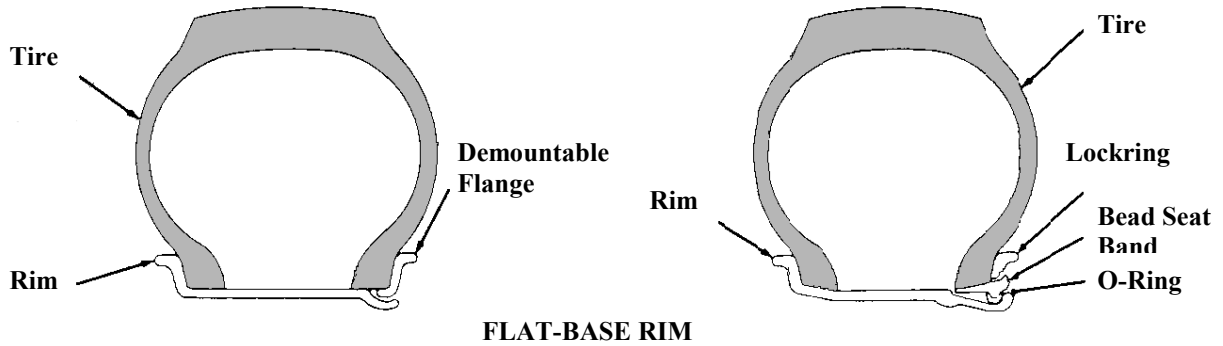
Demountable Flange

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

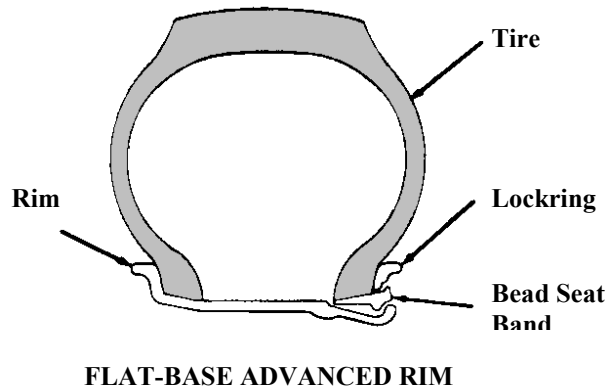
1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

i. RIM TYPES AND VARIATIONS (Con't).

(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.



(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° tapered bead seats on both sides of the rim.

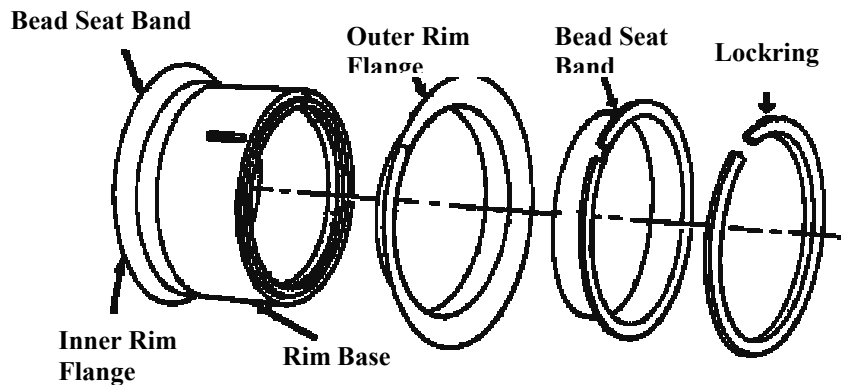


SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

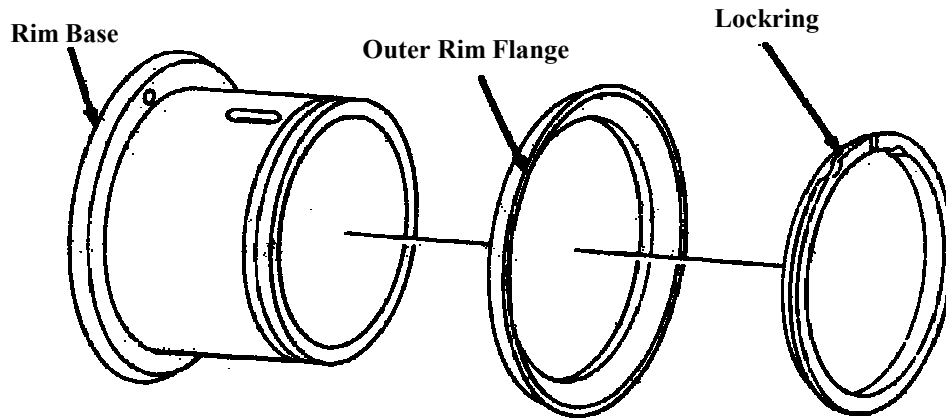
i. RIM TYPES AND VARIATIONS (Con't).

(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 locking. The rim base has a non-demountable rim flange and 5° tapered bead seat. The outer flange and locking 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. Also the rim manufacturer to further prevent slippage may knurl bead seat surfaces.



LARGE EARTHMOVER RIM

(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 a rubber packing between the outer flange and rim base to prevent leakage.



THREE-PIECE FLAT-BASE 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 rim flanges may be mounted or demounted from the rim base with several nuts and studs instead of locked in place with a locking. 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.

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

j. 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.

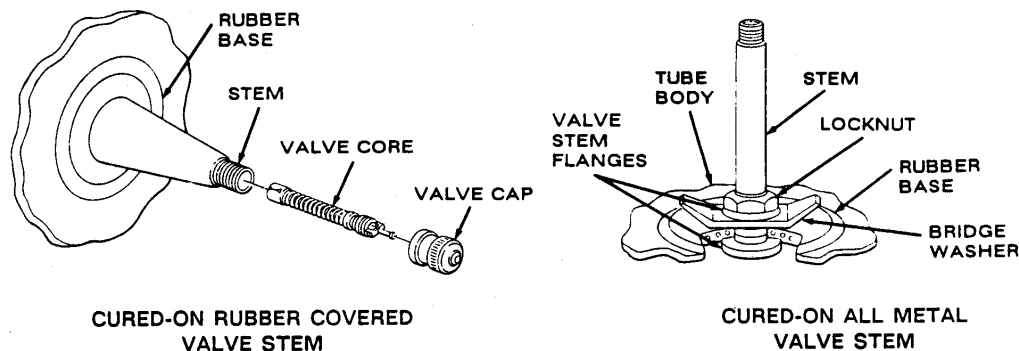
(2) **Flap Description.** Flaps are circular in shape and fit inside a tire assembly between the tube and rim. The flap is made of a thicker, more durable synthetic rubber and protect the tube from being chafed, pinched, punctured, or otherwise damaged from rim components.

(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).

k. 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 consist 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.



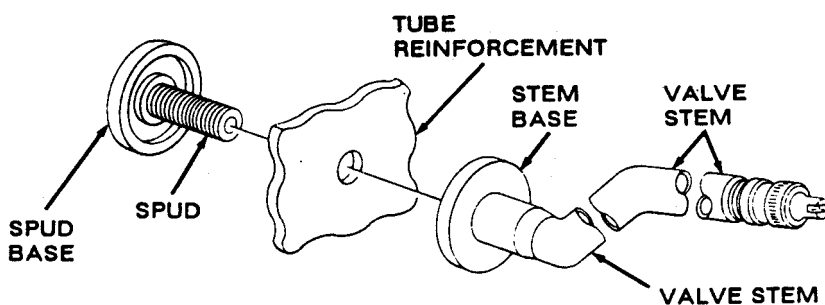
SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

k. VALVE STEMS (Con't).

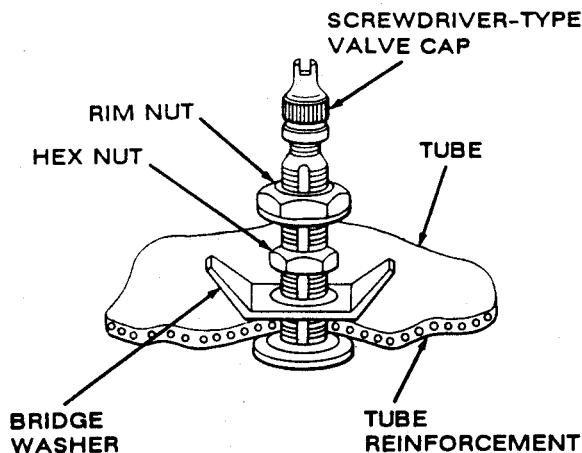
(3) **Tube, Cured-in Valve Stems.** Cured-in valve stems are similar to cured-on valve stems except that the rubber base is inverted and vulcanized to the inner surface of the tube. The rubber base may also be vulcanized directly into the rubber body of the tube.

(4) **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, whose outside thread accepts a valve stem replacement with a preformed packing.



SPUD-MOUNTED VALVE STEM

(5) **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 valve 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.



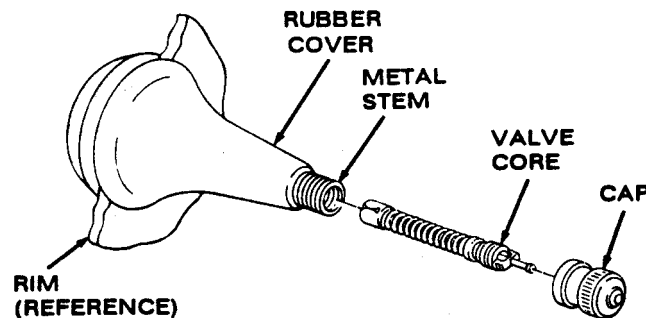
CLAMP-IN VALVE STEM

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

k. VALVE STEMS (Con't).

(6) **Rim Mounted, Tubeless Tire, Clamp-in Valve Stems.** Clamp-in tubeless tire valve stems are used primarily on passenger car 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.



SNAP-IN TUBELESS TIRE VALVE STEM

(7) **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.

(8) **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.

(9) **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. An airtight seal is formed by the rubber washer when the mounting hex nut is tightened.

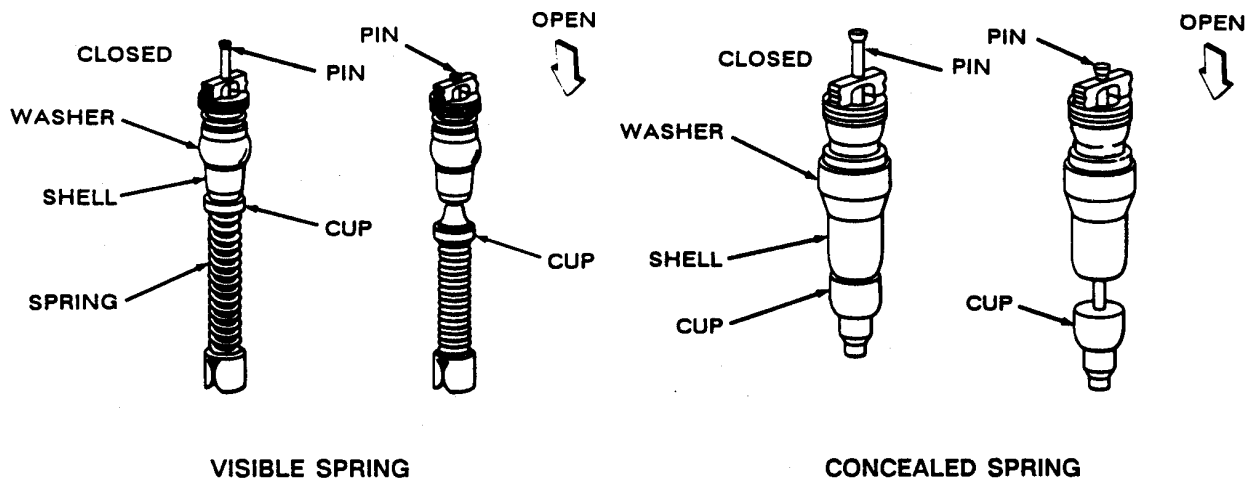
(10) **Rim Mounted, Tubeless Tire, Snap-in, Valve Stems.** Snap-in tubeless tire valve stems are used extensively with passenger car and light trucks. This type of valve stem is mounted on tubeless tire rims through a circular hole of controlled dimension. The valve stem is encased in a heavy, pear shaped 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.

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

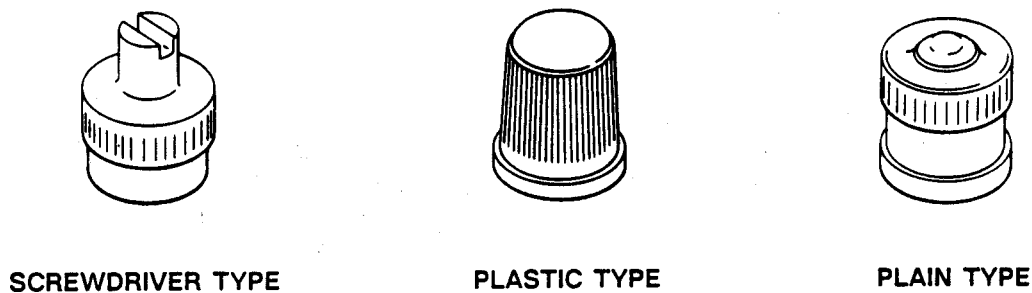
1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES (Con't).

I. VALVE STEM COMPONENTS.

(4) **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.



(5) **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.

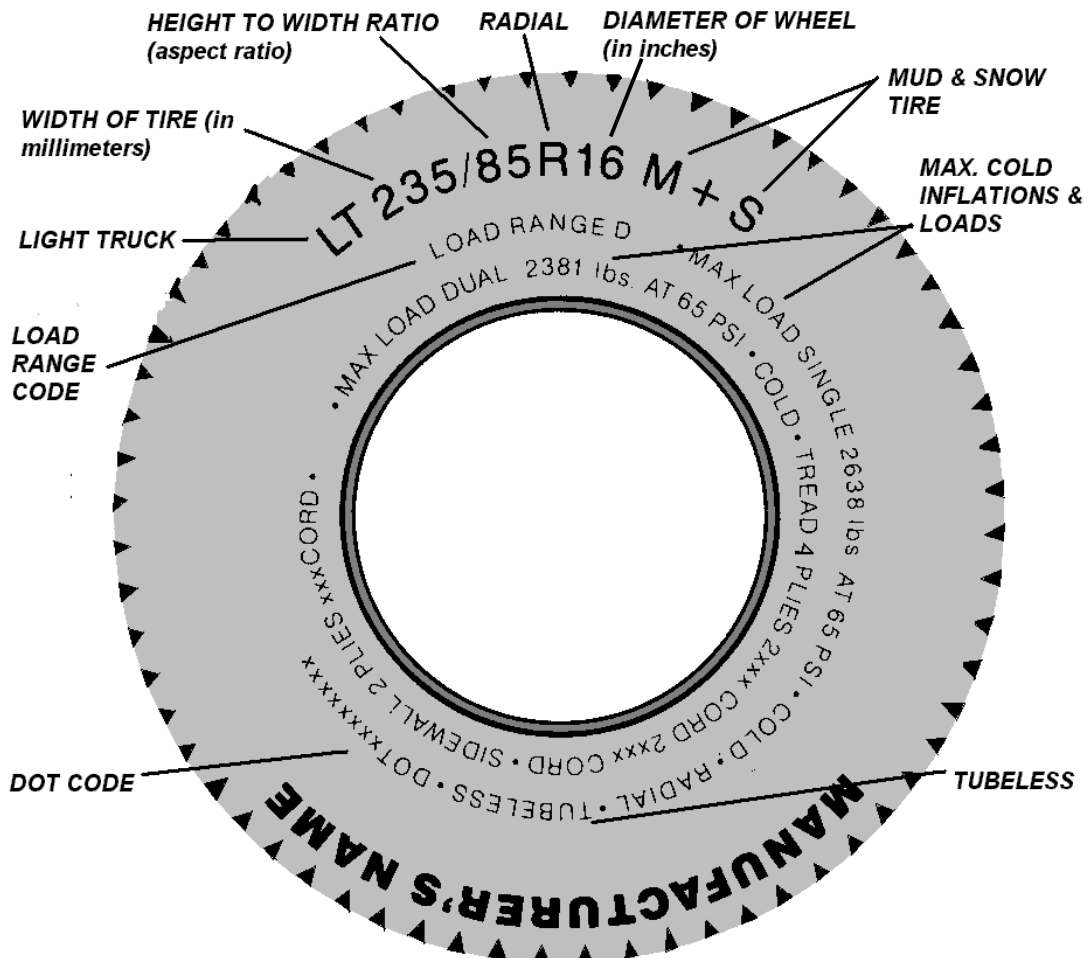


SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-9. TIRE MARKINGS AND CODES

a. GENERAL.

Tire identification and code markings are generally in raised letters and numbers on the sidewall of the tire as illustrated below. On most tires, the manufacturer 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 are explained and located in the following paragraphs.



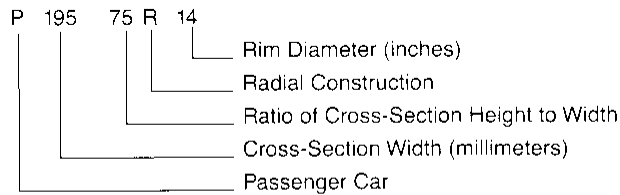
SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-9. TIRE MARKINGS AND CODES (Con't).

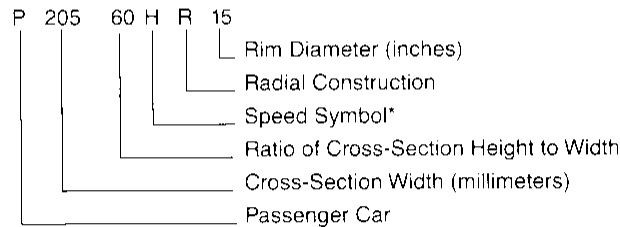
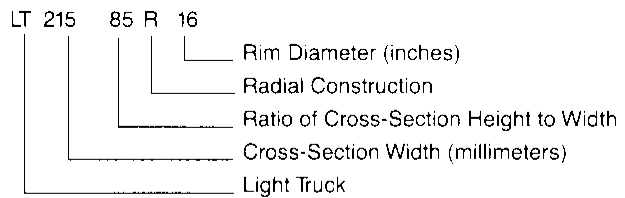
b. TIRE SIZE DESIGNATIONS.

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 Flootation. Examples of each of these systems with definitions follow:

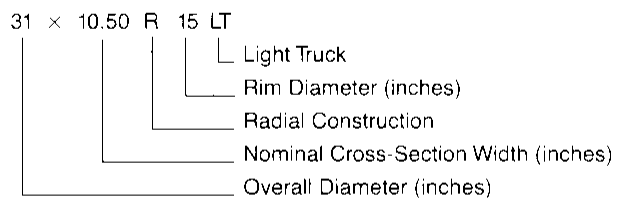
P-METRIC



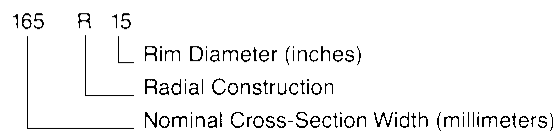
LT-METRIC



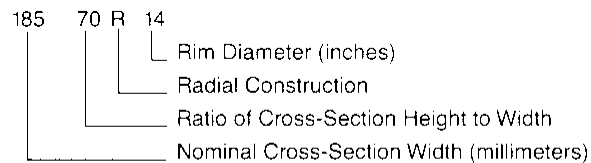
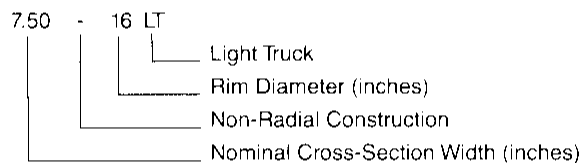
FLOTATION



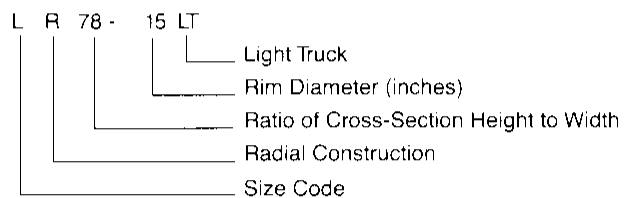
EUROPEAN METRIC



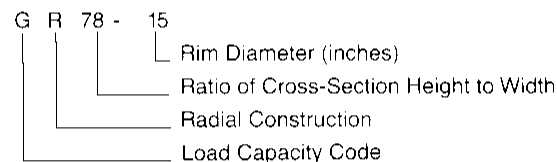
NUMERIC



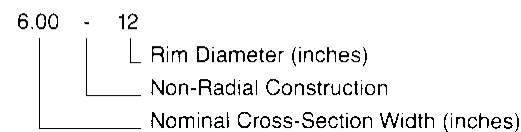
ALPHA-NUMERIC



ALPHA-METRIC



NUMERIC



SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)**1-9. TIRE MARKINGS AND CODES (Con't).****c. TIRE SIZE CONVERSION.**

(1) Most tires received through the military supply system are specific sizes for specific vehicle applications. However, Table 1-2 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 1-2 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.

1-9. TIRE MARKINGS AND CODES (Con't).

Table 1-2 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	P185/75R13 P195/70R13 P215/60R13 P235/50R13	CR78-13	CR70-13 DR70-13 ER70-13 AR70-13		7.00-13
P185/80R13	P205/70R13				
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	P185/80R13 P215/60R13 P235/50R13				
P205/70R13					
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

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-9. TIRE MARKINGS AND CODES (Con't).

Table 1-2 Tire Size Conversions (Con't)

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

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

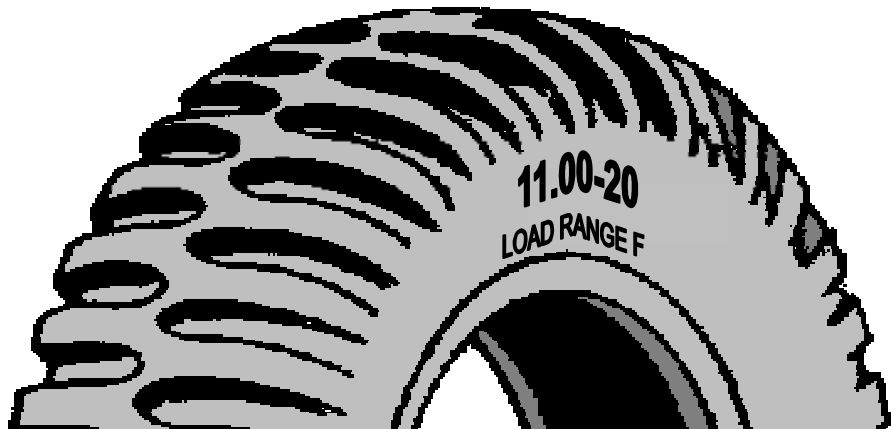
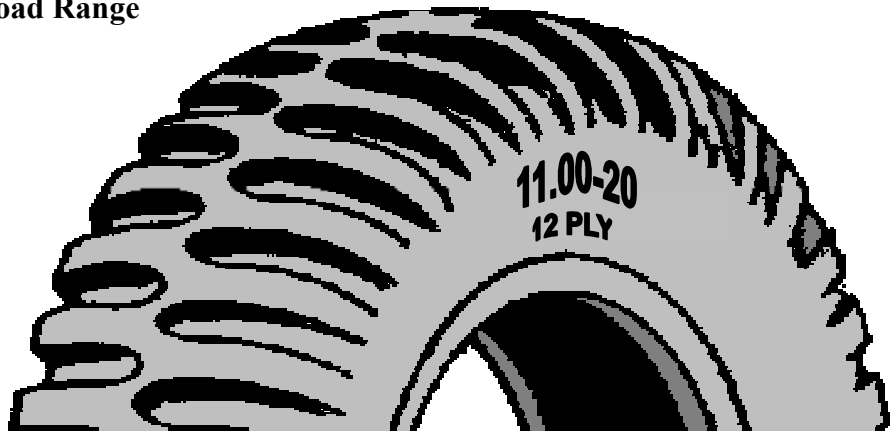
1-9. TIRE MARKINGS AND CODES (Con't).

d. 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 an 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, 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 1-3).

Table 1-3 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



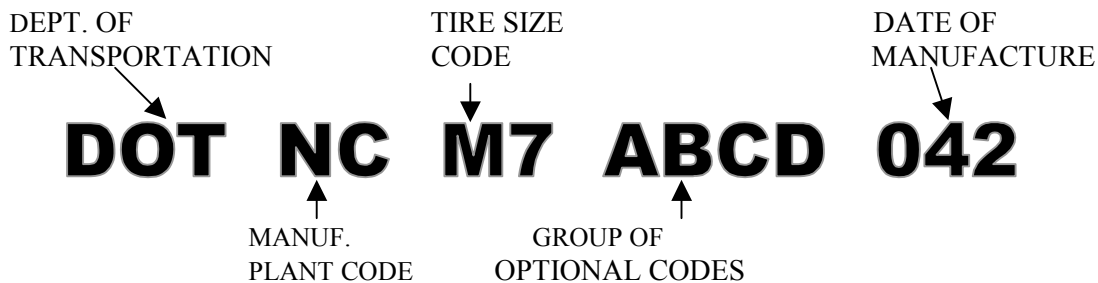
SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-9. TIRE MARKINGS AND CODES (Con't).

e. 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 manufacturer or retread is indicated in the last group of three digits of the DOT or Retread code and consist of the numerical week and the last digit of the year. 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 which includes the decade. In the second example below a date code of 0402 means the tire was manufactured/retreaded in the 4th week of 2032. The third example shows a newer retread code and the date code indicates that the tire was retreaded in the 8th week of 2006.

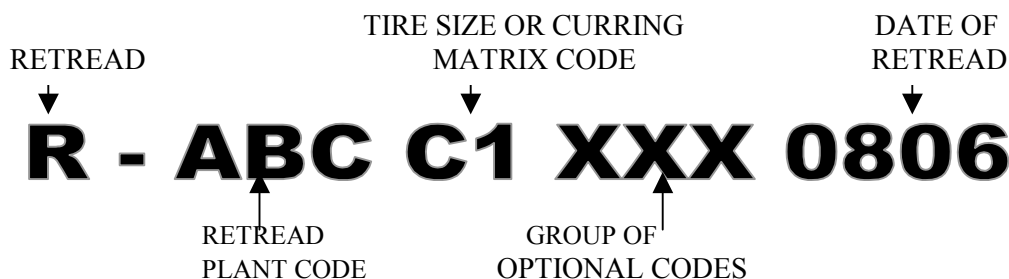
EXAMPLE OF DOT CODE OF NEW TIRES MANUFACTURED BEFORE July 2, 2000



EXAMPLE OF DOT CODE WITH 4 DIGIT DATE CODE FOR NEWER TIRES



EXAMPLE OF RETREAD DOT CODE FOR RETREAD TIRES

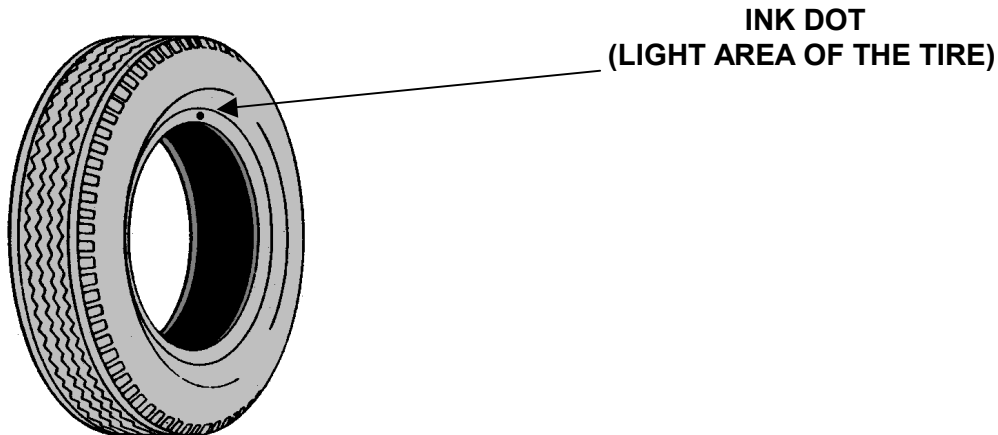


SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-9. TIRE MARKINGS AND CODES (Con't).

f. 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) color and indicate the lightest area of the tire. To provide optimum balance this ink dot should be aligned with the valve stem when mounting the tire.



g. 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.

h. 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.

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-9. TIRE MARKINGS AND CODES (Con't).

h. SPECIAL PURPOSE CODES (Con't).

(2) **Off Road, Construction Equipment Tire Codes.** Tire manufacturers use the codes shown in Table 1-4 to identify the various off road tire applications and use. These codes are usually imprinted on the sidewall of off road tires.

Table 1-4, Off-Road Tire Codes

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

SECTION II. EQUIPMENT DESCRIPTION AND DATA (Con't)

1-9. TIRE MARKINGS AND CODES (Con't).

h. SPECIAL PURPOSE CODES (Con't).

(3) **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 treadwear, 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

(i) **TREADWEAR** The treadwear 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.

(ii) **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 traction grade assigned to this tire is based on braking {straight ahead} traction tests and does not include cornering {turning traction}.

(iii) **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 which all passenger car tires must meet under the Federal Motor Vehicle Safety Standard No.109. Grades B and A represent higher levels of 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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION

SECTION I. GENERAL INFORMATION

Paragraph Number	Paragraph Title	Page Number
2-1.	COMMON TOOLS AND EQUIPMENT.....	2-1
2-2.	SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.	2-1
2-3.	INFLATION SAFETY	2-1
2-4.	MULTI-PIECE RIMS/WHEEL GENERAL MAINTENANCE PROCEDURES..	2-5
2-5.	SINGLE-PIECE RIMS/WHEELS GENERAL MAINTENANCE PROCEDURES.	2-5
2-6.	REFERENCE INFORMATION FOR SAFE MAINTENANCE PROCEDURES FOR DEMOUNTING, MOUNTING AND INFLATING TIRES.	2-6
2-7.	TUBE AND FLAP USAGE.	2-6
2-8.	EXTREME COLD WEATHER CONDITIONS.	2-7
2-9.	VALVE POSITIONING.	2-7
2-10.	MARKING OF TIRES.	2-7
2-11.	MATCHING OF TIRES.....	2-7
2-12.	TIRE INJURIES AND OZONE DAMAGE.....	2-8
2-13.	TIRE ROTATION.....	2-9
2-14.	ROTATION OF BIAS, BELTED BIAS, AND RADIAL TIRES.	2-9
2-15.	EFFECTS OF VEHICLE OPERATION.	2-10
2-16.	EFFECTS OF VEHICLE MAINTENANCE.....	2-10
2-17.	IRREGULAR AND EXCESSIVE TIRE WEAR.	2-11
2-18.	TIRE WEAR PATTERNS.	2-11

2-1. COMMON TOOLS AND EQUIPMENT.

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

2-2. SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

For authorized special tools and support equipment, refer to Appendix B of this manual.

2-3. INFLATION SAFETY.

WARNING

- Always inflate tires that are mounted on rims with demountable side ring flanges or lockrings in an 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 (3.1 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-gage. Failure to do so could cause serious injury.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-3. INFLATION SAFETY (Con't).

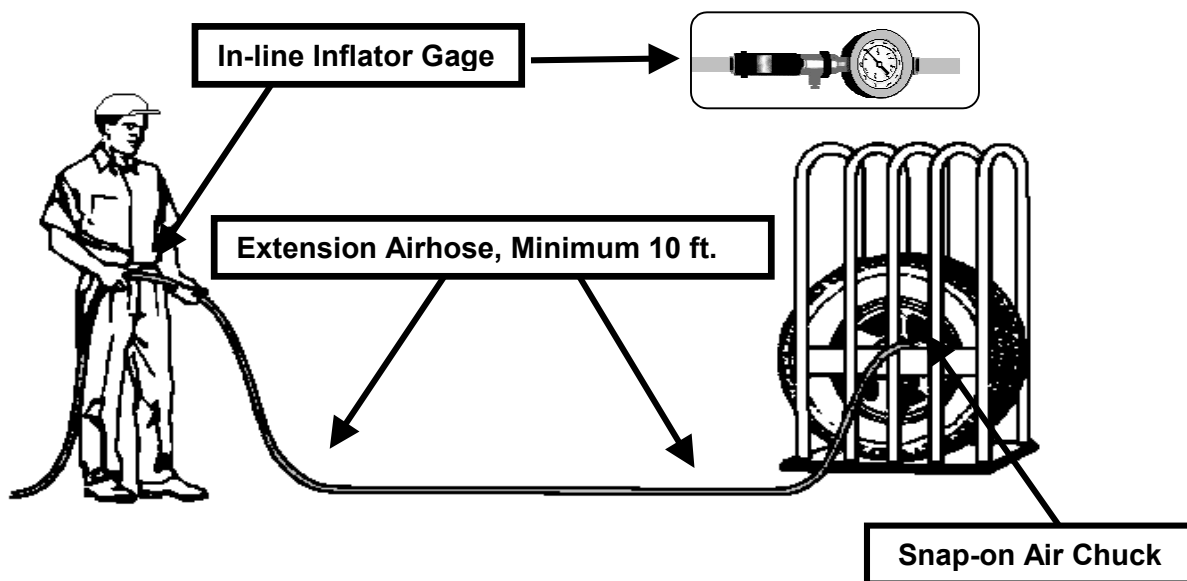
a. Inflation Safety Cages and Restraining Devices.

(1) 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 Appendix D). Most commercially manufactured and available safety inflation cages are certified by the manufacturer to meet OSHA standards. Before using an inflation safety cage verify that the construction of the cage is certified by the manufacturer to meet OSHA standards.

(2) Tire safety inflation cages should be free standing and a minimum of 3 feet 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.

(3) When using a safety cage to inflate tires the operator should not stand in the trajectory and ensure that all persons stay out of the trajectory during inflation.

(4) Do not stick their 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.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-3. INFLATION SAFETY (Con't).

a. Inflation Safety Cages and Restraining Devices (Con't).

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

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

(1) 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).

(2) Remove the valve core to completely deflate tires before demounting them.

(3) 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.

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

(5) All persons must stay out of the trajectory when tires are being inflated.

(6) 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.

(7) After tire inflation, the tire and rim/wheel components must carefully be inspected while still in the safety inflation cage to ensure they are properly seated and locked. If adjustments are required, the tire must be completely deflated by removing its valve core while the tire is still in the safety inflation cage before adjustments are made.

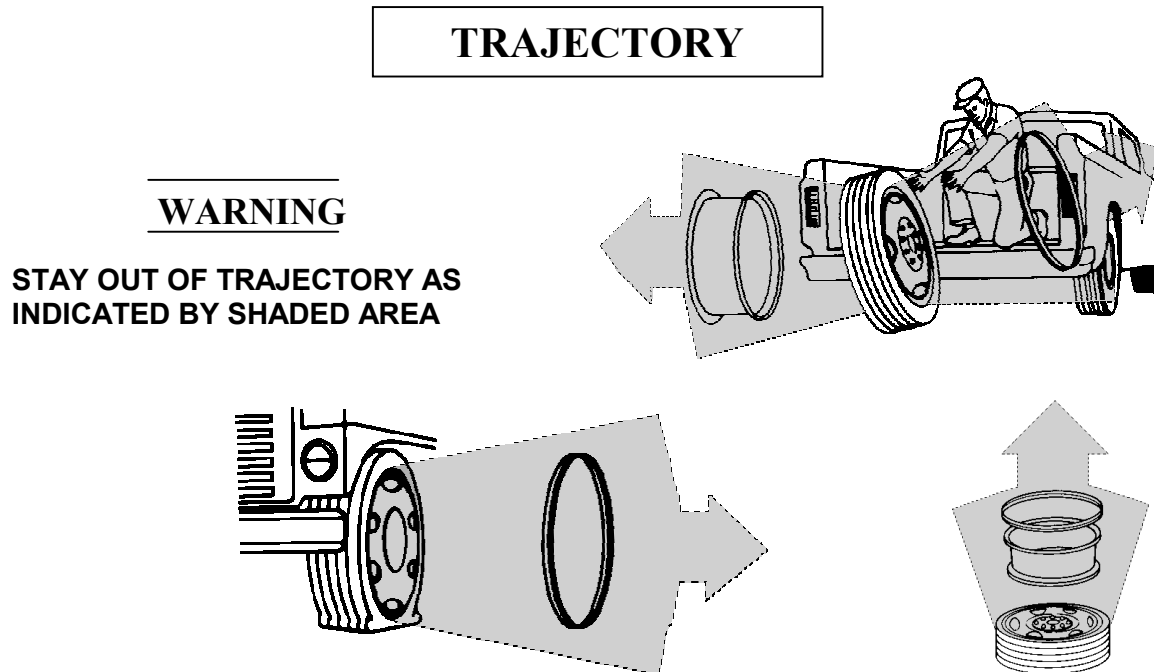
(8) Never attempt to correct the seating of side flanges or lock rings by hammering or forcing the components while the tire is inflated.

(9) Even after inflation and inspection for properly seated components, stand clear whenever handling multi-piece rims/wheels. With the exception needed to mounting 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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-3. INFLATION SAFETY (Con't).



c. Inflation Safety, Single-Piece Rims.

(1) 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.

(2) Remove the valve core to completely deflate tires before demounting them.

(3) 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 to seat the bead on a single piece rim. If more air pressure is needed, never inflate above 40 psi to seat the tire bead. If the beads are not seated against the rim flange at 40 psi, stop, deflate the tire, and determine the problem.

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-3. INFLATION SAFETY (Con't).

c. Inflation Safety, Single-Piece Rims (Con't).

- (5) All persons must stay out of the trajectory when tires are being inflated.
- (6) When inflating tires in a positive wheel lock down device, always use a pneumatic tire inflator-gage.
- (7) 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.

2-4. 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 a weak point and a pressure point also and if the where 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. The ends on the lockring on three piece assemblies, such as on the HEMTT vehicle, should not touch, when assembled.

2-5. 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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-5. SINGLE-PIECE RIMS/WHEELS GENERAL MAINTENANCE PROCEDURES (Con't).

(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.

2-6. 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
Washington, D. C. 20310
(202) 523-9667

The Rubber Manufacturers Association (RMA)
c/o Mail Room, PO Box 3147, Medina, OH
44258-31471
or by contacting the RMA Main Office
at (202) 682-4800

2-7. TUBE AND FLAP USAGE.

a. 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.

b. 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.

c. 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.

d. 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."

e. 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 and possible blowout.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-7. TUBE AND FLAP USAGE (Con't).

f. 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.

2-8. EXTREME COLD WEATHER CONDITIONS.

a. 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°.

b. 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, Appendix C) instead of talcum and increase tire pressure by 10 percent.

2-9. 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 brakedrums. They should be placed so that valve stems extend through the wheels. Valve stems of inside duels should point away from the vehicle, and valve stems of outside duels should point toward the vehicle. On dual wheels, the valve stem of the outside wheel will be placed 180° 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.

2-10. MARKING OF TIRES.

Using paint to mark tires in order to reduce pilferage is not recommended. A yellow label (Item 101, Appendix C) marked US GOVT will be used. Installation procedures are contained in each kit.

2-11. MATCHING OF TIRES.

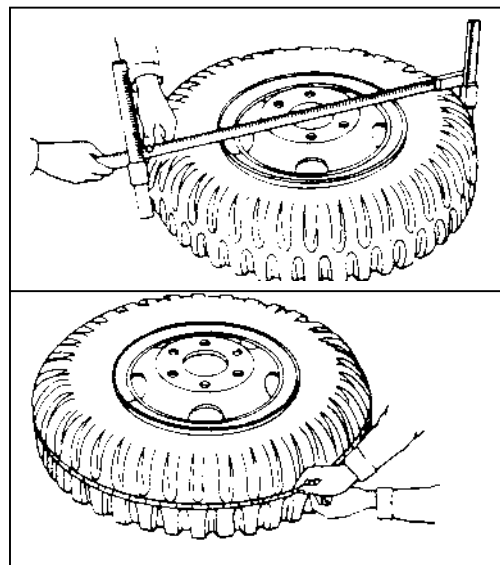
a. For longer tire life and more efficient performance, dual tires and tires on all-wheel drive vehicles should be the same size, tread design, and tread wear. Improperly matched tires cause rapid, uneven wear. They can also cause transfer case and differential failures.

b. 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. It is for this reason that all drive wheels must have tires of the same circumference and diameter. If one tire of a pair of dual tires is worn considerably more than the other, it will not carry its proper share of the load which will result in uneven wear of the smaller tire. The large tire will have irregular wear due to increased load.

c. 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.

2-11. MATCHING OF TIRES (Con't).

d. 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 overinflate or underinflate 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. When dual tires have permissible difference in measurements (see Table 2-1), the larger size tire should be mounted outside. Minor variations of tread designs, as encountered from one manufacturer to another, may be used providing 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.



e. Measure circumference at the center of the tread with a steel tape or other device. Measure overall diameter with a caliper (Item 10, Appendix B). This tool may also be improvised.

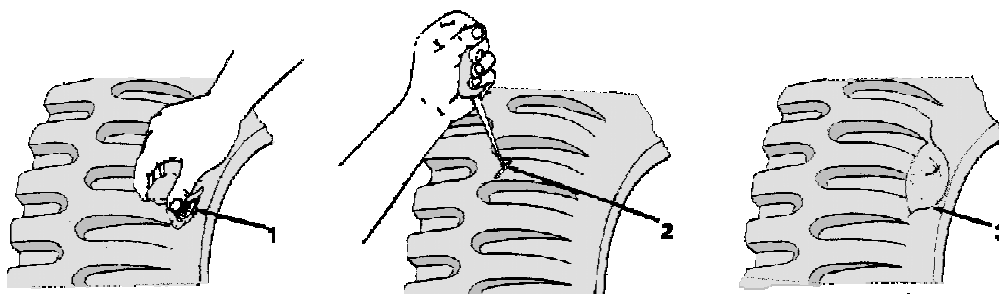
Table 2-1. Permissible Measurement Differences for Dual Tires.

Outside Diameter of Tire	Permissible 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

2-12. TIRE INJURIES AND OZONE DAMAGE.

a. 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.

b. 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). 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.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION I. GENERAL INFORMATION (Con't)

2-13. TIRE ROTATION.

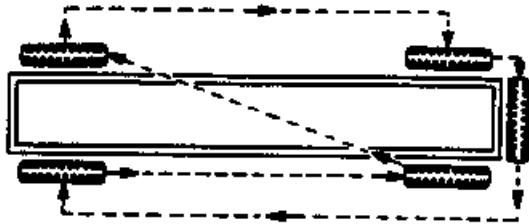
a. PURPOSE.

(1) Rotating tires equalizes wear and extends their service life. The degree 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.

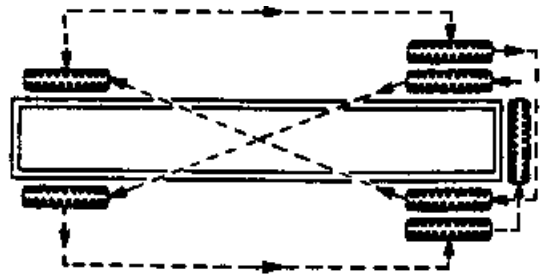
(2) There are two basic tread wear indicators that justify tire rotation. The first indicator is normal uneven wear. This occurs through routine over-the-road tire scrubbing and power friction generated through the drive wheels. The second indicator is unusual tread wear. This is identified by a rapid, 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.

2-14. ROTATION OF BIAS, BELTED BIAS, AND RADIAL TIRES.

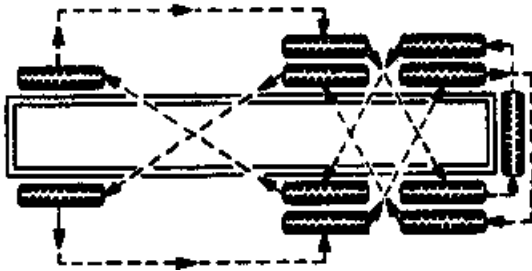
When rotating bias, belted bias, and radial tires, the spare tire is also rotated (in accordance with established measurements). After all of the tires are rotated, the tire that becomes the spare should be interchanged with the smallest diameter tire on the vehicle, in accordance with proper tire matching .



4x4 (ST), 4x2 (ST) TRUCKS AND CARS. BIAS, BIAS BELTED, AND RADIAL TIRES



4x4 (DT), 4x2 (DT) TRUCKS. BIAS, BIAS BELTED, AND RADIAL TIRES



6x6 (DT). BIAS, BIAS BELTED, AND RADIAL TIRES



6x6 (ST). BIAS, BIAS BELTED, AND RADIAL TIRES

NOTE
INCLUDE SPARE IN ROTATION PROCESSES IN ACCORDANCE WITH ESTABLISHED MEASUREMENTS.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-15. EFFECTS OF VEHICLE OPERATION.

a. 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.

b. EXCESSIVE SPEED.

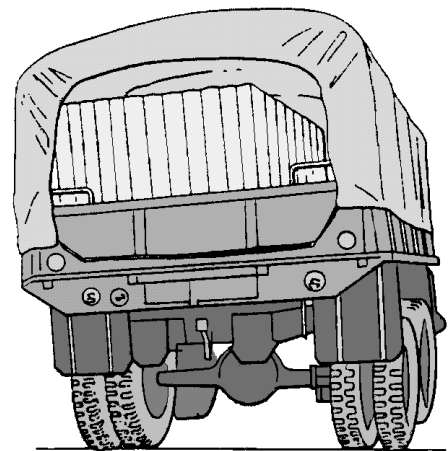
Continued operation at high speed causes internal friction in the rubber as it flexes and thereby generates excessive heat. The higher the speed, the higher the rate of this flexing, and the hotter the tire gets. Excessive heat will weaken the cord body and soften the rubber causing excessive wear and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

c. 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.

d. 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.



**TIRES OVERLOADED BY UNEVEN
LOAD DISTRIBUTION**

2-16. EFFECTS OF VEHICLE MAINTENANCE.

a. 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.

b. 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.

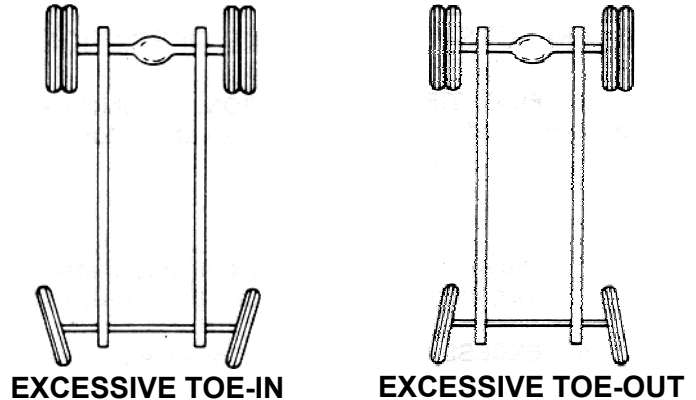
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

2-16. EFFECTS OF VEHICLE MAINTENANCE (Con't).

c. 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. Insufficient caster angle will cause front wheels to wander from side to side, resulting in uneven tire wear. Excessive camber angle increases slippage between the center and side sections of the tread area, also causing uneven tire wear. When any of these conditions develop, take immediate corrective action. Refer to applicable maintenance TM for procedures and tolerances.



d. MISALIGNMENT OF AXLES.

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

2-17. IRREGULAR AND EXCESSIVE TIRE WEAR.

At the first sign of irregular and excessive wear, change the tire to a new wheel position, determine the cause, and take corrective action. Mechanical maladjustment's 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.

2-18. TIRE WEAR PATTERNS.

CAUTION

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

a. 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 which will increase pressure and provide inaccurate readings. When checking air pressures, always use an accurate gage. Air pressure gage accuracy should be checked and calibrated periodically with a precision gage. Also check valve cores for leaks. When necessary inflate the tires to the prescribed air pressure as indicated in the vehicle Technical Manual.

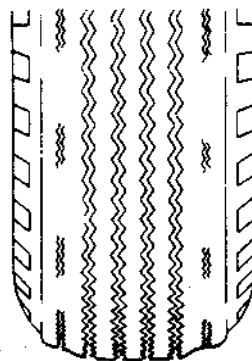
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION I. GENERAL INFORMATION (Con't)

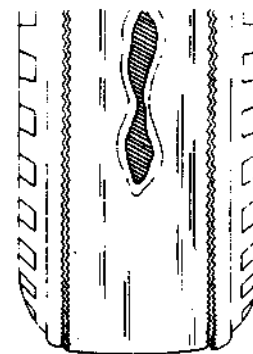
2-18. TIRE WEAR PATTERNS (Con't).

a. AIR PRESSURE (Con't)

(1) **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 blowout. Underinflation also causes tread edges to scuff the road, which puts uneven wear on the tread and shortens tire life. 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.



UNDERINFLATION



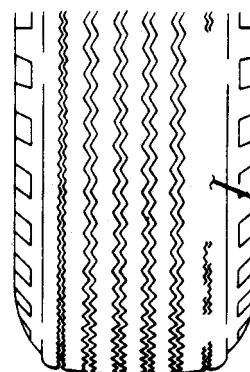
OVERINFLATION

(2) **Overinflation.** Overinflation also causes tire failure. 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.

(3) **Deflation.** Tires should never be deflated during or immediately after vehicle operation for the purpose of air pressure adjustment. Tires heat as they roll, causing air to expand, which increases pressure. When the tire cools after pressure adjustment it becomes dangerously underinflated. Pressure increases of more than 20 psi (138 kPa) could indicate underinflation, overloading, or excessive speed.

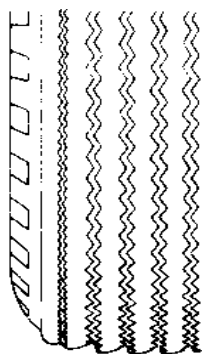
b. MISALIGNED WHEELS.

(1) **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.

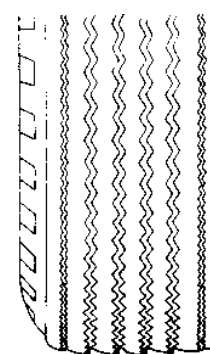


EXCESSIVE CAMBER

(2) **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.



EXCESSIVE TOE-OUT



EXCESSIVE TOE-IN

(3) **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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION II. OPERATOR INSPECTIONS AND SERVICES

2-19. OPERATOR INSPECTIONS AND SERVICES.

a. The operator must ensure that the tires receive proper care and service to prevent 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.

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

(1) Check 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 rebuild. 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.

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

(3) Check for loose lug nuts. Tighten or have tightened as required.

(4) Check for missing valve caps. Replace as required.

(5) Check dual tires for proper match.

(6) Examine seal areas for oil or grease leaks.

(7) Inspect body and frame for security of mounting bolts

(8) Inspect steering mechanisms (wheel bearings. steering knuckles. steering gears. etc

(9) Operator must be aware of a wide variety of defects 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 be directly related to 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 retread.

(a) Vibration (intermittent at a given speed).

(b) Tire squirm (similar to operation over ice conditions).

(c) Thumps, bounces, or wobbles.

(10) Report all tires requiring repair.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION II. OPERATOR INSPECTIONS AND SERVICES (Con't)

2-19. OPERATOR INSPECTIONS AND SERVICES (Con't).

c. For readiness reporting, equipment is not ready/available if:

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

(2) Any tires with leaks or bulges.

(3) Tire tread depth is less than the minimum tread depth indicated in the vehicle technical manual or the tire tread wear bar indicators are visible across the tread crown of the tire.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-20.	GENERAL.....	2-15
2-21.	TIRE REPAIR LIMITS.....	2-16
2-22.	UNIT INSPECTION.....	2-18
2-23.	TIRE INSPECTION.....	2-18
2-24.	TREAD DEPTH MEASUREMENT.....	2-20
2-25.	RETREADING.....	2-23
2-26.	VALVE CORE REPLACEMENT.....	2-24
2-27.	AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE.....	2-25
2-28.	FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS).....	2-31
2-29.	RUNFLAT TIRE MAINTENANCE (HMMWV).....	2-39
2-30.	BOLT TOGETHER RIMS REPAIR (M939A1 SERIES).....	2-47
2-31.	TIRE REPAIR PROCEDURES -TEMPORARY STRING REPAIR.....	2-52
2-32.	TIRE REPAIR PROCEDURES - COMPLETE TIRE REPAIR.....	2-55
2-33.	INNER TUBE REPAIR PROCEDURES.....	2-57

2-20. GENERAL

a. 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:

- (1) Inspection and initial condition code classification.
- (2) Mounting and demounting of tire/wheel assemblies from vehicles.
- (3) Mounting and demounting of tires from rims.
- (4) Inner tube patching.
- (5) Valve core replacement.
- (6) 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.
- (7) Puncture repair of tires in the tread crown areas only within limits specified in Table 2-2., Table 2-3., and within the repair areas shown in the illustrations on the following pages.

b. 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.

c. 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). 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.

2-21. TIRE REPAIR LIMITS

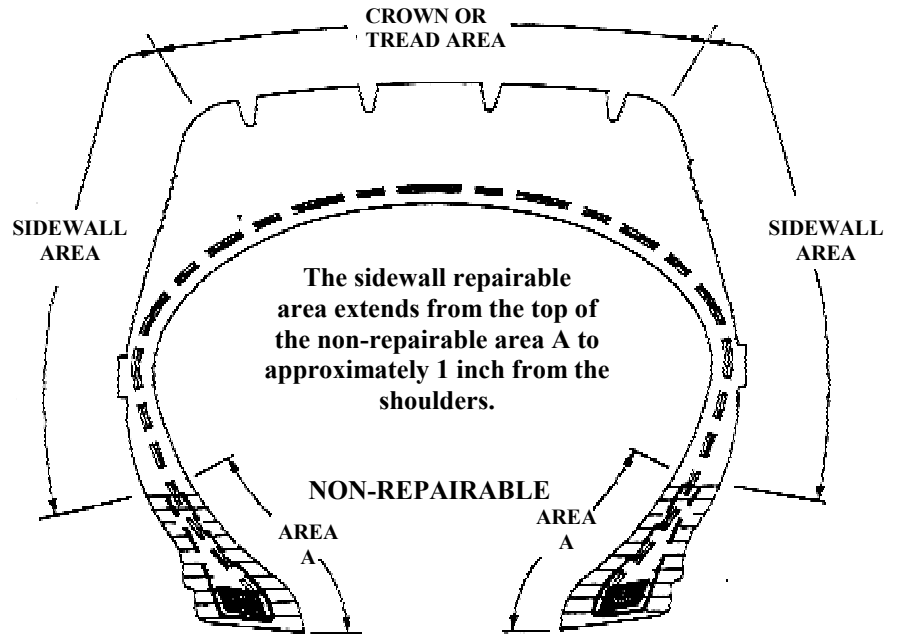
Table 2-2. PUNCTURE REPAIR LIMITS FOR TREAD CROWN AREA ONLY

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.

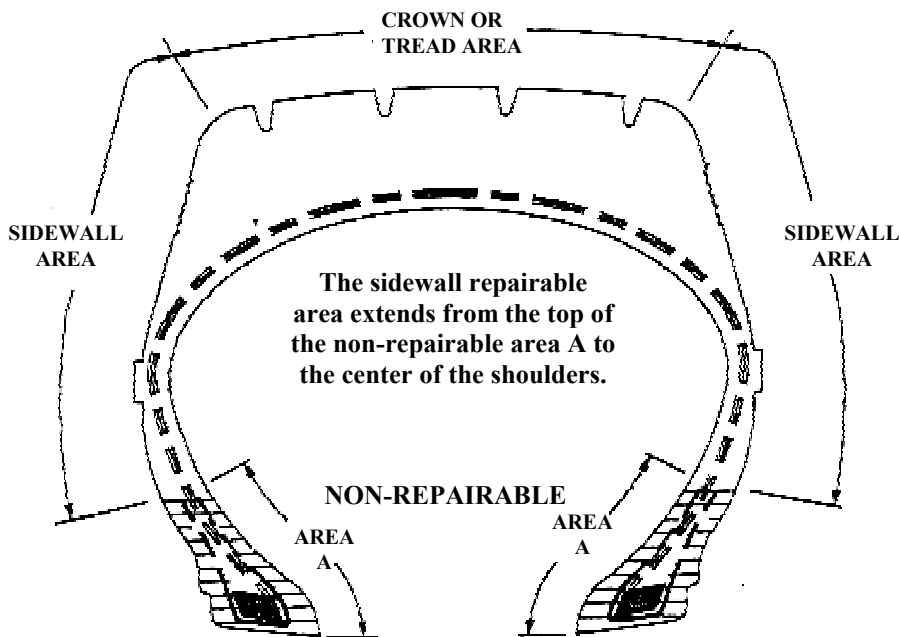
Radial Repair Areas

Notes:

- A tire puncture is defined as a penetration by a foreign object through the tire body.
- Repair units can not overlap.
- Two or more injuries to the same radial cable must be a full section repair.



Bias Repair Areas



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

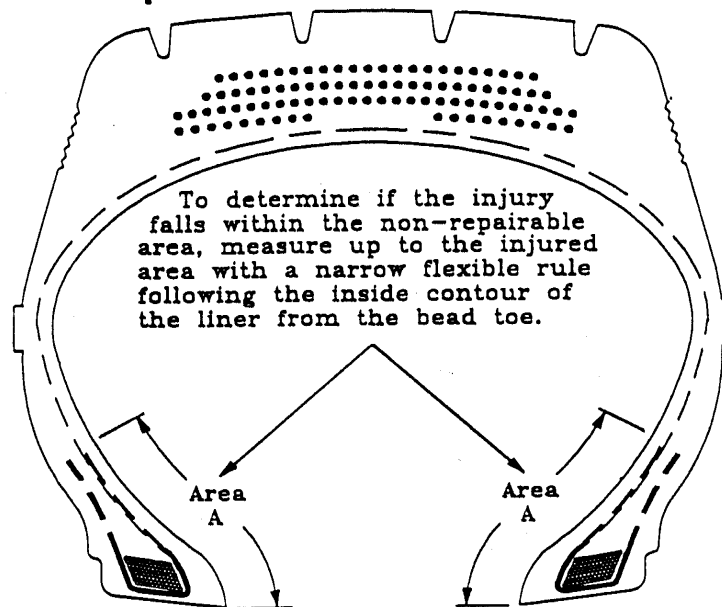
SECTION III. UNIT MAINTENANCE (Con't)

2-21. TIRE REPAIR LIMITS (Con't).

Table 2-3. TIRE NON-REPAIRABLE AREAS

NON-REPAIRABLE AREA A FOR BODY PLY DAMAGE	
<u>TIRE CROSS SECTION</u>	<u>DIMENSION OF NON-REPAIRABLE AREA</u>
All Passenger Car Tires	1 1/2" (38.1 mm)
Truck –Tubetype 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)

Non-Repairable Area



NON-REPAIRABLE AREA

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-22. UNIT INSPECTION.

a. 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.

b. INSPECTION PROCEDURES.

During scheduled maintenance, the following items must be inspected:

- (1) Correct deficiencies noted by operator.
- (2) Match and install tires according to tread design and degree of wear.
- (3) Check all wheel nuts, rims, and side rings for security and serviceability.
- (4) 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.
- (5) Inspect wheel and rim components for proper seating, distortions or other obvious damage, which may cause the assembly to dislodge or fail.
- (7) Inspect tires for conditions shown in paragraph 2-23, which follows.
- (8) Painting of Tires. 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.

2-23. TIRE INSPECTION.

a. INSPECTION OF TIRE BEADS.

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

- (1) Tears or gouges that are more than 2/32 inch deep or expose bead wire.
- (2) Kinked or distorted beads.
- (3) Burned beads, which are indicated by rough, brittle, and/or discolored hard surface in the bead area.
- (4) Petroleum damage which is indicated by blisters, swelling, spongy, dry and/or brittle rubber in the bead area.
- (5) Bead damage from curbing which is indicated by localized rippling or waviness in the bead area with no exposed cord. Scuffs may also be apparent in the lower sidewall.
- (6) Flow cracks from improper manufacturing processes which is indicated by a solid extended circumferential crack above the bead with no wire exposed.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)**SECTION III. UNIT MAINTENANCE (Con't)****2-23. TIRE INSPECTION (Con't).****b. 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.

- (1) Damaged tire cord or wider than normal wire spacing which is indicated by a radial (up & down), pencil shaped bulges in the sidewall.
- (2) Scrapes, gouges or cuts in the sidewall which expose cords or are 2/32nd inch deep or more.
- (3) Snow chain damage, which is indicated by numerous pock marks around the tire in the upper sidewall and crown areas.
- (4) 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.
- (5) Weatherchecking cracks, which extend to the cord body or 2/32nd inch deep or which have 2 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.
- (6) Indications of circumferential cord fatigue and eventual sidewall rupture (also known as Zipper rupture). Indicators are circumferential cracks or very subtle bumps in a even circumferential arced line which can be felt when gently rubbing the mid or upper sidewall.
- (7) Nails or other foreign objects lodged into the tire sidewall which extend 2/32nd inch or deeper or to the cord body.

c. 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.

- (1) Nails or other foreign objects lodged into the tread lugs, which extend to the cord body.
- (2) Nails or other foreign objects lodged into the tread groove areas which extend 2/32nd inch or deeper or to the cord body.
- (3) Cuts in tread or shoulder area that are deeper than the tread base or tread groove, usually 360 degrees around the tire and caused from interference from other vehicle components.
- (4) Belt lift and separation, which is indicated by a bulge or split through the upper sidewall and tread shoulder area.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-23. TIRE INSPECTION (Con't).

a. INSPECTION OF TIRE TREAD AND SHOULDERS (Con't).

(5) 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.

(6) Brake skid damage that extends $2/32^{\text{nd}}$ inch 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.

(7) Tread chunking which is indicated by sections of the tread torn from the tire.

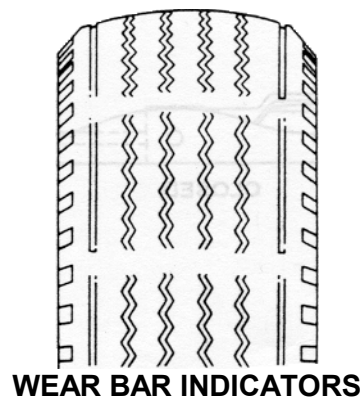
(8) Petroleum or chemical damage indicated by localized blistering or spongy or deteriorated rubber in the tread area.

(9) Excessive tread wear.

2-24. TREAD DEPTH MEASUREMENT

a. TREAD WEAR BARS.

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



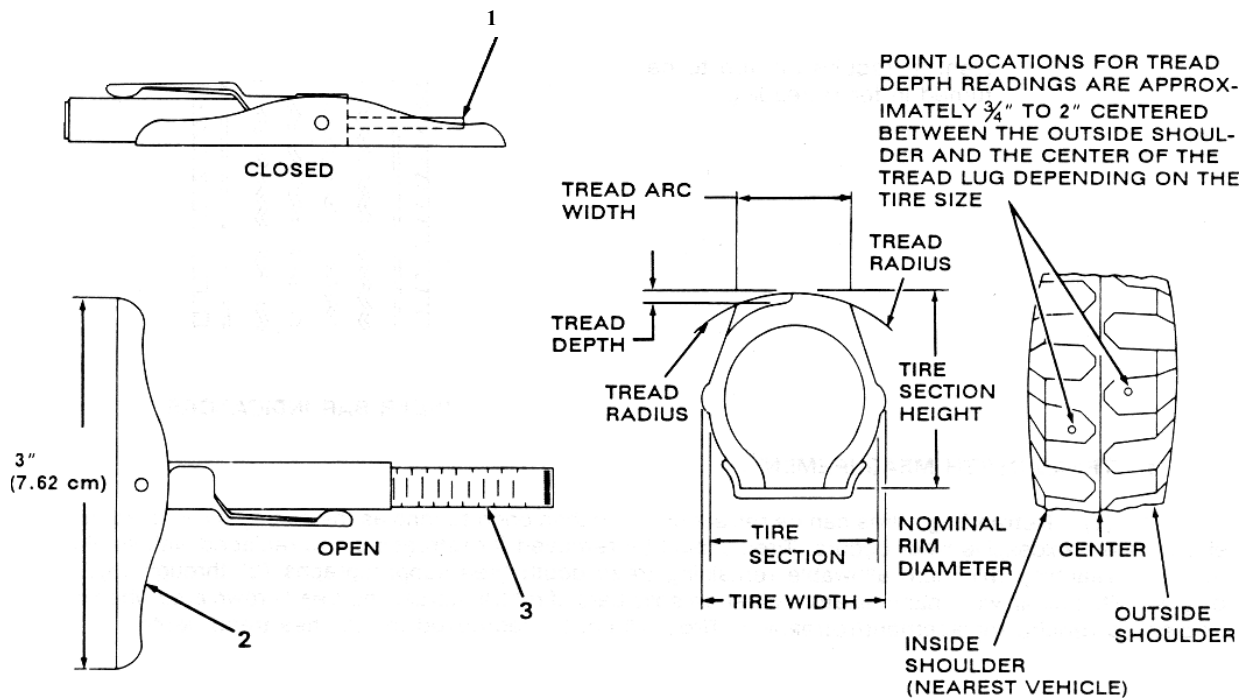
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-24. TREAD DEPTH MEASUREMENT (Con't).

b. USING A TREAD DEPTH GAGE.

Tire tread depth should be checked only with a tread depth gage (Item 22, Appendix B). The gage folds for easy storage in a pocket. The plunger tip (1) must be pushed all the way in before the gage is opened, or the gage will be bent. The contact bar (2) can then be folded out to form a T. Gage scale markings (3) are in 1/32nd inch increments. The tread depth gage 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.



c. TREAD DEPTH MEASUREMENT.

(1) Military Tires.

The minimum tread depth for military tires is 4/32nd inch. This dimension applies to both front and rear tires. In most instances tread depth measurements for military tire will be taken by measuring tread depth approximately 3/4 (19 mm) to 2 inches (5.1 cm) from the center line of the tire, depending on the tire size (see Table 2-4, next page). Place contact bar of tread depth gage parallel with tire center line and press down plunger until its tip touches the center of the tread groove. The gage will indicate the tread depth.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-24. TREAD DEPTH MEASUREMENT (Con't).

Table 2-4. Military Tire Tread Depth Location Measurements

Tire Size	Location From Center Line	
	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

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

The minimum tread depth for truck tires (16 inch rim and above) is $4/32^{\text{nd}}$ inch. 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.

(3) Passenger Car and Light Truck Tires.

The minimum tread depth for commercial tires mounted on the steering axle is $4/32^{\text{nd}}$ inch. The minimum tread depth for commercial tires mounted on all other axles is $2/32^{\text{nd}}$ inch. Measure the tread depth by bridging the tread groove with the contact bar and pressing the plunger into the center of the groove.

(4) 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:

(a) Minimum tread depth for industrial vehicles and earth moving equipment (except industrial tractors) is $11/32^{\text{nd}}$ inch. This includes rough terrain fork trucks, loaders, graders, scrapers, ditching machines, intrenching machines, crane-shovels, and snow removal equipment.

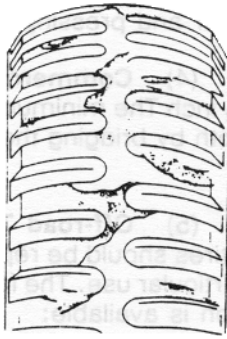
(b) Minimum tread depth for industrial tractors is $17/32^{\text{nd}}$ inch.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-24. TREAD DEPTH MEASUREMENT (Con't).

d. EXAMPLES OF TIRE WEAR CONDITIONS.



**EXCESSIVE IRREGULAR WEAR:
REPLACE TIRE**



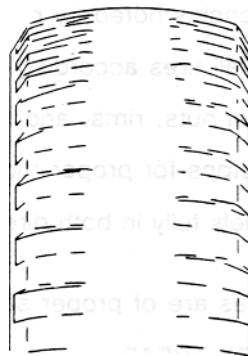
**TIRE DESTROYED BY
IRREGULAR WEAR**

2-25. RETREADING.

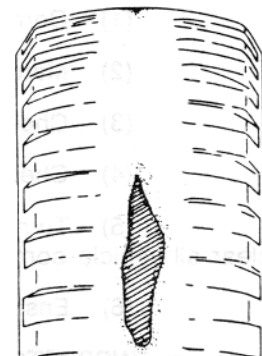
Tires can be retreaded more than once as long as the casing is removed from the vehicle before excessive wear occurs. Tires should be removed for retreading and replaced with serviceable tires upon reaching minimum allowable remaining tread depth (see paragraph 2-24). Tires designed with built-in wear 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 regrooved to increase tread depth.

(1) When To Retread Tires

Tires should be carefully watched and removed for re-treading at the proper time. The tire on the left is worn just enough and should be turned in for retreading. For minimum allowable tread see paragraphs 2-24. 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 anyone spot, cannot be retreaded and must be replaced.



**READY FOR
RETREADING**



**WORN TO FAR
FOR RETREADING**

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-26. VALVE CORE REPLACEMENT.

This Task Covers:

a. Removal

b. Installation

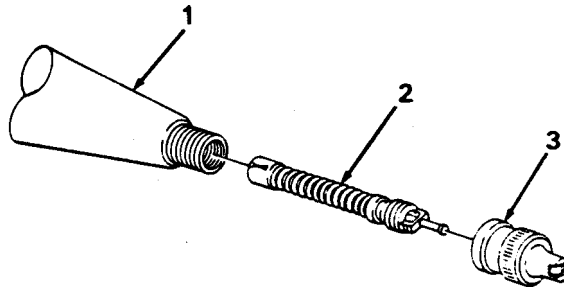
Initial Setup:

Tools/Test Equipment:

- Shop equipment, automotive maintenance and repair, Organizational Maintenance, common no.1 (Item 1, Appendix B)
- Pneumatic tire valve repair tool (valve core extractor) (Item 46, Appendix B)

a. REMOVAL

1. Remove valve cap (3) from valve stem (1).
2. Deflate tire by removing valve core (2) from valve stem with valve core extractor. Run a piece of wire through valve stem (1) to ensure that it is not plugged.
3. With tire completely deflated, install valve cap (3) onto valve stem (1). This will protect valve stem threads.



b. INSTALLATION

NOTE

If this procedure is being performed as Follow-On Maintenance, Step 1 may not apply.

1. Remove valve cap (3) from valve stem (1)
2. Install valve core (2) in valve stem (1) using a valve core extractor.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-27. AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE.

This Task Covers:

- | | |
|--------------------|-------------|
| a. Demounting | c. Mounting |
| c. Rim Maintenance | |

Initial Setup:

Equipment Conditions:

- Tire and wheel assembly removed (see applicable vehicle TM).
- Valve core removed and tire deflated (see paragraph 2-26).

Materials /Parts:

- Tire and rim lubricant (Item 90, 91 or 92, Appendix C)

Tools/Test Equipment:

- Tire iron (Item 32, Appendix B)
- Two tire irons, hooked, spooned, drop-center type (Item 38, appendix B)
- Fishing tool (Item 21, Appendix B)
- Inflator-gage, pneumatic tire (includes 10' hose) (Item 30, Appendix B)
- Bead Breaker (optional, Item 6, Appendix B)
- Tire Balancer (Item 5, Appendix B)

References:

- Tire Balancer, Operating Manual, TM 9-4910-743-14&P

a. 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.

CAUTION

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-27. AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE (Con't).

a. DEMOUNTING (Con't)

NOTE

- This task is for tube and tubeless tires.
- Use of bead breaker to separate tire beads from rim flanges is encouraged. Follow instructions that accompany bead breaker.

1. All Tires.

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

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

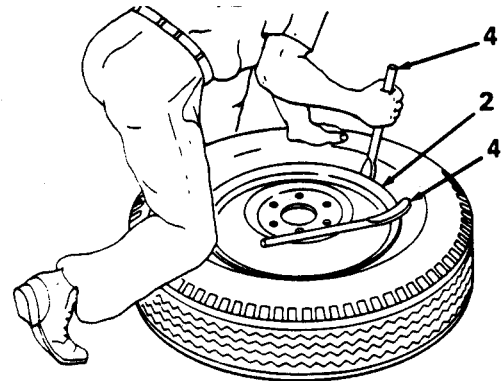
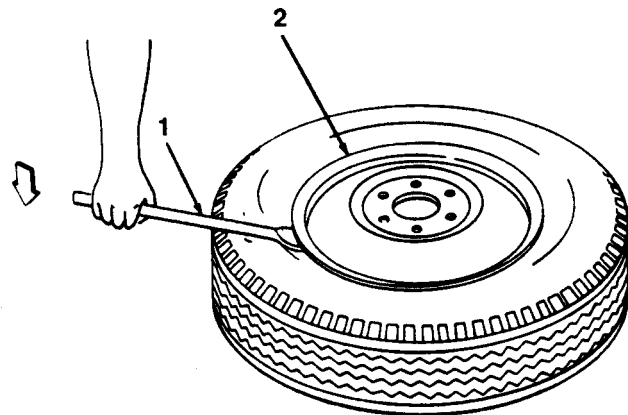
(c) Determine which rim flange (2) is nearest drop-center well and position rim and tire, with this side up.

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

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

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

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



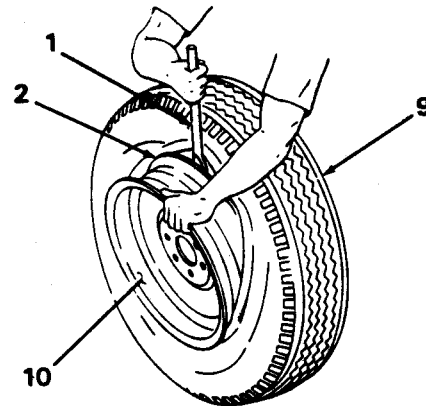
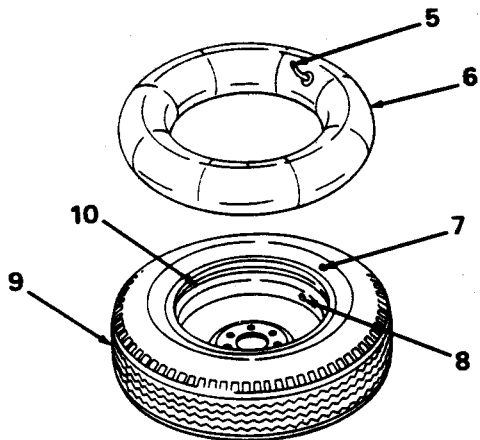
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-27. AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE (Con't).

a. DEMOUNTING (Con't)

2. **Tube Tires.** Push tube valve stem (5) through valve hole (8) in rim (10) and remove inner tube (6).
3. **All Tires.**
 - (a) Stand tire (9) and rim (10) upright and push rim down so that inner tire bead is in drop-center well area.
 - (b) Using tire iron (1) placed between rim flange (2) and inner tire bead, work tire (9) off rim (10).



b. RIM MAINTENANCE

1. **All Tires.**
 - (a) Inspect rim and rim flanges for damage or abnormal wear. Check for elongated mounting holes in rim.
 - (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 residues from rim.
2. **Tubeless Tires.** Inspect tire valve stem. Replace if damaged or deteriorated.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-27. AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE (Con't).

c. MOUNTING

CAUTION

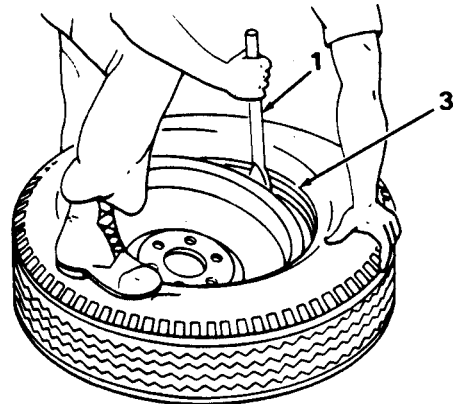
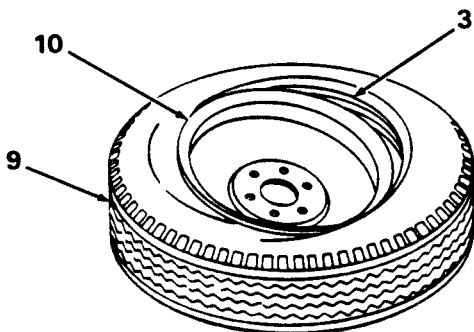
Never mount a tire on a rim that is damaged or has been repaired by welding or brazing.

NOTE

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

1. All Tires.

- (a) Place rim (10) flat on floor. Lubricate both tire beads (3) with tire and rim lubricant.
- (b) Place tire (9) on rim (10) so that both tire beads (3) are partly in drop-center well.
- (c) Hold both tire beads (3) in well area with one foot. Work inner bead only completely into drop-center well using tire iron (1).



2. Tube Tires.

- (a) Insert inner tube (6) 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).
- (b) Attach valve stem fishing tool to valve stem (5) and guide valve stem through valve hole (8) in rim (10).

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-27. AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE (Con't).

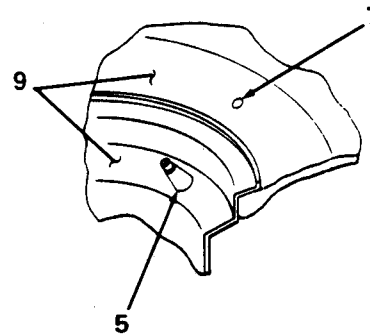
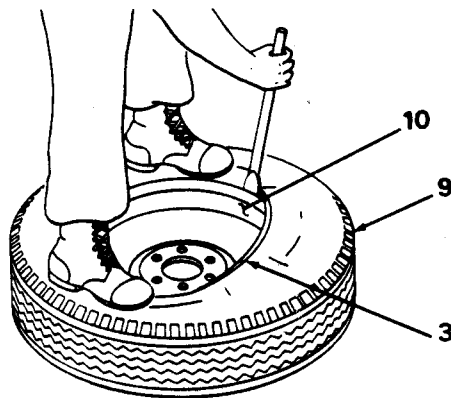
c. MOUNTING (Con't)

4. Tube Tires.

- (a) 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.
- (b) 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.
- (c) Remove valve stem.

5. Tubeless Tires.

- (a) Shift tire (9) on rim (10) as necessary to center balance mark (7) with valve stem (5).
- (b) Inflate tire to 15 psi (103 kPa) and allow to deflate.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-27. AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE (Con't).

c. MOUNTING (Con't)

6. All Tires.

WARNING

- ◆ **Always use an inflation safety cap 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-gage. Failure to do so could cause serious injury.**
 - ◆ **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.**
- (a) If a tire changing machine with a positive lock down device is not available, position tire in an inflation safety cage. Using an extension airhose and a pneumatic tire inflator-gage, 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.
- (b) When both tire beads are properly seated, allow tire to deflate, then install valve core (see paragraph 2-26). Inflate tire to normal operating pressure.
- (c) Check tire pressure, then install valve cap finger-tight.
- (d) Remove tire/rim assembly from inflation safety cage, as required.
- (e) Balance tire according to balancing machine instructions.

Follow –on Tasks:

- Balance tire and wheel assembly (see TM 9-4910-743-14&P).

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS).

This Task Covers:

- | | |
|-------------------------------------|-------------|
| a. Demounting
b. Rim Maintenance | c. Mounting |
|-------------------------------------|-------------|
-

Initial Setup:

Equipment Conditions:

- Tire and rim assembly removed (see applicable vehicle TM).
- Valve core removed and tire deflated (see paragraph 2-26).

- Tire Iron, Lockring Type (Item 35, Appendix B)
- Tapered Tire Tool (Item 35, Appendix B)
- Rawhide Mallet (Item 41, Appendix B)
- Inflator-gage, pneumatic tire (includes 10' hose) (Item 30, Appendix B)

Tools/Test Equipment:

- Tire Iron, Curved Bead Breaker (Item 33, Appendix B).
- Tire Iron, Curved Type (Item 34, Appendix B)

Materials/Parts:

- Tire and rim Lubricant (Item 90, 91 or 92, Appendix C)

a. 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.

CAUTION

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

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**

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

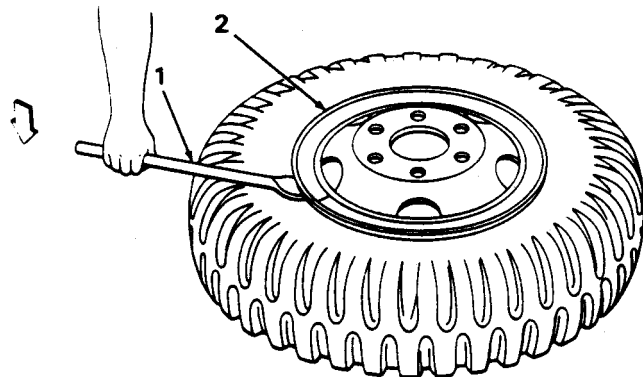
SECTION III. UNIT MAINTENANCE (Con't)

2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS)(Con't).

a. DEMOUNTING (Con't)

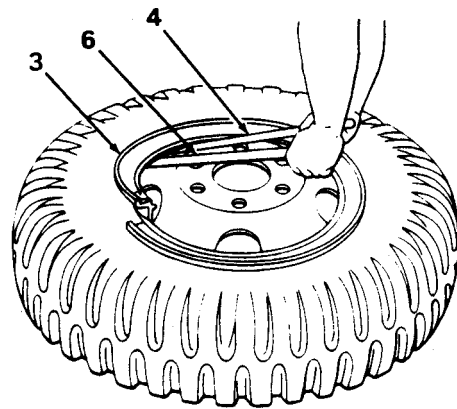
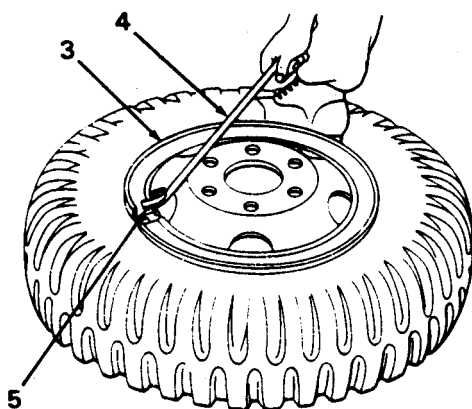
1. All Flat Base Rims.

- (a) Loosen tire beads from rim flanges (2) by inserting curved bead breaker tire iron (1) between tire bead and rim flange.
- (b) Work progressively around rim, rotating tire iron (1) down, forcing tire beads towards center of rim base.
- (c) With both tire beads free of rim flanges (2), and position tire and rim with de-mountable flange or side ring facing up.



2. Continuous Flat Base Split Side Ring.

- (a) Remove split side ring flange (3) by inserting a locking tire iron (4), curved side up, into prying notch (5).
- (b) Work Split side ring flange (3) out of rim gutter with locking tire iron (4)
- (c) Insert curved flat tire iron (6) adjacent to locking 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.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

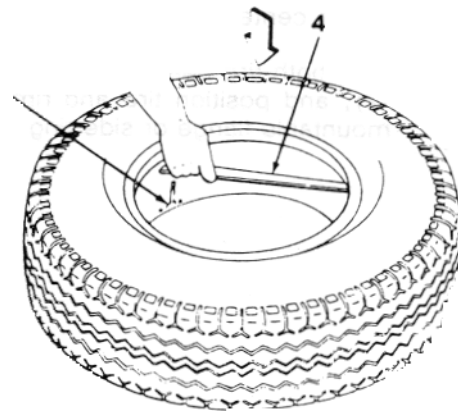
2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS)(Con't).

a. DEMOUNTING (Con't)

3. Two-piece Continuous Side Ring with Split Base

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

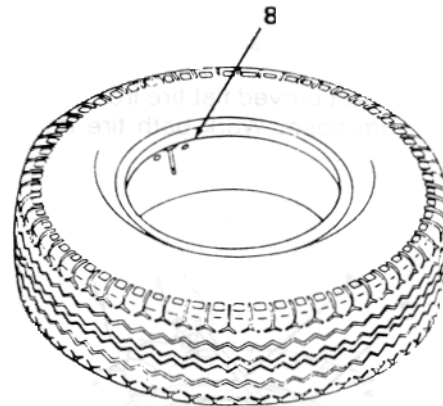
(b) Insert locking tire iron (4) in second rim notch and push downward toward center of rim, working continuous side ring from rim.



4. Continuous Flat Side Ring with Continuous Rim Base.

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

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



5. Flange and Split Lockring.

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

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

(c) Remove flange from rim

6. All Flat Base Rims.

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

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

(c) Remove tire flap and tube from tire.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS)(Con't).

b. RIM MAINTENANCE

1. **All rims.**

- (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.

c. 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.

1. **All Flat Base Rims.**

- (a) Insert tube into tire and partially inflate to round out the tube.
- (b) Insert tire flap. Apply tire and rim lubricant to inside and outside surface of tire beads.
- (c) Apply tire and rim lubricant sparingly to tire flap.
- (d) Position rim with valve slot up.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)**SECTION III. UNIT MAINTENANCE (Con't)****2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS)(Con't).****c. MOUNTING (Con't)****2. Continuous Flat Base Split Side Ring.**

- (a) Align tire valve stem with rim slot and place tire over rim.
- (b) Insert tire valve stem through rim slot.
- (c) Place side ring on rim so that split in ring is 180° opposite valve stem.
- (d) Start side ring into rim groove and progressively walk side ring onto rim.
- (e) Ensure that side ring is fully seated in rim groove.

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.

- (f) 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 .
- 3. Two-piece Continuous Side Ring with Split Base.**
- (a) Spread split base by placing a block under rim. Remove block.
 - (b) Align tire valve stem with slot in rim.
 - (c) Place tire on rim and insert tire valve stem through rim slot.
 - (d) Position side ring on rim and walk ring into proper position on rim.
 - (e) Turn tire and wheel assembly over and position block under rim to properly position split in rim.
 - (f) Tap rim so that split is aligned.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS)(Con't).

c. MOUNTING (Con't)

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.

(g) 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.

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

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

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

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

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

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

(f) 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.

(g) 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 into inflation safety cage. Failure to do so may cause serious injury or death.

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)**SECTION III. UNIT MAINTENANCE (Con't)****2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS)(Con't).****c. MOUNTING (Con't)****5. Flange and Split Lockring.**

- (a) Align tire valve stem with valve slot in rim.
- (b) Position tire over rim and insert tire valve stem through rim slot.
- (c) Position lockring with split 180° from tire valve stem.
- (d) Snap leading edge of lock ring into rim gutter .
- (e) 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.

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

6. 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-gage. Failure to do so could cause serious injury.**

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-28. FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS)(Con't).

c. MOUNTING (Con't)

NOTE

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

(a) Inspect all rim components to ensure that they are properly seated. Place tire and rim assembly in inflation safety cage (see paragraph 2-3).

(b) Using a pneumatic tire inflator-gage and an extension airhose, 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.

(c) 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.

(d) Install valve core in valve stem (see paragraph 2-26).

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

(f) Install valve cap finger-tight.

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION III. UNIT MAINTENANCE (Con't)

2-29. RUNFLAT TIRE MAINTENANCE (HMMWV).

This Task Covers:

- a. Disassembly
- b. Inspection and Cleaning
- c. Assembly

Initial Setup:

Equipment Conditions:

- Wheel removed (see TM 9-2320-280-20)

Tools/Test Equipment:

- Torque wrench adapter (Item 2, Appendix B)
- Thickness gage in Shop equipment, automotive maintenance and repair, Organizational Maintenance, Common no.1 (Item 1. Append. B)
- Inflator-gage, pneumatic tire (includes 10' hose) (Item 30, Appendix B)

References:

- TM 9-2320-280-10
- TM 9-2320-280-20
- TM 9-2320-280-20P

Materials/Parts:

- Adhesive tape (see TM 9-2320-280-20P)
- Filament tape (see TM 9-2320-280-20P)
- One preformed packing (see TM 9-2320-280-20P)
- Twelve self-locking nuts (see TM 9-2320-280-20P)
- Detergent (Item 83, Appendix C)
- Two lubricant packs (Item 89, Appendix C)
- Tire and rim lubricant (Item 90, 91 or 92, Appendix C)
- Wire brush (Item 102, Appendix C)

a. DEMOUNTING

WARNING

Do not use tire machine. Injury to personnel or damage to equipment may result.

1. Place wheel assembly in inflation safety cage (see paragraph 2-3).

WARNING

Ensure that tire is totally deflated before removing wheel nuts. Failure to follow proper safety precautions could cause serious injury or death.

CAUTION

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

These instructions only provide basic information for the HMMWV bias tire, rim and two-piece magnesium runflats. Since fielding of the first HMMWV's there have been various configurations of the HMMWV tire, rim and runflat assemblies (e.g. radial tires, one-piece rubber runflats etc.). Refer to the latest version of TM 9-2320-280-20 for maintenance instructions on other HMMWV configurations.

2. Remove valve core (4) from valve stem (3) (see paragraph 2-26) and deflate tire (6). Run a piece of wire through valve stem to ensure that it is not plugged.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION III. UNIT MAINTENANCE (Con't)

2-29. RUNFLAT TIRE MAINTENANCE (HMMWV) (Con't).

a. DEMOUNTING (Con't)

WARNING

Never inflate assembly with wheel locknuts removed in an attempt to separate inner and outer rim halves. The assembly will separate under pressure resulting in serious injury or death.

3. When tire (6) is fully deflated, remove wheel assembly from inflation safety cage and place flat on floor with valve stem (3) facing up.
4. Using a circular pattern, loosen eight self-locking nuts (1) on studs (9) securing rim halves (2 and 8) together. If you hear escaping air, DO NOT proceed. Wait until the sound stops and recheck valve stem. When you are certain tire (6) is fully deflated, remove and discard self-locking nuts.

5. Remove rim half (2) from tire (6).

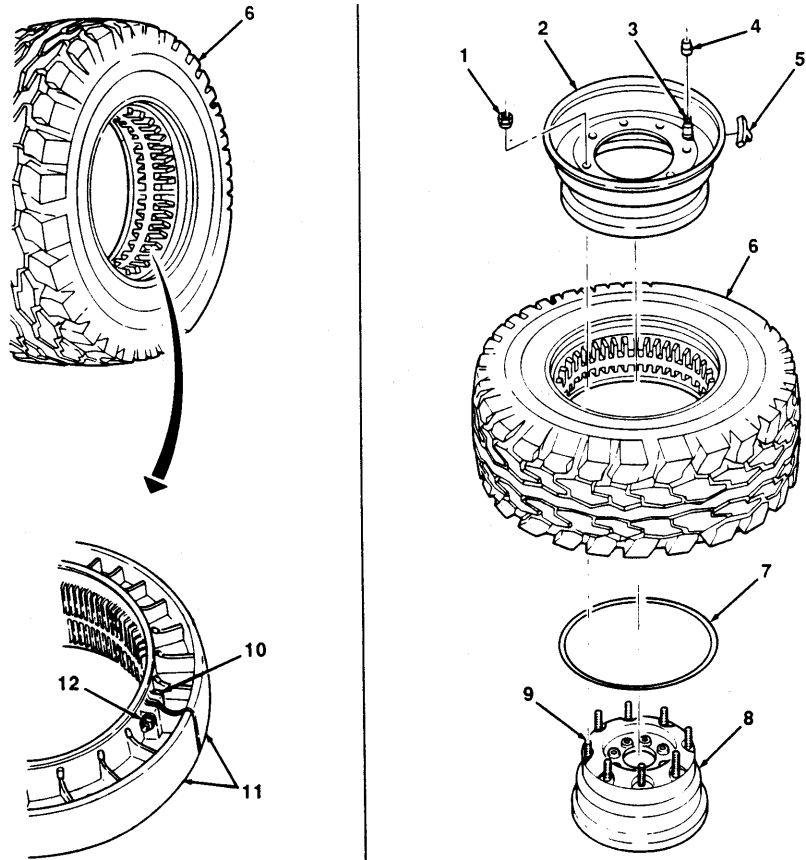
6. Remove tire (6) from rim half (8).

7. Remove preformed packing (7) from rim half (8). Cut preformed packing in half to ensure that it is not reused. Discard preformed packing.

8. Remove four self-locking nuts (12) and flange bolts (10) securing runflat halves (11) together. Discard self-locking nuts.

9. Remove runflat halves (11) from tire (6).

10. Remove balance weights (5) from rim halves (2 and 8) if present. Discard balance weights.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

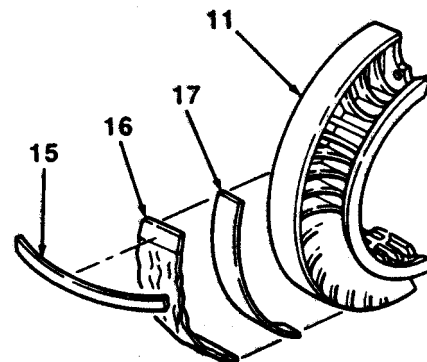
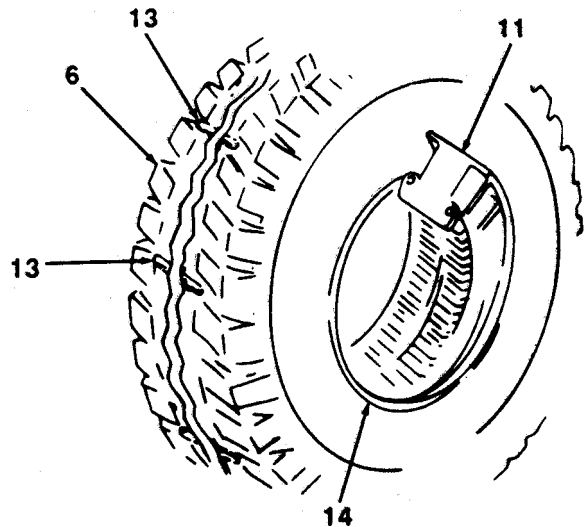
2-29. RUNFLAT TIRE MAINTENANCE (HMMWV) (Con't).

b. INSPECTION AND CLEANING

WARNING

Do not use a tire that has been run flat without thoroughly inspecting for damage. Failure to follow these instructions may result in damage to equipment, injury or death.

1. Inspect inside of tire (6) for cord or belt separation and inner liner damage. Replace tire if damaged.
2. Inspect tire bead (14) for abrasions caused from runflat halves (11). Replace tire (6) if damaged.
3. Check for protruding objects inside tire (6) that may not be visible from outside. Repair tire if damaged (see paragraph 2-32).
4. Check tread depth on tire (6) (see paragraph 2-24). Tread should not be worn below level of wear bars (13). Replace tire if tread is worn below wear bars.
5. Remove eight strips of filament tape (15), two lubricant packs (16), and adhesive tape (17) from each runflat half (11). Discard lubricant packs, filament tape, and adhesive tape.
6. Clean lubricant from tire (6) and runflat halves (11) with detergent and water. Allow to air dry.



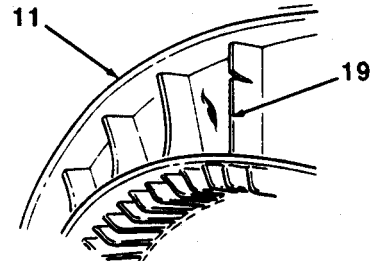
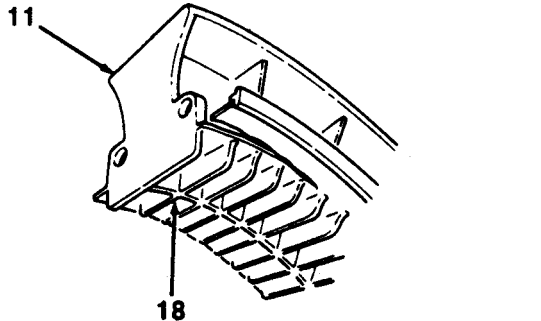
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

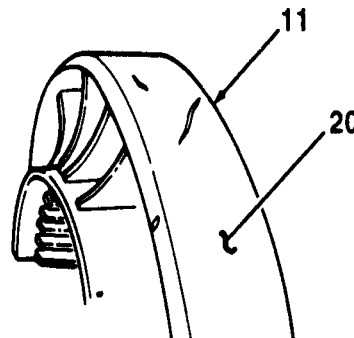
2-29. RUNFLAT TIRE MAINTENANCE (HMMWV) (Con't).

b. INSPECTION AND CLEANING (Con't)

7. Inspect inside diameter fins (18) and center section fins (19) of runflat halves (11) for cracks or broken sections. Replace runflat halves if cracked or broken.



8. Inspect outside diameter (20) of runflat halves (11) for total penetration cracks. Replace runflat halves if cracked.

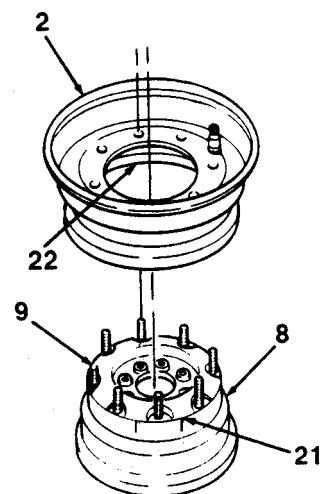


WARNING

Preformed packing surfaces and pressure relief grooves must be kept clean and free of rust and dirt. Failure to do so could cause the wheel assembly to separate under pressure, causing serious injury or death.

9. Using wire brush, clean studs (9). Clean all dirt and foreign material from rim halves (2 and 8) with detergent and water. Allow to air dry. Ensure that preformed packing surfaces (22) and pressure relief grooves (21) on rim halves are smooth and clean.

10. Inspect rim halves (2 and 8) for cracks, bent sealing surfaces, or oversized mounting holes. Replace rim halves if cracked, bent, or if mounting holes are oversized.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-29. RUNFLAT TIRE MAINTENANCE (HMMWV) (Con't).

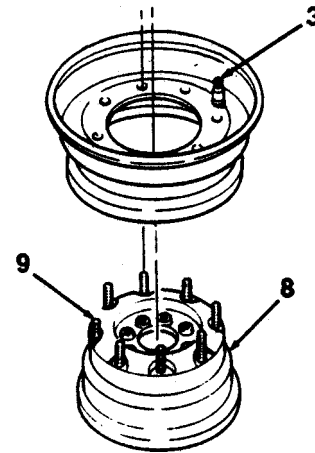
b. INSPECTION AND CLEANING (Con't)

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.

11. Inspect rim half (8) for cracked, broken, rusted, pitted, bent, or loose studs (9). Inspect studs for damaged, mutilated, or deformed threads. Replace studs if damaged, loose, or if threads are damaged (see TM 9-2320-280- 20).

12. Inspect valve stem (3) for cracks or deterioration. Replace valve stem if cracked or deteriorated.



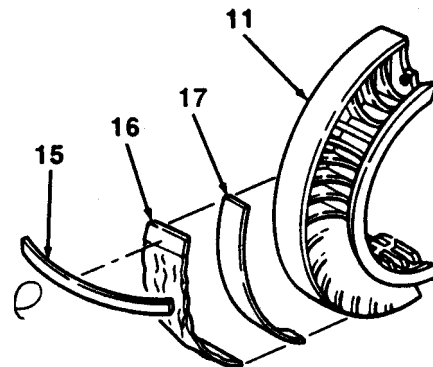
c. ASSEMBLY

WARNING

- Never use tubes in runflat wheel assemblies. Use of a tube defeats built-in safety features and could allow wheel to come apart under pressure, resulting in serious injury or death.
- Use only replacement parts and material specified in TM 9-2320-280-20P. Wheels assembled with components that do not meet specifications could cause the assembly to separate under pressure, resulting in serious injury or death.

1. Position strip of double-sided adhesive tape (17) on center of outer surface of each runflat half (11).

2. Position two lubricant packets (16) on adhesive tape (17) at each runflat half (11). Apply four 15 strips of filament tape (15) around each lubricant packet to ensure bonding to runflat halves.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

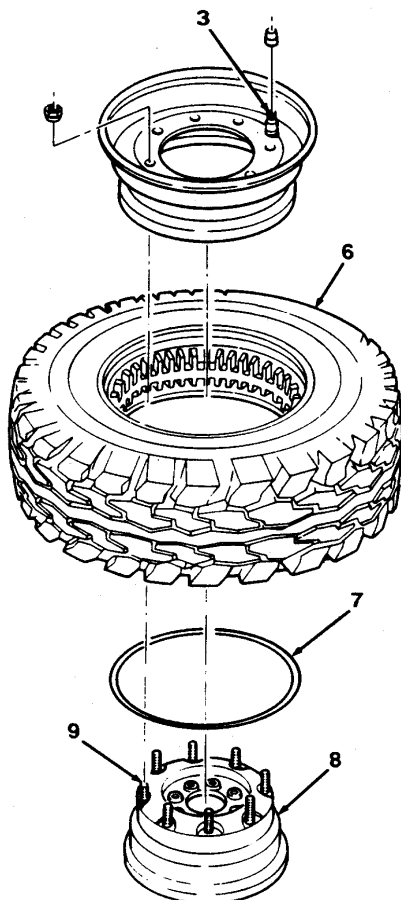
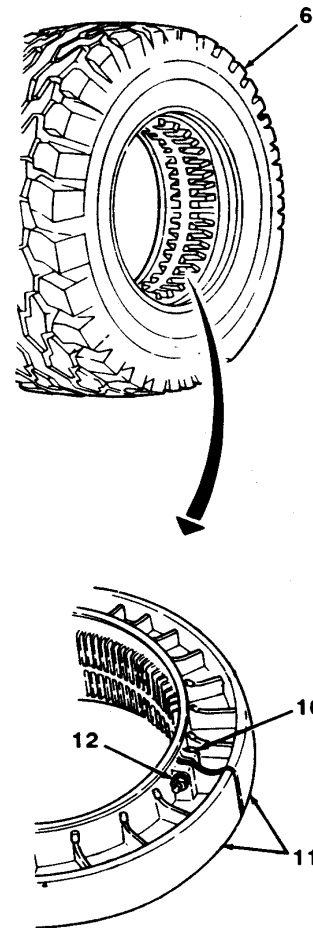
2-29. RUNFLAT TIRE MAINTENANCE (HMMWV) (Con't).

c. ASSEMBLY (Con't)

3. Install two runflat halves (11) inside tire (6), ensuring that notches are aligned on same side of runflat halves.

4. Secure runflat halves (11) together with four flange bolts (10) and new self-locking nuts (12). Using torque wrench adapter, torque self-locking nuts to 18-22 Ib-ft. (24-30 N.m).

5. Lubricate new preformed packing (7) with tire and rim lubricant and install preformed packing on first ledge of rim half (8). Ensure that preformed packing is not twisted and is uniformly positioned 1 inch (2.5 cm) below studs (9). Do not overstretch preformed packing.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-29. RUNFLAT TIRE MAINTENANCE (HMMWV) (Con't).

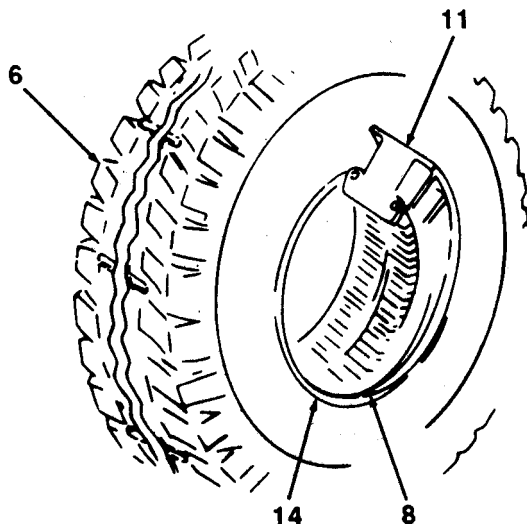
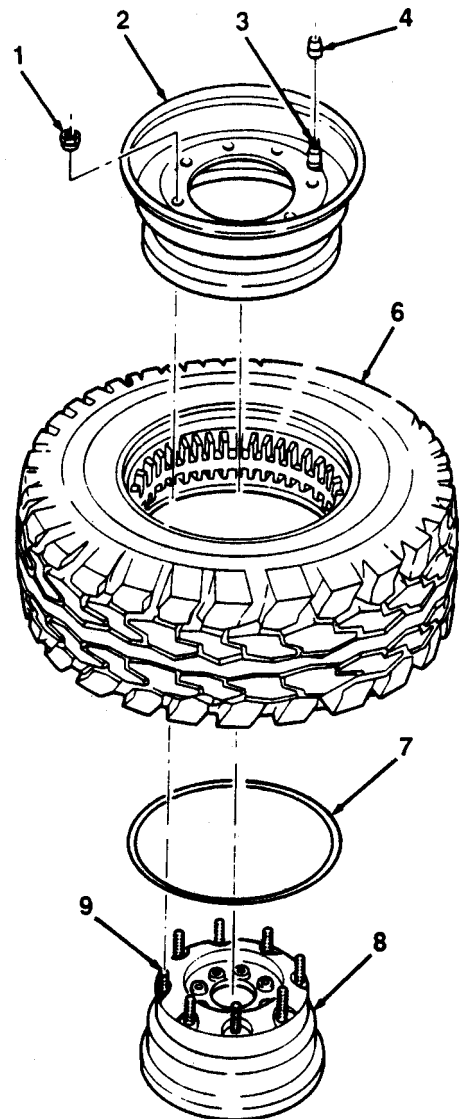
c. ASSEMBLY (Con't)

6. Position rim half (8) on a raised stand (or another rim half) to ensure that tire sidewall will not contact floor when installed.
7. Lubricate tire bead (14) and rim bead seat areas with tire and rim lubricant.
8. Center runflat halves (11) in tire (6). Carefully lower tire over rim half (8). Check to ensure that preformed packing (7) has not been disturbed.
9. Ensure that runflat halves (11) are not binding flat portion of rim half (8). Runflat halves should clear rim half.
10. Install rim half (2) in tire (6).

CAUTION

Tighten locknuts gradually to avoid bending and breaking studs or damaging wheel components.

11. Secure rim half (2) to rim half (8) with eight new self-locking nuts (1). Tighten nuts in sequence shown until rim halves are nearly touching.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION III. UNIT MAINTENANCE (Con't)

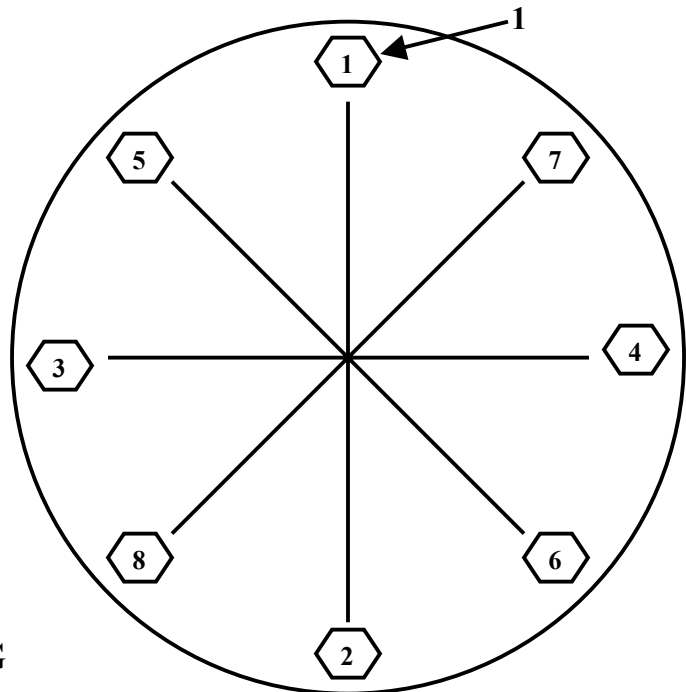
2-29. RUNFLAT TIRE MAINTENANCE (HMMWV) (Con't).

c. ASSEMBLY (Con't)

12. Torque eight self-locking nuts (1) to 65 lb.-ft, (88 N.m) in sequence shown.

13. Check wheel assembly for gaps at each stud (9) between rim halves (2 and 8) .Use a 0.0015 inch (0.038 mm) thickness gage (e.g. spark plug gap feeler gage) to detect gaps. If gaps are detected, disassemble and assemble wheel assembly and check for gaps. If gaps are still detected, replace rim half (2).

14. Install valve core (4) in valve stem (3) (see paragraph 2-26).



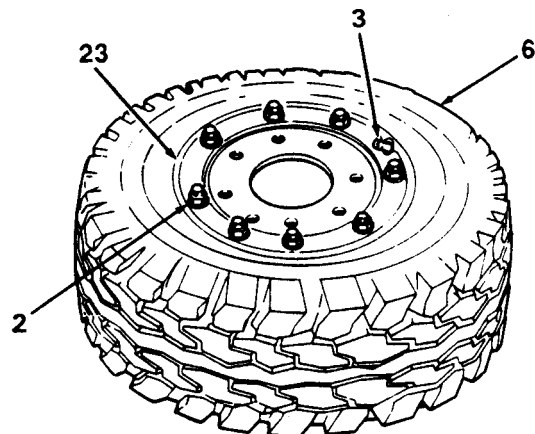
WARNING

- **Never inflate a wheel assembly without having checked wheel locknut torque's to ensure that the wheel locknuts are tightened to specification. An assembly with improperly tightened locknuts could separate under pressure, resulting in serious injury or death.**
- **Always use a tire inflation safety cage when inflating tires. Stand to one side of the cage during inflation, never directly in front. Keep hands out of cage during inflation. Inflate assembly to recommended pressure using a pneumatic tire inflator-gage. Do not exceed 30 psi (207 kPa) cold inflation pressure. Failure to follow these instructions may result in serious injury or death.**

15. Place assembly in an inflation safety cage (see paragraph 2-3} and inflate tire (6} to 30 psi (207 kPa) to seat tire bead.

16. Inflate tire (1) to recommended pressure (see TM 9-2330-280-10).

17. Check for leaks around rim edges (23) and valve stem (3) using a detergent and water solution.



FOLLOW-ON TASKS:

- Install wheel (TM 9-2320-280-20).

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION III. UNIT MAINTENANCE (Con't)

2-30. BOLT TOGETHER RIMS REPAIR (M939A1 SERIES).

This Task Covers:

- a. Disassembly b. Assembly
-

Initial Setup:

Equipment Conditions:

- Wheel removed (see TM 9-2320-272-10).
- Valve core removed and tire deflated (see paragraph 2-26)

Tools/Test Equipment:

- Wheel assembly tool (Item 55, Appendix B)
- Inflator-gage, pneumatic tire (includes 10' hose) (Item 30, Appendix B)

References:

- TM 9-2320-272-10
- TM 9-2320-272-20P

Materials/Parts:

- One preformed packing (TM 9-2320-272-20P)
- Ten self-locking nuts (TM 9-2320-272-20P)
- Detergent (Item 83, Appendix C)

Personnel Required: Two

a. DISASSEMBLY

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.

CAUTION

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.

1. Loosen then remove ten self-locking nuts (14) from wheel rim studs (13). Discard self-locking nuts.
2. Remove clamp ring (12) and wheel rim (9) from tire (1).

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.

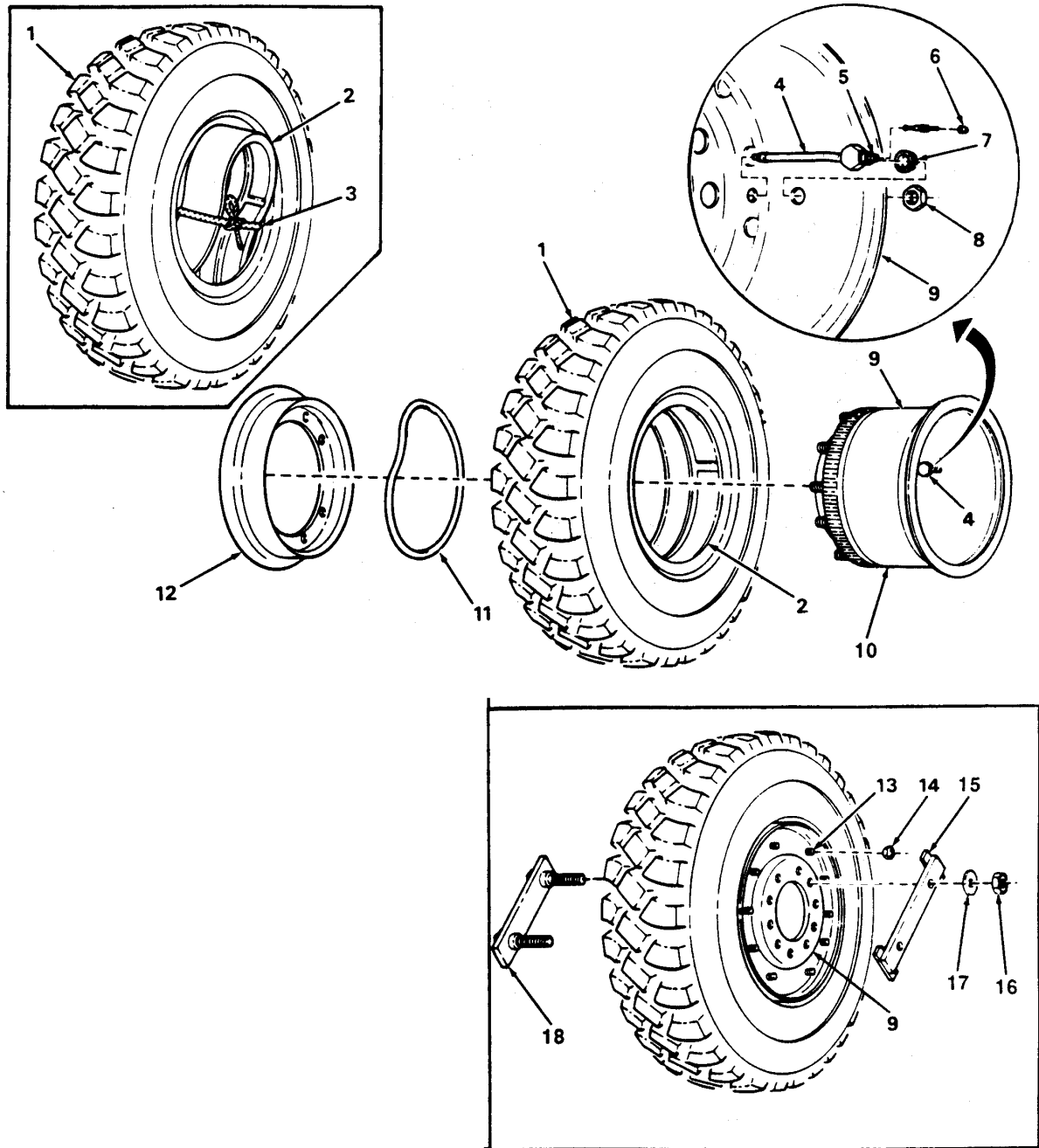
5. Compress beadlock (2) enough to install rope (3). Remove beadlock from tire (1).

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-30. BOLT TOGETHER RIMS REPAIR (M939A1 SERIES) (Con't).

a. DISASSEMBLY (Con't)



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)**SECTION III. UNIT MAINTENANCE (Con't)****2-30. BOLT TOGETHER RIMS REPAIR (M939A1 SERIES) (Con't).****b. RIM MAINTENANCE****7. 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.

c. 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.

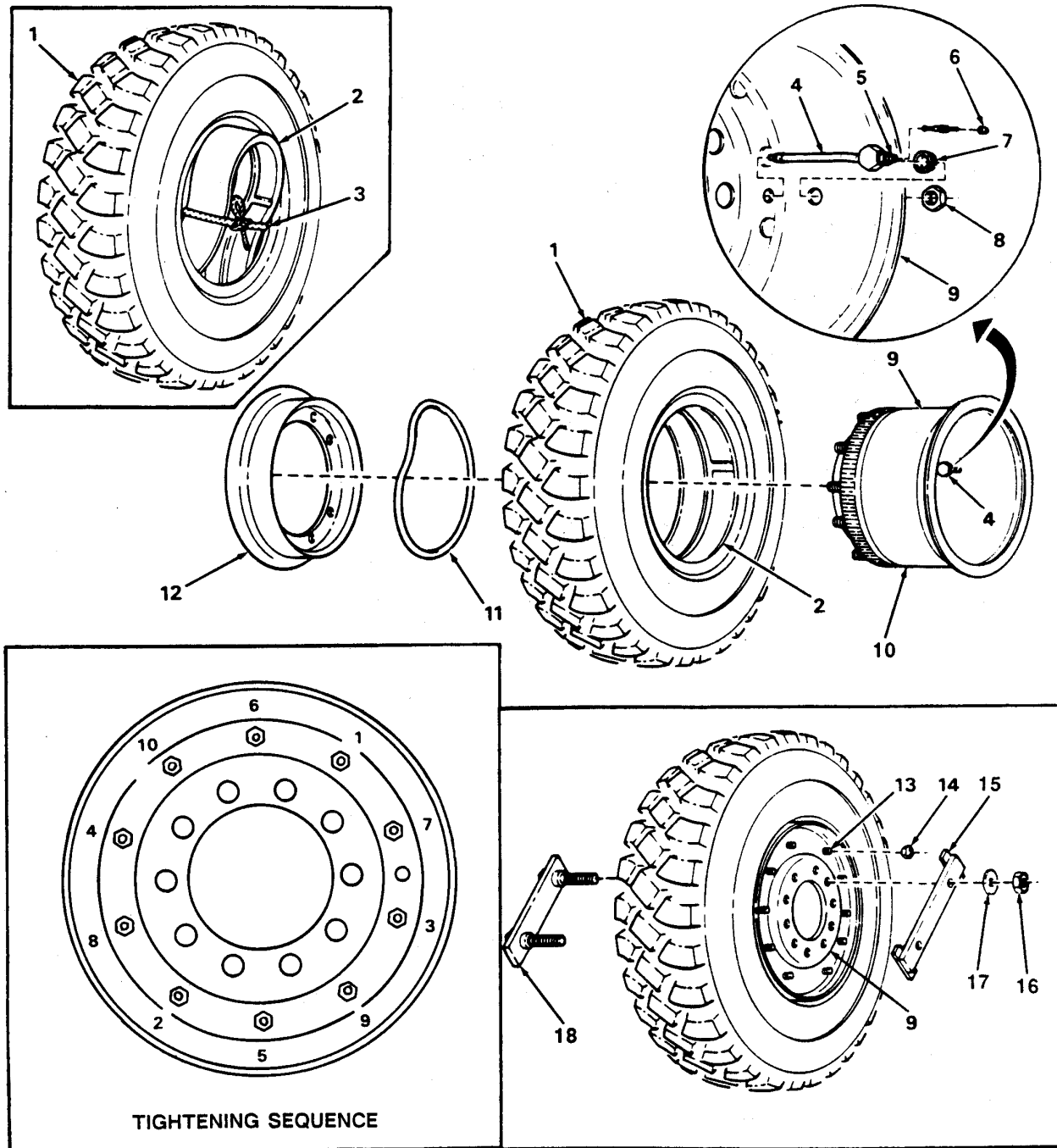
1. Install rope (3) on beadlock (2). Compress bead lock and install in tire (1). Remove rope. Ensure that beadlock is centered in tire .
2. Install grommet (7) on turret valve (4).
3. Install turret valve (4) on wheel rim (9) using nut (8). Torque nut to 40-65 lb.-in. (5-7 N.m).
4. Install wheel rim (9) on tire (1).
5. Install new preformed packing (11) on groove (10).
6. Install clamp ring (12) on wheel rim (9) with valve stem hole aligned with turret valve (4).
7. Install wheel assembly tool base (18) on wheel rim (9).
8. 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 9.
9. Install ten new self-locking nuts (14) on wheel rim studs (13) finger-tight.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-30. BOLT TOGETHER RIMS REPAIR (M939A1 SERIES) (Con't).

c. ASSEMBLY (Con't)



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-30. BOLT TOGETHER RIMS REPAIR (M939A1 SERIES) (Con't).

c. ASSEMBLY (Con't)

10. Remove two nuts (16) , two washers (17) , wheel assembly tool plate (15) , and wheel assembly tool base (18).
11. Torque self-locking nuts (14) alternately, in increments, and in sequence shown until 210-240 Ib.-ft. (285-325 N.m).
12. Install valve core (see paragraph 2-26).
13. Inflate tire to proper pressure (see TM 9-2320-272-10) and install valve cap (6) on valve stem (5) finger-tight.

FOLLOW-ON TASKS:

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-31. TIRE REPAIR PROCEDURES -TEMPORARY STRING REPAIR.

This Task Covers: Repair

Initial Setup:

Equipment Conditions:

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

- File handle (Item 28. Appendix B).
- Shears (Item 47, Appendix B)

Materials/Parts:

- Pneumatic tire puncture repair kit (Item 72, Appendix C)

Tools/Test Equipment:

- Awl, scratch (Item 4, Appendix B).
- Hand file (Item 20. Appendix B).

a. REPAIR

WARNING

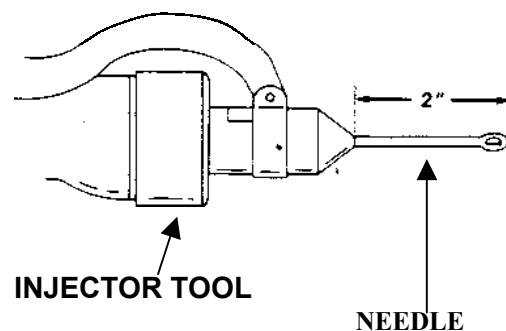
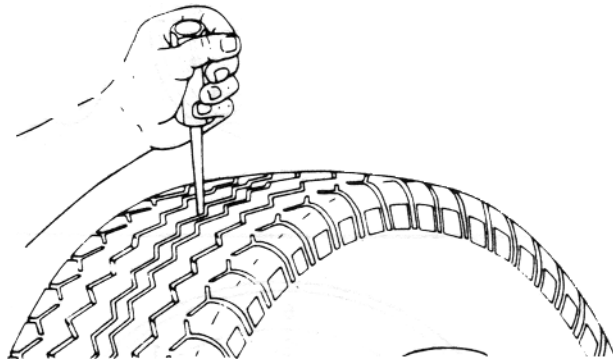
Any outside-to-in tire repair, like string repair is considered only a temporary fix to provide get home capability. A permanent and complete repair includes inspection of the tire for further damage, filling voids in the injured area and applying the appropriate patch or patch/plug combination from 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.

1. 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.
2. If foreign substances are present. use a hand file to clean out the injury .

NOTE

Needle length may be adjusted for larger and thicker tires.

3. 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 (5.1 cm). Non-adjustable injector tools are standard size and will also work with just about any truck tire size or smaller.

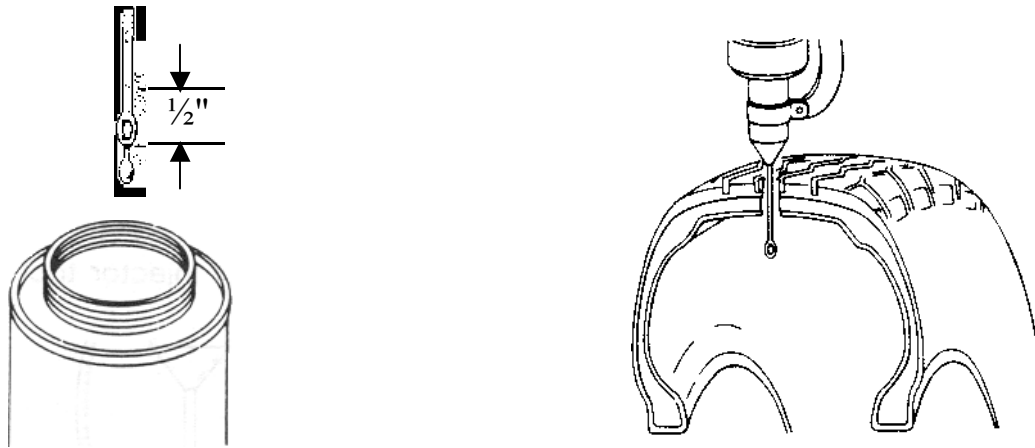


CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-31. TIRE REPAIR PROCEDURES-TEMPORARY STRING REPAIR (Con't)

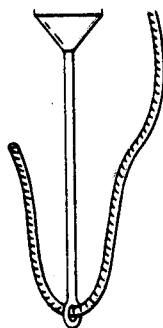
4. Dip eye of needle 1/2 inch (12.7 mm) into bonding compound.
5. Insert needle of injector tool into injury and through tire following path of injury, then remove from tire.



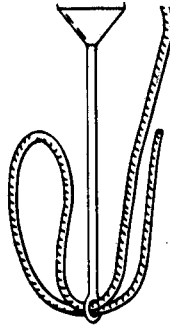
NOTE

Length of repair material will differ depending on size and thickness of tire being repaired. As a guide, 4 inches (10.16 cm) for light duty tires and 8 inches (20.32 cm) for heavy duty tires will be pulled through the eye of injector tool. Use double strand for large punctures.

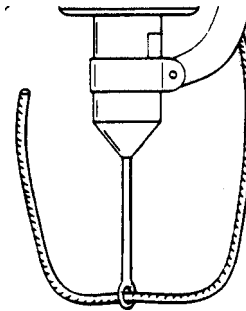
6. Pull full length of needle out of injector tool and thread repair material through eye of needle.
7. Push needle of injector tool back to 2 inches (5.1 cm) length.
8. Dip end of injector tool needle 1/2 inch (12.7 mm) into adhesive.



4 INCHES (10.2 cm) FOR LIGHT DUTY TIRES



DOUBLE STRAND FOR HEAVY DUTY TIRES & LARGER PUNCTURES

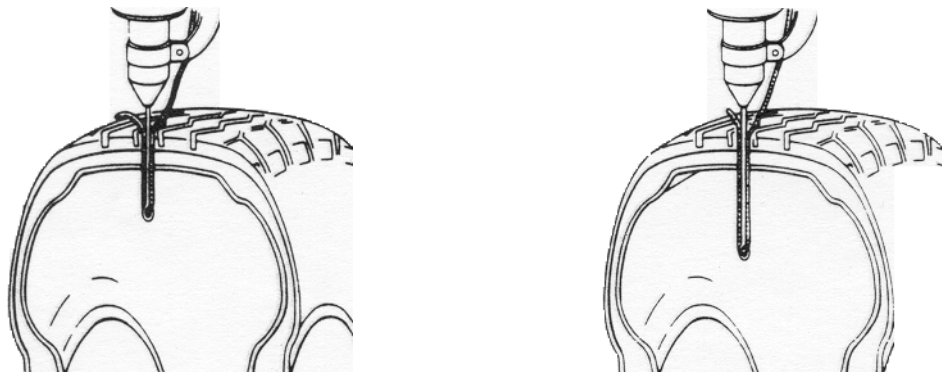


PUSH NEEDLE BACK TO 2 INCHES (5.1 cm) LENGTH

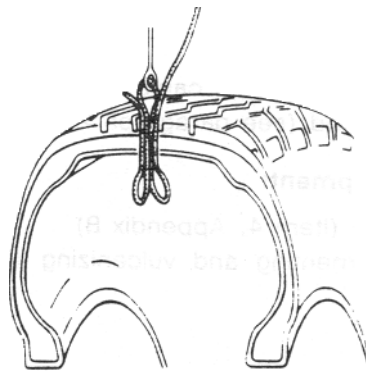
2-31. TIRE REPAIR PROCEDURES-TEMPORARY STRING REPAIR (Con't)

9. Using injector tool, insert repair material into injury with a steady pressure, following direction of puncture.

10. 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.



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



12. 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.

13. Repeat steps 6 through 12 with additional repair material as required to seal puncture

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-32. TIRE REPAIR PROCEDURES - COMPLETE TIRE REPAIR.

This Task Covers: Repair

Initial Setup:

Equipment Conditions:

- Tire removed (see applicable vehicle TM).
- Tire demounted (see paragraphs 2-27 thru 2-30)

Tools/Test Equipment:

- Awl, scratch (Item 4, Appendix B)
- Stitcher, cementing and vulcanizing (Item 50, Appendix B) There also may be a stitcher with repair kit.

Materials/Parts:

- Patch, as required:
 - Passenger car or light truck tire (bias or radial) (Item 40, Appendix C)
 - Large truck tire (bias) (Item 42, Appendix C)
 - Large truck tire (steel belted) (Item 71, Appendix C)
- Pneumatic tire puncture repair kit (Item 78 or 77, Appendix C)
- Marking chalk (Item 81, Appendix C)
- Vulcanizing fluid (Item 87, Appendix C)
- Buffing solution (Item 100, Appendix C)

a. 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.**
 1. Inspect tire for any puncturing objects.
 2. Check the injured area and paragraphs 2-21 through 2-23 to see if it injury falls within the tread crown area and determine if it's repairable.
 3. Remove any puncturing objects and mark an area slightly larger than the injury, on the inner liner, with chalk.
 4. 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
 5. Examine tire liner for any other sign of damage.
 6. 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 the scrape the area first then wipe with a clean cloth.
 7. 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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-32. TIRE REPAIR PROCEDURES - COMPLETE TIRE REPAIR (Con't).

CAUTION

Step 7 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.

8. Fill injury with plug material in repair kit (item 78, Appendix C) or plugs from repair kit (Item 77, Appendix C). If plug is used, remove and buff head of plug even with inner liner and/or tread.

WARNING

Use vulcanizing fluids and cleaning fluids in a well-ventilated area. Read all WARNINGS and CAUTIONS on containers. Prolonged inhalation of fumes could cause health hazards.

9. Center patch over injury and press it lightly into place.
10. Using a stitcher, stitch patch down thoroughly from center of patch to edges.
11. Check repair to ensure that seal is complete.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION III. UNIT MAINTENANCE (Con't)

2-33. INNER TUBE REPAIR PROCEDURES.

This Task Covers:

- a. Inspection and Repair Criteria b. Inner Tube Repair

Initial Setup:

Equipment Conditions:

- Inner tube removed from demounted tire (see appropriate procedure)

- Abrasive stick or wheel assembly tool (Item 55, Appendix B)

Tools/Test Equipment:

- Stitcher, Cementing and Vulcanizing stitcher (Item 50, Appendix B)

Materials/Parts:

- Repair Kit, Tube (Item 66, Appendix C)
- Vulcanizing fluid (Item 85, Appendix C)
- Buffing solution (Item 100, Appendix C)

a. INSPECTION AND REPAIR CRITERIA

1. Minor injuries to inner tubes can be repaired quickly and easily. Check inner tubes for punctures, pinches, cuts, and cracks.
2. Refer to table below 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.
3. 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.

Table 2-5. Permissible Inner Tube Repairs.

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

b. INNER TUBE REPAIR

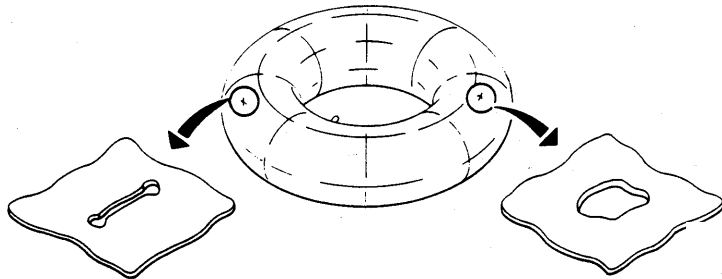
1. Mark location of injury.
2. Remove valve core (see paragraph 2-26).

NOTE

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

2-33. INNER TUBE REPAIR PROCEDURES (Con't).

3. Cut damaged material out of tube. Round ends of injury or cut X punctures in a circle.



WARNING

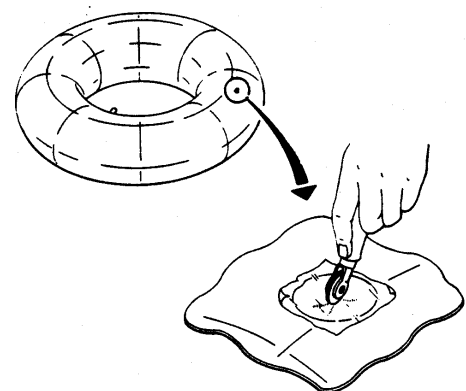
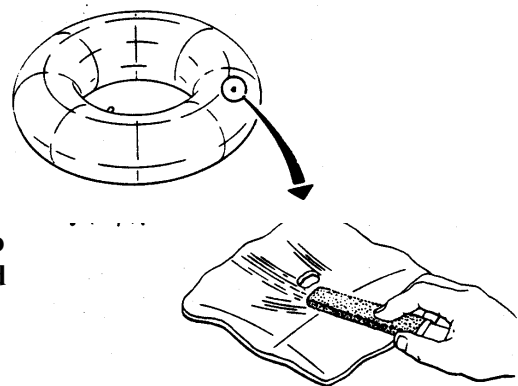
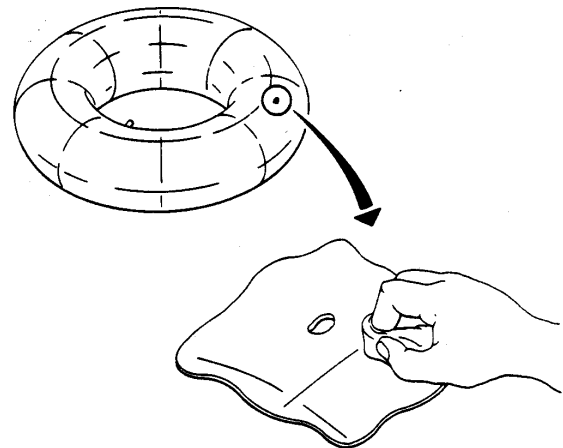
Use vulcanizing fluids and cleaning fluids in a well-ventilated area. Read all WARNINGS and CAUTIONS on containers. Prolonged inhalation of fumes could cause health hazards.

4. Clean injured area with buffing solvent.
5. Select a patch that will adequately cover injury. Mark area approximately 1/2 inch (12.7 mm) larger than the patch.
6. Buff around injury with an abrasive stick or buffing tool. Buff to size marked in step 5. Do not gouge tube during buffing.

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).

7. Remove buffing dust with compressed air.
8. Apply one coat of vulcanizing fluid to buffed area of inner tube and allow to dry for a minimum of 20 minutes.
9. Remove backing from patch. Center patch over injury and press into place.
10. Thoroughly stitch patch with stitcher, working from center of patch to outer edges.
11. Remove top coating from patch (if applicable).



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION VI. DIRECT SUPPORT MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-34.	GENERAL	2-59
2-35.	NONDEMOUNTABLE FLAT BASE RIM TUBE TIRE MAINTENANCE.	2-60
2-36.	DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE.	2-66
2-37.	NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE	2-70

2-34. GENERAL.

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

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

c. Demountable tires requiring demounting at the Direct Support Level may come from using organizations that are not equipped with a tire changing 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 changing machine accompany the machine and must be followed. These procedures are not included in this manual.

d. 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.

2-35. NONDEMOUNTABLE FLAT BASE RIM TUBE TIRE MAINTENANCE.

This Task Covers:

a. Demounting

b. Mounting

Initial Setup:

Equipment Conditions:

- With the nondemountable rim, the tire will be demounted and mounted with rim remaining on vehicle. Jack up vehicle. Refer to appropriate vehicle maintenance TM for jacking instructions and safety precautions.

- Two tire irons, curved flat type (Item 34, Appendix B)
- Tire iron, lockring type (Item 35, Appendix B)

Materials Parts:

- Tire and rim lubricant (Item 90, 91 or 92, Appendix C)

Tools/Test Equipment:

- Inflator-gage, pneumatic tire (includes 10' hose) (Item 30, Appendix B)

Personnel Required: Two

a. DEMOUNTING

1. Remove valve core and deflate tire (see paragraph 2-26). 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 no air pressure remains in the tire. Serious injury or death could result.

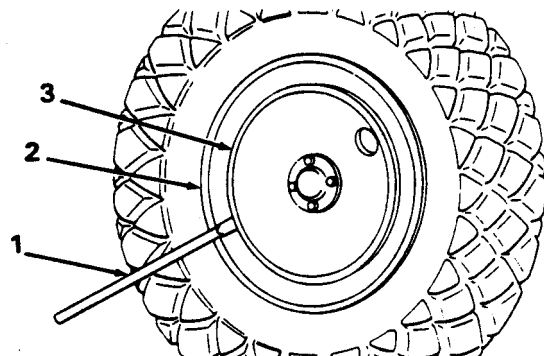
CAUTION

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

CAUTION

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.

2. Insert a curved flat tire iron (1) between tire bead and outer rim flange (2).
3. Working progressively around rim, work outer tire bead completely free of outer rim flange.
4. Work outer rim flange (2) inward away from lockring (3), enough to permit removal of lockring.



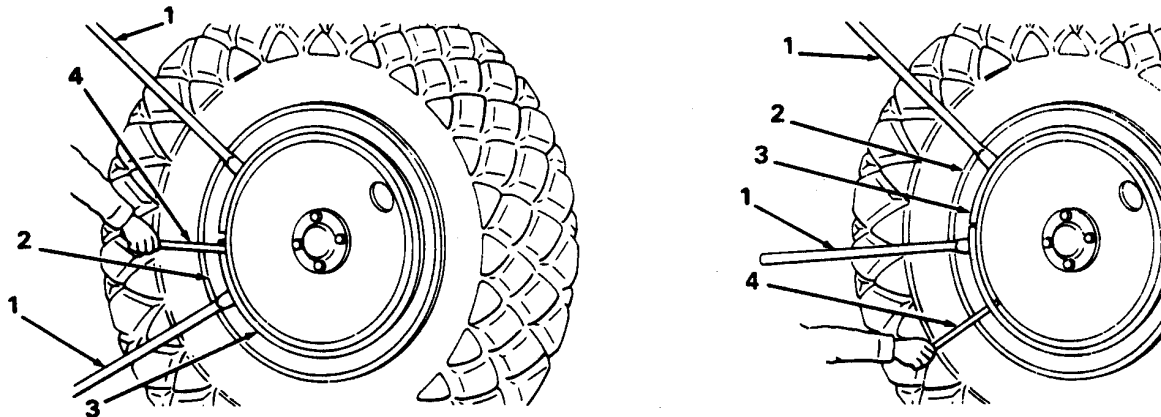
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-35. NONDEMOUNTABLE FLAT BASE RIM TIRE MAINTENANCE (Con't).

a. DEMOUNTING (Con't)

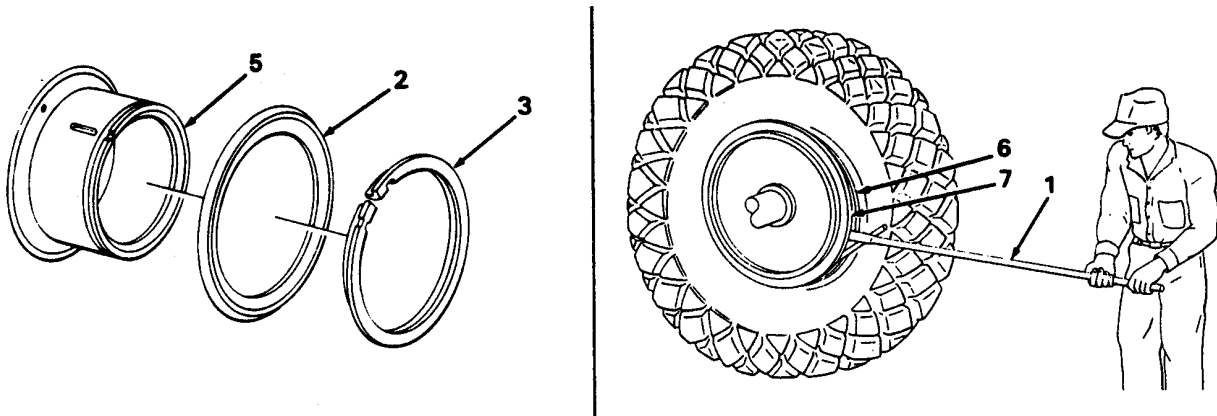
5. With two, curved flat tire irons (1) have an assistant work outer rim flange (2) inward away from locking near prying notch.
6. With assistant working rim flange (2) inward. Insert a locking tire iron (4) into prying notch and work locking (3) partly out of rim gutter.
7. With assistant, work progressively around rim holding flange (2) in and working locking (3) out to completely remove locking.



8. With locking (3) completely removed, slide outer rim flange (2) completely off rim (5).
9. Work inner tire bead (6) from inner rim flange (7) with a curved flat tire iron (1) inserted between inner tire bead and inner rim flange.

NOTE

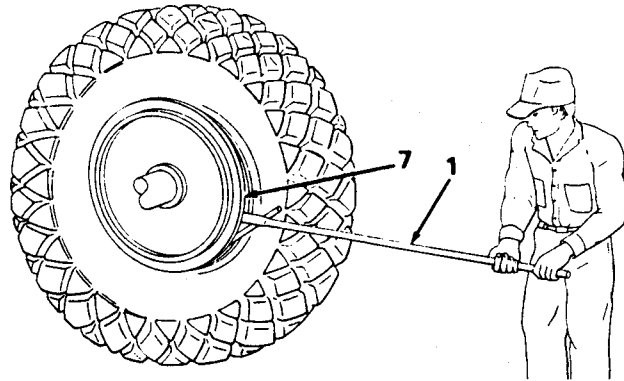
Refer to appropriate vehicle maintenance TM for jacking instructions and safety precautions. If a crane or hoist is available, it may be used to raise and lower tire instead of jacking vehicle up or down.



2-35. NONDEMOUNTABLE FLAT BASE RIM TIRE MAINTENANCE (Con't).

a. DEMOUNTING (Con't)

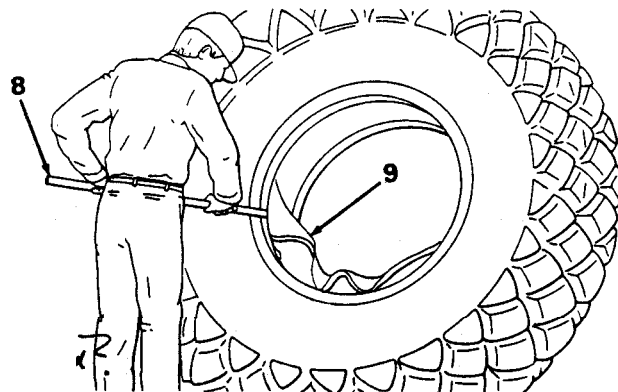
10. With inner tire bead (6) completely free of inner rim flange (7), force bottom of tire out as far as possible. Have assistant lower vehicle a little so weight of tire rests on ground.
11. Force top of tire out as far as possible. Have assistant raise vehicle so weight of tire is not resting on ground.
12. Repeat steps 10 and 11 until tire is almost completely off rim.
13. Working with assistant, completely remove tire from rim and lean tire in an upright position against vehicle or other solid object.
14. Slide inner rim flange (7) off rim.



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.

15. Using a flat tire iron (8), work tire flap (9) out of tire, being careful not to damage tube and tire flap.
16. Remove tube from tire, being careful not to damage valve stem.



b. RIM MAINTENANCE

1. 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.

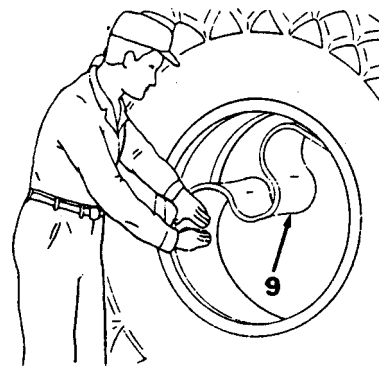
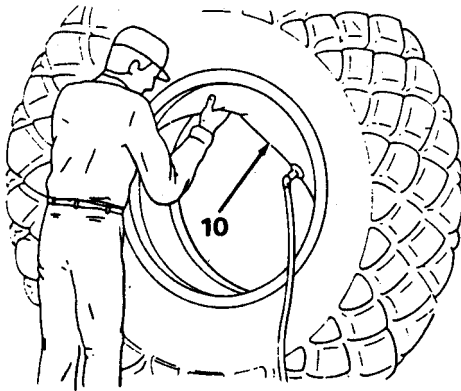
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

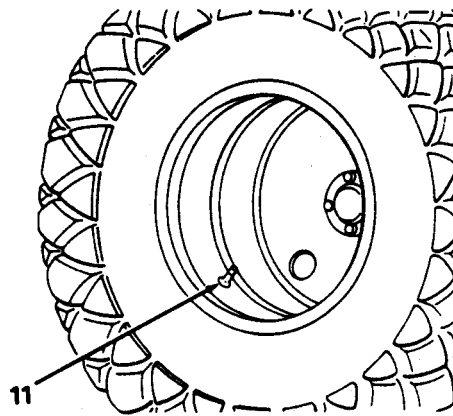
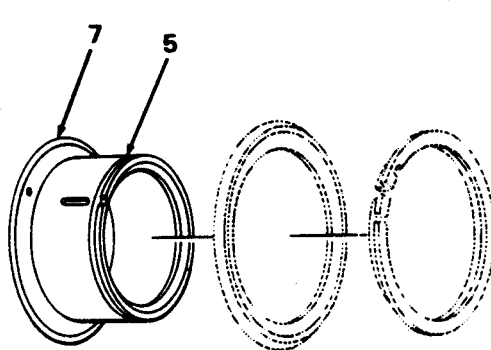
2-35. NONDEMOUNTABLE FLAT BASE RIM TIRE MAINTENANCE (Con't).

c. MOUNTING

1. Install tube (10) 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.
2. Install tire flap (9) starting at bottom and rotating tire so the portion being installed is at the bottom of tire.
3. Apply tire and rim lubricant to both beads and tire flap (9).



4. Slide inner rim flange (7) into proper position on rim (5).
5. 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.



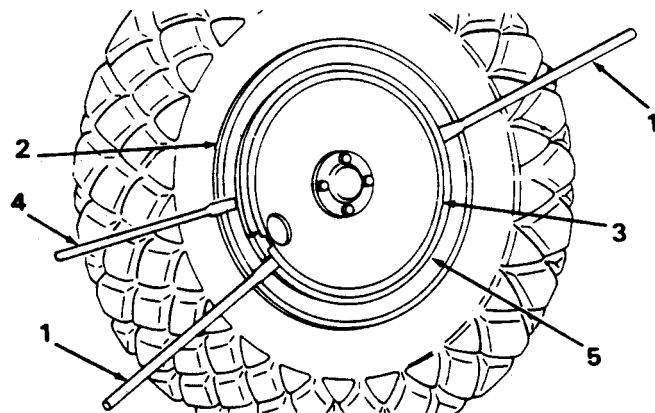
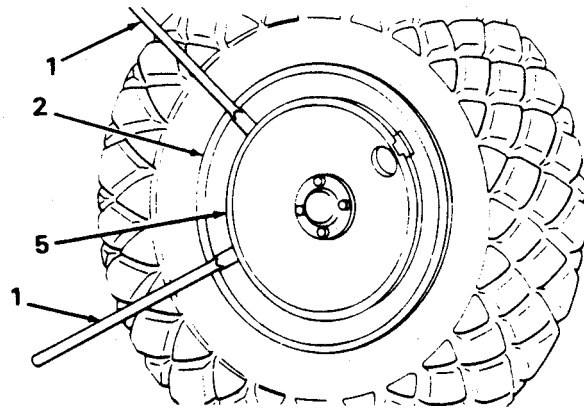
2-35. NONDEMOUNTABLE FLAT BASE RIM TIRE MAINTENANCE (Con't).

c. MOUNTING (Con't)

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.

6. Have assistant lower vehicle until center of tire is aligned with rim (5) and push top of inner tire bead onto rim.
7. Have assistant raise vehicle so weight of tire does not rest on ground. Push bottom of tire in as far as possible.
8. Have assistant lower vehicle so weight of tire will rest on ground. Push top of tire in as far as possible.
9. Repeat steps 7 and 8 until tire is completely on rim (5) .up against inner rim flange (7) and up off ground.
10. Slide outer rim flange (2) onto rim (5) and under outer tire bead.
11. With help from assistant, work outer rim flange (2) in and away from gutter of rim (5) with two curved flat tire irons (1).
12. With help from assistant, work outer rim flange in and away from gutter of rim (5) and place end of lockring (3) without prying notch into gutter of rim as shown.
13. 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).
14. With lockring (3) completely installed, allow outer rim flange (2) to come out and contact lock rim throughout entire circumference.



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.

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-35. NONDEMOUNTABLE FLAT BASE RIM TIRE MAINTENANCE (Con't).

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-gage and 10 ft. (3.1 mm) air hose. Failure to do so could result in serious injury.

16. Install valve core (see paragraph 2-26).

17. Using a pneumatic tire hose (13) with in-line inflator-gage (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.

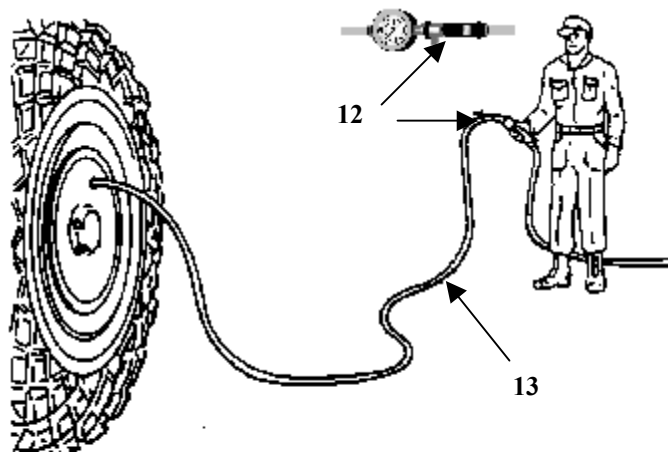
18. Inflate the tire enough to seat both tire beads. Both tire beads should seat properly before reaching 40 psi (276 kPa). If tire beads fail to seat, deflate tire, determine cause of failure, take corrective action, add additional tire and rim lubricant and repeat this step.

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

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

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

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



TM 9-2610-200-14
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-36. DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE.

This Task Covers:

- a. Demounting b. Mounting

Initial Setup:

Materials/Parts:

- Tire and rim lubricant (Item 90, Appendix C)
- Preformed Packing (refer to the vehicle parts manual)

Tools/Test Equipment:

- Inflator-gage, pneumatic tire (includes 10' hose) (Item 30, Appendix B)
- Tire iron, curved flat type (Item 34, Appendix B)
- Tire iron, curved bead breaker type (Item 33, Appendix B)
- Tire iron, lockring type (Item 35, Appendix B)

a. DEMOUNTING

1. Remove valve core and completely deflate tire (see paragraph 2-26). 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.

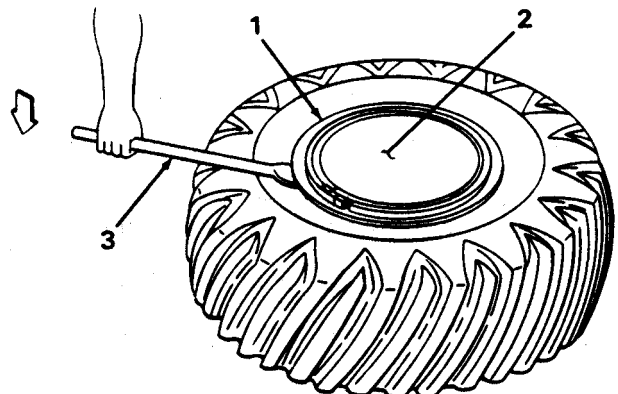
CAUTION

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

CAUTION

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.

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



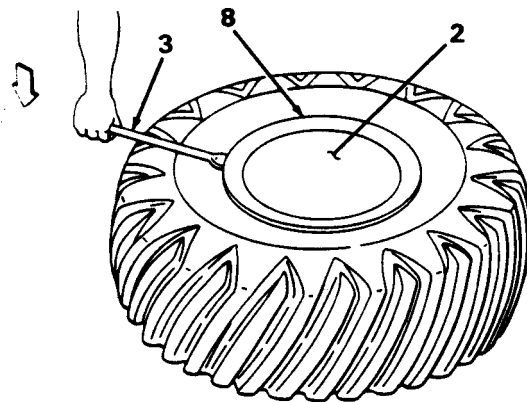
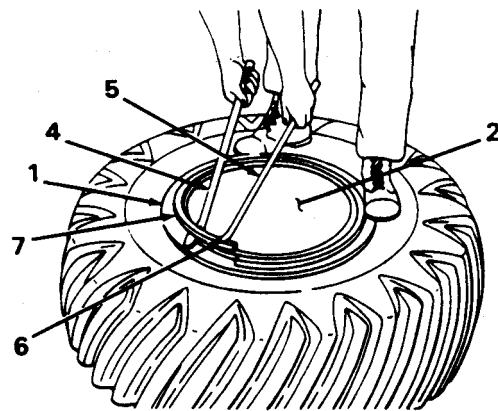
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-36. DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE (Con't)

a. DEMOUNTING (Con't)

4. Force side ring flange (1) down enough to clear lockring (7).
5. Insert locking tire iron (5) into prying notch (6) and work lockring (7) partly out of gutter of rim (2).
6. Insert curved flat tire iron (4) between lockring (7) and rim (2).
7. Work both curved flat tire iron (4) and locking tire iron (5) progressively around rim (2), removing lockring (7).
8. With lockring (7) removed, force side ring flange (1) down and remove preformed packing.
9. Slide ring flange (1) straight up and off rim (2).
10. Turn tire and rim (2) 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.
11. 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).
12. Lift rim (2) out of tire.



b. RIM MAINTENANCE

2. **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.

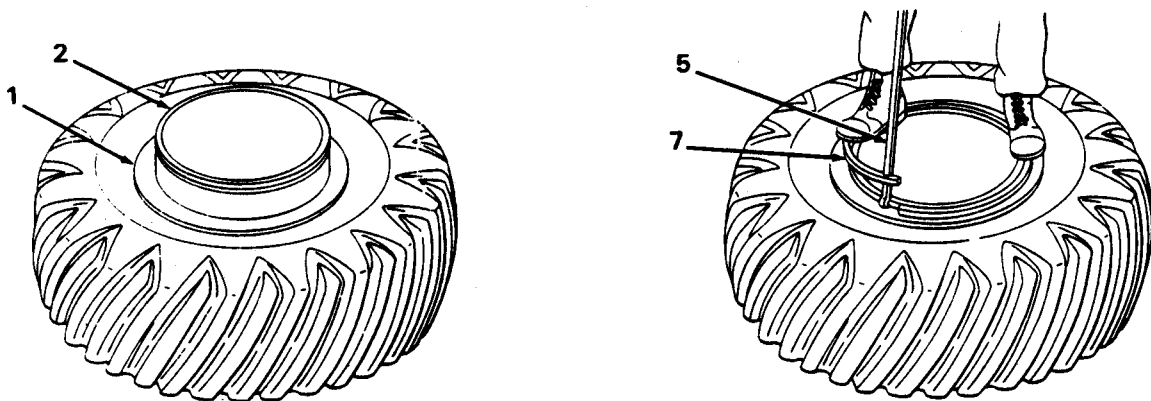
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-36. DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE (Con't)

c. MOUNTING

1. Place rim (2) flat on floor, lubricate both beads of tire with tire and rim lubricant, and place tire completely on rim.
2. Slide side ring flange (1) down onto rim (2) and under bead of tire.
3. Force side ring flange (1) down past gutter of rim (2) and install preformed packing in groove of rim.
4. Holding side ring flange (1) down past gutter of rim (2) place end of lockring (7) without prying notch into gutter of rim.
5. 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.
6. Ensure that preformed packing is properly installed, and guide side ring flange (1) up over preformed packing and onto lockring (7).



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.

7. Inspect all rim components to ensure that they are properly seated. Place rim and tire assembly in an inflation safety cage (see paragraph 2-3).

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

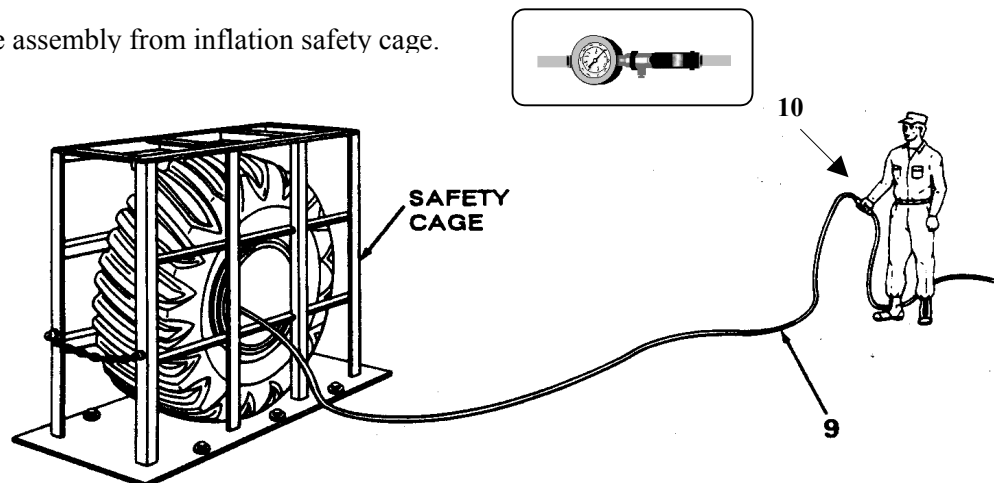
SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-36. DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE (Con't)

c. MOUNTING (Con't)

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-gage and a 10 ft. (3.1 mm) air hose. Failure to do so could cause serious injury.
8. Using a pneumatic tire hose (9) with in-line, inflator-gage (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.
 9. Visually check to see that all rim components are properly seated and allow tire to deflate.
 10. Install valve core (see paragraph 2-26).
 11. Inflate tire to normal operating pressure (see appropriate vehicle TM). Visually inspect all rim components to ensure that they are properly seated.
 12. Install valve cap onto valve stem finger-tight.
 13. Remove rim and tire assembly from inflation safety cage.



2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE.

This Task Covers:

a. Demounting

b. Mounting

Initial Setup:

Equipment Conditions:

- With the nondemountable rim, the tire will be demounted and mounted with the rim remaining on the vehicle. Jack up vehicle. Refer to appropriate vehicle maintenance TM for jacking instructions and related safety precautions.

Materials/Parts:

- Tire and rim lubricant (Item 90, Appendix C)

Personnel Required: Two

Tools/Test Equipment:

- Hydraulic tire removing tool (optional)
- Inflator-gage, pneumatic tire (includes 10' hose) (Item 30, Appendix B)
- Tire iron, rim type (Item 36, Appendix B)
- Tire iron, curved flat type (Item 34, Appendix B)
- Tire iron, lockring type (Item 35, Appendix B)

a. DEMOUNTING

1. Remove valve core and completely deflate tire (see paragraph 2-26). 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 affect on tire rubber. Use only approved tire and rim lubricant.

NOTE

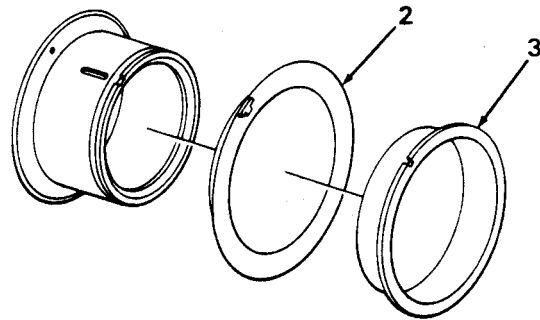
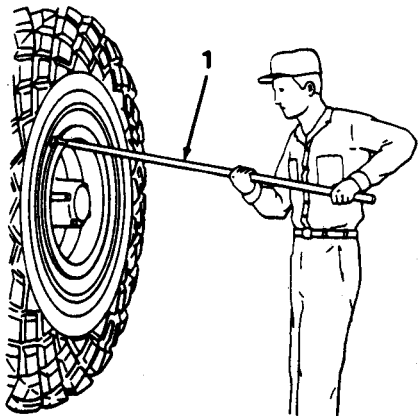
If a hydraulic tire remover is available to loosen tire beads, the manufacturer's instructions must be followed. When tire bead is completely free of rim flange, proceed with step 8.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

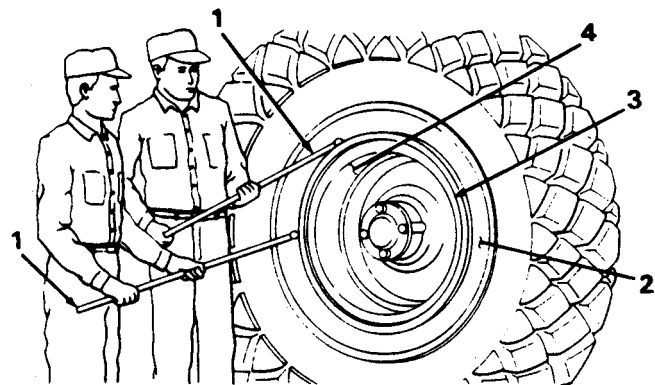
2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE (Con't).

a. DEMOUNTING (Con't)

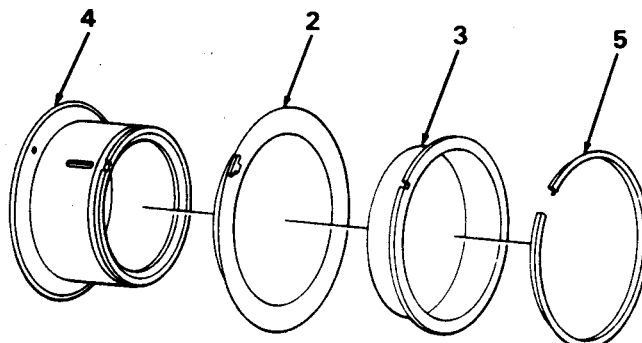
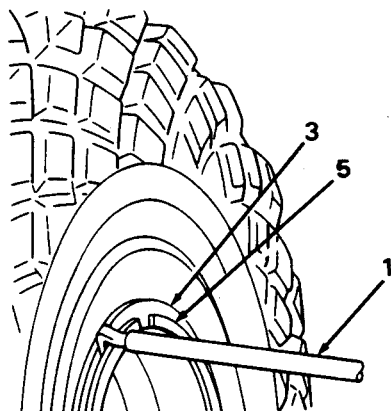
- Place end of tire iron (1) into one of the prying slots between bead seat band (3) and outer rim flange (2).



- Work outer rim flange (2) in and away from bead seat band (3).
- Have assistant place second tire iron (1) between bead seat band (3) and outer rim flange (2).
- With assistant, work both tire irons (1) progressively around rim (4) until outer rim flange (2) is completely free of bead seat band (3).
- Place tire iron (1) between bead seat band (3) and locking (5) and work bead seat band in and away from locking.



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



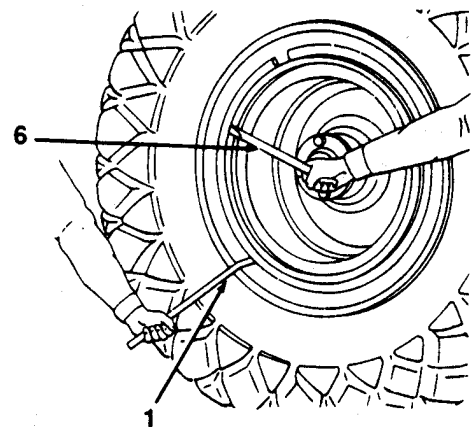
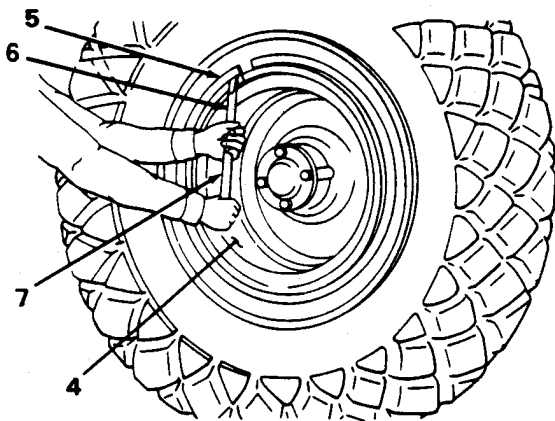
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

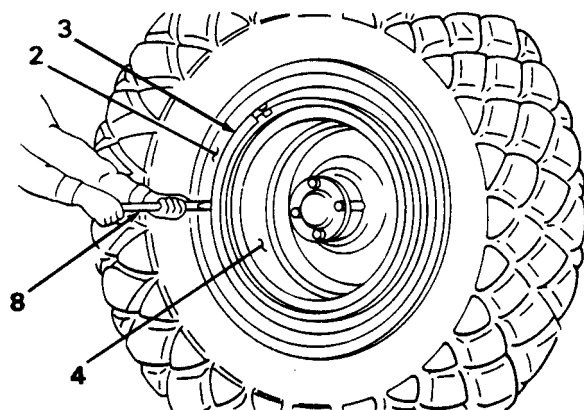
2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE (Con't).

a. DEMOUNTING (Con't)

8. Using a locking tire iron (6), work locking (5) partly out of gutter by inserting tire iron into prying notch and rotating tire iron down.
9. Insert a second tire iron (1) between base of rim (4) and locking (5).
10. Work both tire irons (1 and 6) progressively around rim (4) until locking (5) is completely removed.



11. Remove bead seat band (3) by working with curved flat tire iron (8).
12. Insert curved flat tire iron (8) between outer rim flange (2) and outer tire bead.
13. Work progressively around rim (4) with curved flat tire iron (8) until outer rim flange (2) is completely free of outer tire bead.
14. Slide outer rim flange (2) off rim (4).
15. Insert curved flat tire iron (8) between inner rim flange (10) and inner tire bead (9).



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

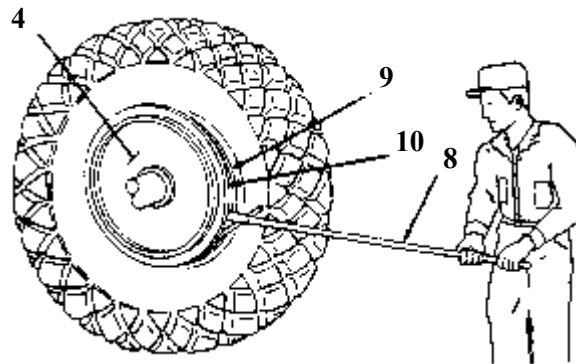
2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE (Con't).

a. DEMOUNTING (Con't)

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.

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

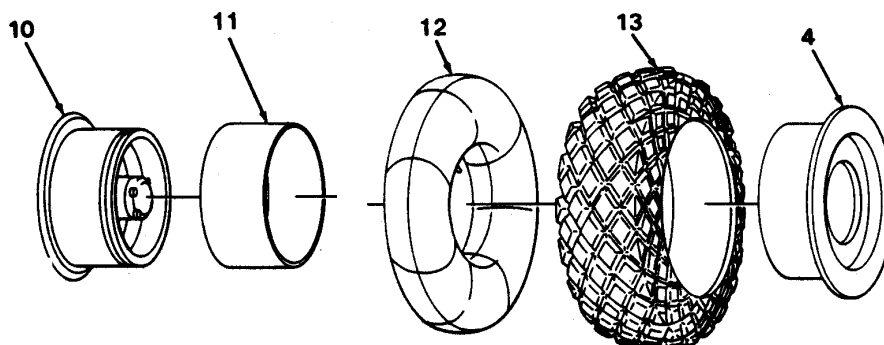


17. With inner tire bead completely free of inner rim flange (10), force bottom of tire (13) out as far as possible. Have assistant lower vehicle so that weight of tire rests on ground.
18. Force top of tire (13) out as far as possible. Have assistant raise vehicle so that weight of tire is not resting on ground.
19. Repeat steps 17 and 18 until tire is almost completely off rim.
20. With assistant, completely remove tire (13) from rim (4) and lean tire in an upright position against vehicle or other solid object.
21. 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.

22. 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.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

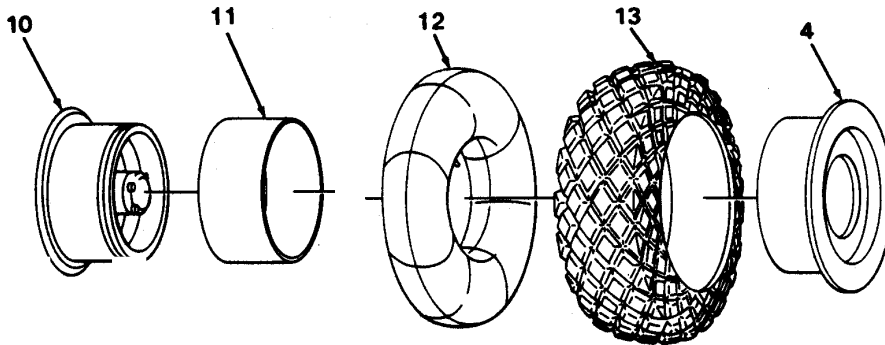
SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE (Con't).

b. RIM MAINTENANCE

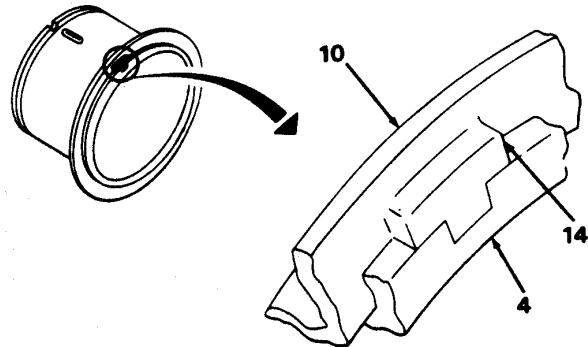
1. All rims.

- (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.



c. MOUNTING

1. Install tire flap (11) and tube (12) into tire (13).
2. Lubricate both tire beads and tire flap (11) with tire and rim lubricant.
3. Place inner rim flange (10) on rim (4) and align drive lug (14) with slot in rim base.
4. 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 tire instead of jacking vehicle up and down as described below.

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

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

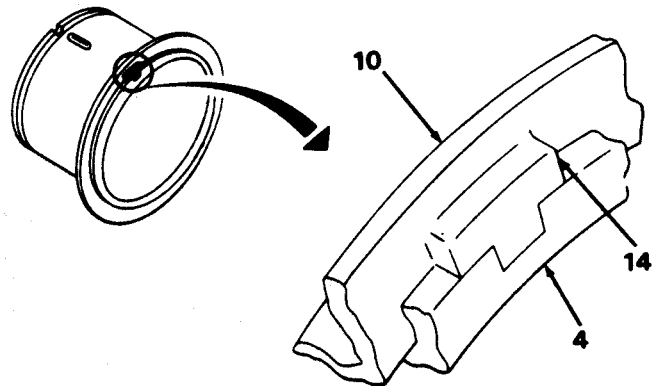
SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE (Con't).

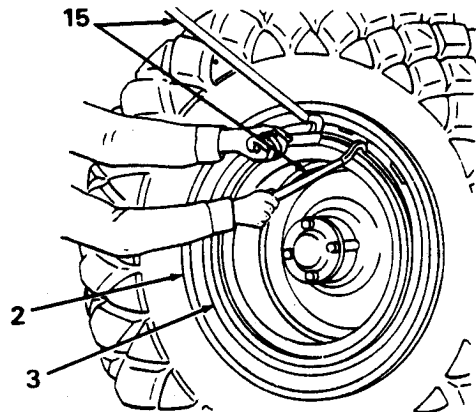
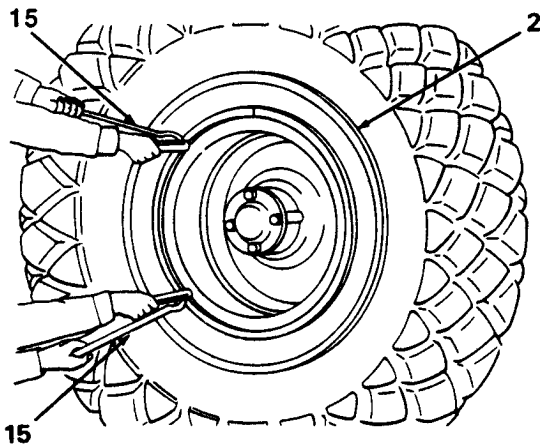
c. MOUNTING (Con't)

6. Have assistant raise vehicle so weight of tire does not rest on ground. Push bottom of tire in as far as possible.
7. Have assistant lower vehicle so weight of tire will not rest on ground. Push top of tire in as far as possible.
8. Repeat steps 6 and 7 until tire is completely on rim (4) and up against inner rim flange (10) and up off ground.

9. 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.



10. Hook two tire irons (15) onto rim gutter approximately 4 inches (10.2 cm) from either side of valve stem.
11. Keeping together as one unit, slide bead seat band (3) and outer rim flange (2) over both tire irons (15) and onto rim.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

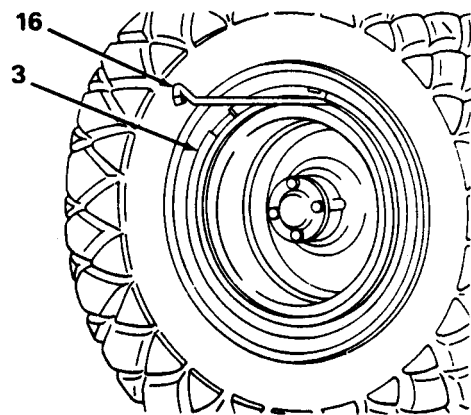
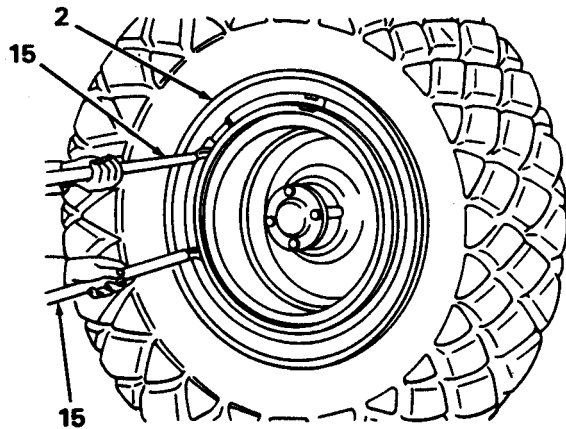
SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE (Con't).

c. MOUNTING (Con't)

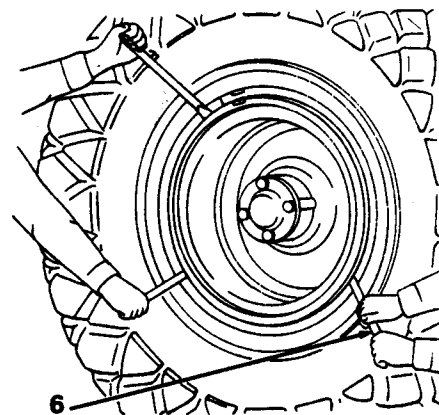
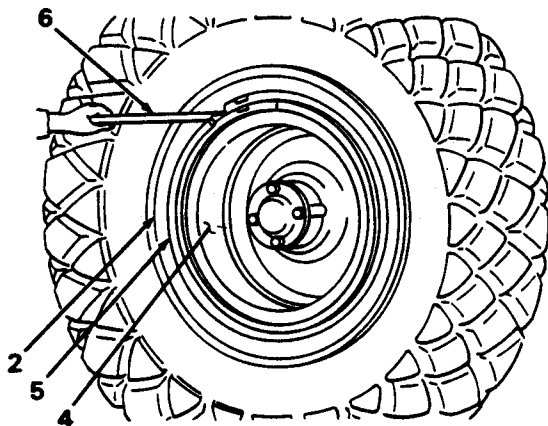
12. Working with assistant, work both tire irons (1 5) alternately .working bead seat band and outer rim flange onto rim.

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



14. Place end of locking (5) without prying notch into gutter and adjacent to drive lug of outer rim flange (2).

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

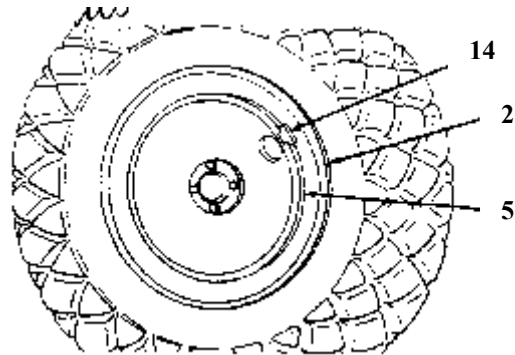


CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION IV. DIRECT SUPPORT MAINTENANCE (Con't)

2-37. NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE (Con't).

c. MOUNTING (Con't)

16. Remove all tools from rim and guide bead seat band and outer rim flange (2) out onto lockring (5). Ensure that drive lug (14) is positioned between ends of lockring.
17. Inspect all rim components to ensure that they are properly seated.
18. Install valve core (see paragraph 2-26).

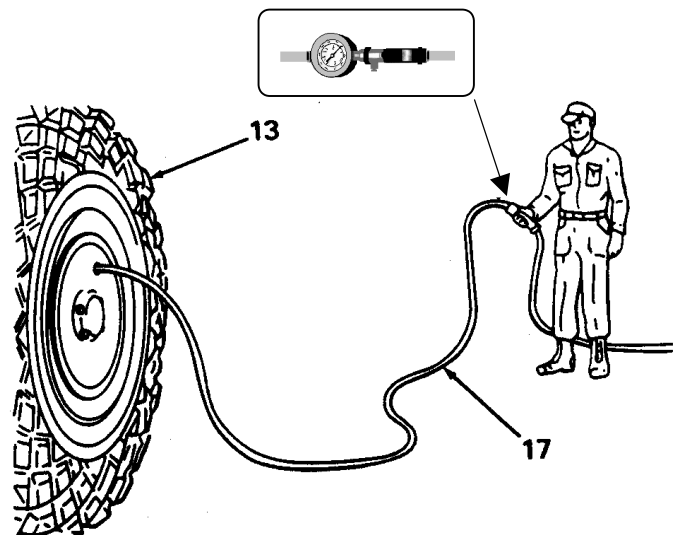


WARNING

- **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 nondemountable rims, always use a pneumatic tire inflator-gage and a 10 ft (3.1 m) hose. Failure to do so could result in serious injury.**

19. Remove valve cap. Using a pneumatic tire inflator-gage with 10 ft airhose (17), 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.

20. Visually check that all rim components are properly seated. If not deflate tire (13) and correct the problem.
21. Inflate tire to normal operating pressure (see appropriate vehicle TM). Visually inspect all rim components again to ensure that they are properly seated.
22. Install valve cap on valve stem.
23. Lower jack and remove from under vehicle (see appropriate vehicle TM).



TM 9-2610-200-14

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION VII. GENERAL SUPPORT MAINTENANCE

Paragraph Number	Paragraph Title	Page Number
2-38.	GENERAL.....	2-79
2-39.	TIRE REPAIR AND REPAIR LIMITS.	2-79
2-40.	TIRE REPAIR PROCEDURES, SELF-VULCANIZING SPOT REPAIR.....	2-85
2-41.	TIRE REPAIR PROCEDURES -SPOT REPAIR USING SPOTTER PRESS FOR HEAT AND PRESSURE.....	2-87
2-42.	TIRE REPAIR PROCEDURES, SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER.....	2-88
2-43.	PRELIMINARY INSPECTION & CONDITION CLASSIFICATION OF TIRES. ..	2-92
2-44.	TIRE INSPECTION CRITERIA.	2-96
2-45.	INSPECTION OF REPAIRED OR RETREADED TIRES.....	2-102

2-38. GENERAL.

a. This section provides instructions for General Support maintenance units responsible for repairing tires. The type of repair depends on the extent, location, and type of damage.

b. 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.

c. Personnel are listed only if a task requires more than one technician. A repair on a very large tire, however, may require more than one technician to move and position the tire.

d. 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 from 1/4 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.

e. 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.

2-39. TIRE REPAIR AND REPAIR LIMITS

a. GENERAL

This section provides information on the different types of repairs repair limitations for each type. The tire inspector and repairperson need to be familiar with the types of repairs and limits set forth in this section.

2-39. TIRE REPAIR AND REPAIR LIMITS (Con't).

b. TYPES OF TIRE REPAIRS

There are three different types of tire repairs shown in this manual. Which type used to repair and injury 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:

(1) **Puncture Repair** (also known as nail hole repair). These types of repairs are for minor punctures in the tread crown area only. It consist of cleaning and buffing the damaged area, filling the injured cavity with a repair insert, stem or material, and applying cement and a patch specifically designed for punctures, to the inner liner. Repair units may also come as a combination patch-plug (also known as tee-unit).

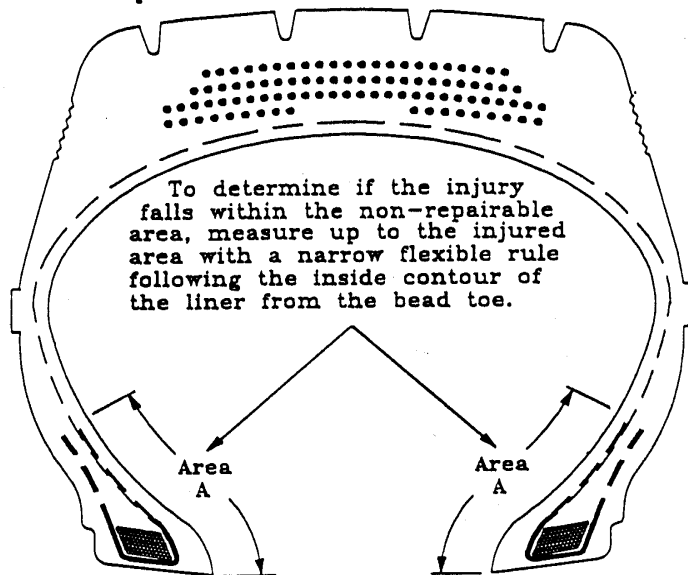
(2) **Spot Repairs**. These types of repairs are for filling outside injuries that only extend into the surface rubber on the tread, shoulder and sidewalls of radial tires or no more than 25% of the actual plies of a bias tire. Because spot repairs are surface type repairs, no reinforcement patch is needed.

(3) **Section Repairs**. These type of repairs are for sidewall, shoulder and tread crown injuries that usually extend through the casing or beyond 25% of the actual body plies of bias tires. These type of repairs can be accomplished using a heated spotter to cure hole fill material and a reinforced patch, 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 (a.k.a. tee-unit).

c. NON-REPAIRABLE AREAS

Use the illustrations and tables below and on the next page 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.

Non-Repairable Area



NON-REPAIRABLE AREA

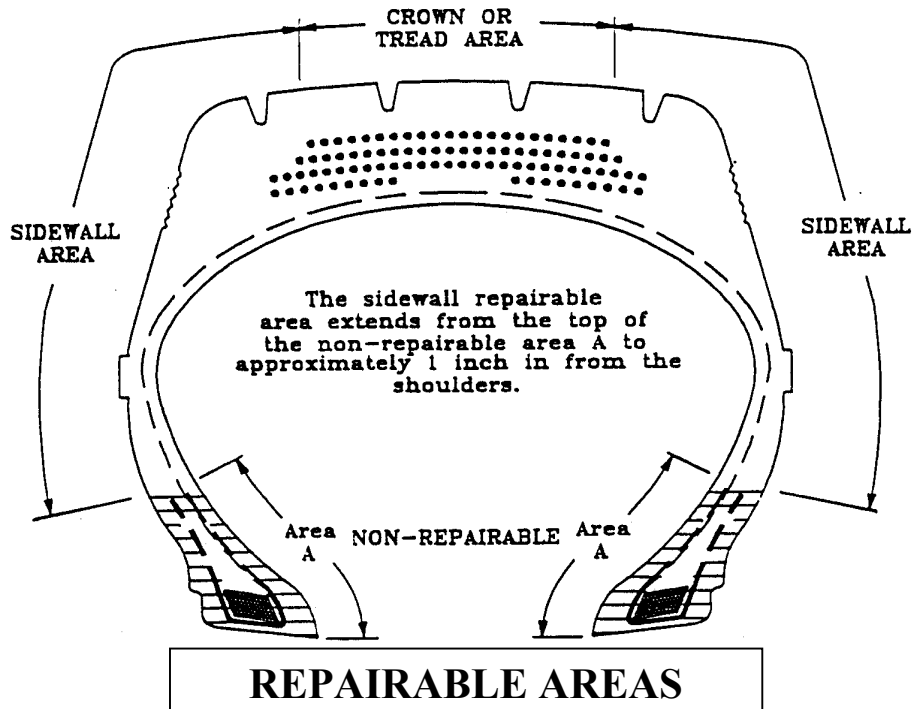
Table 2-6. NON-REPAIRABLE AREA A FOR BODY PLY DAMAGE

<u>TIRE CROSS SECTION</u>	<u>DIMENSION OF NON-REPAIRABLE AREA</u>
All Passenger Car Tires	1 1/2" (38.1 mm)
Truck -Tubetype 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)

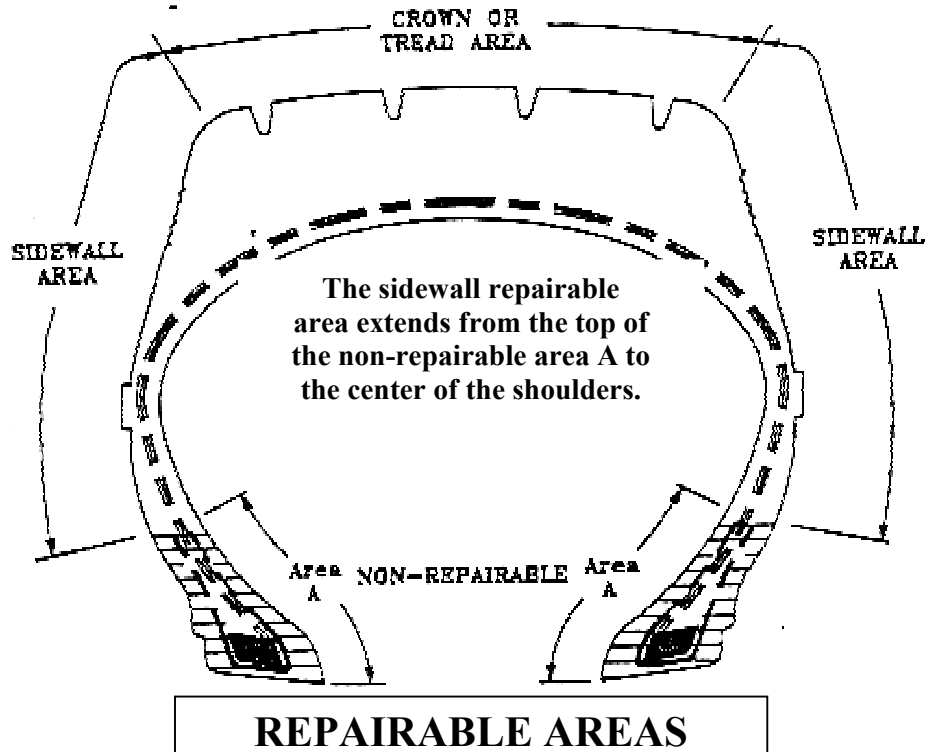
CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-39. TIRE REPAIR AND REPAIR LIMITS (Con't).

Radial Repair Areas



Bias Repair Areas

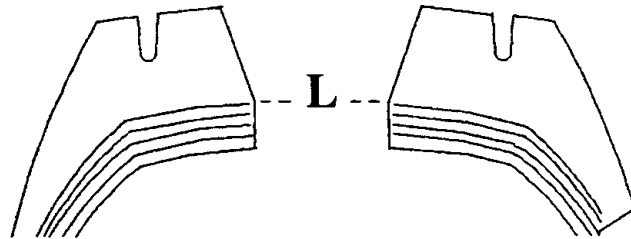


CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-39. TIRE REPAIR AND REPAIR LIMITS (Con't).

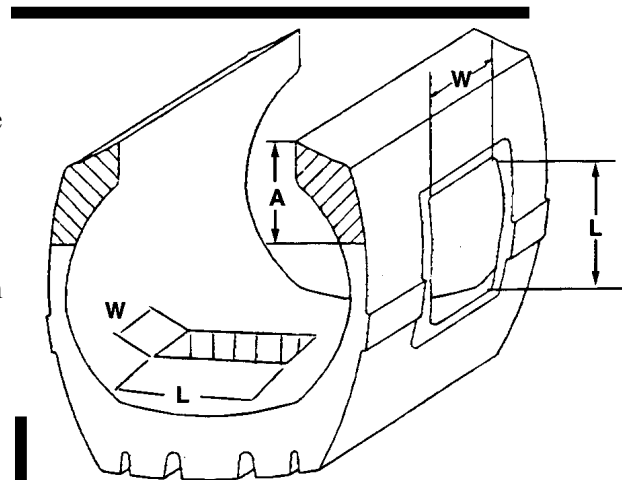
d. Repair Area Measurements.

(1) 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 longest measurement of cord damage, in anyone direction is used (see bias illustration to the right). 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 widest points in both length and width are used. The size of a crown injury is determined by the maximum diameter of the damage (see radial illustration below and to the right).



L = Largest measurement of cord damage in any one direction.

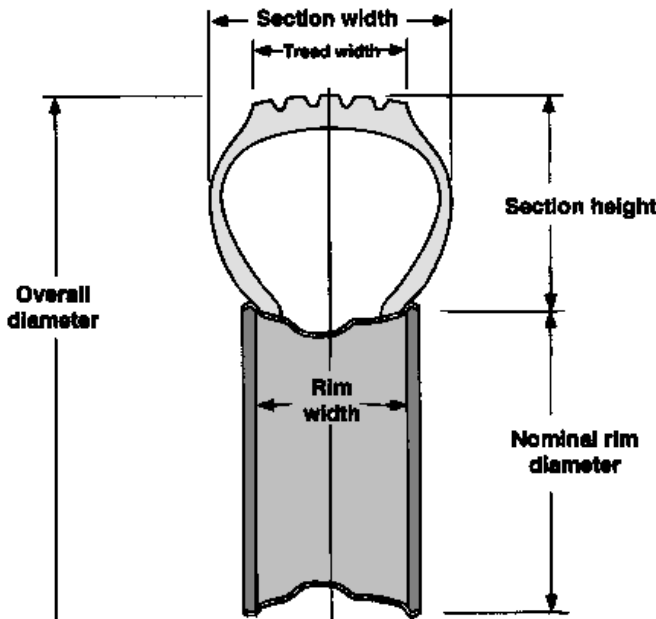
Bias Repair Measurement



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.

Radial Repair Measurement

(2) To determine if an injury is repairable check the size and section width of the tire against the tables on the following pages. Section width is the width of the tire from sidewall to sidewall, with the tire mounted and inflated but not loaded (see illustration below). 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.



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-39. TIRE REPAIR AND REPAIR LIMITS (Con't).

Table 2-7. 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)	
	1" (25 mm)	2" (51 mm)	1" (25 mm)	
Any other LT size				
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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-39. TIRE REPAIR AND REPAIR LIMITS (Con't).

Table 2-8. 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"(25mm)	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:			
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	3 1/2" (89 mm)	2 1/2" (64 mm)	2*

*NOTE: Maximum number of repairs are for tires that will applied to 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.

*NOTE: The above standards apply to General Support tire repair facilities and are not intended to be applied to commercial retreaders who may have the capability to conduct repairs beyond these limits.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-40. TIRE REPAIR PROCEDURES, SELF-VULCANIZING SPOT REPAIR.

This Task Covers: Repair

Initial Setup:

Materials/Parts:

- Tire repair filler (Item 84, Appendix C)
- Rubber buffer fluid (Item 100, Appendix C)
- Vulcanizing fluid (Item 85, Appendix C)
- Cement primer (Item 97, Appendix C)
- Rag (Item 98, Appendix C)

Tools/Test Equipment:

- Vacuum cleaner (Item 14, Appendix B) or air nozzle
- Air cooled finishing rasp (Item 45, Appendix B)
- Cementing and vulcanizing stitcher (Item 50, Appendix B)
- Wheel Assembly Tool (Item 55, Appendix B)

a. 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 cause health hazards.

1. Using an air cooled finishing rasp, remove all loose rubber and frayed cords from damaged area, being careful to remove a minimum of material.
2. Buff an area 2 inches (5.1 cm) 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).

3. Remove buffing dust with vacuum cleaner or air nozzle. Clean buffed area only with a rag wet with rubber buffer fluid.

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.

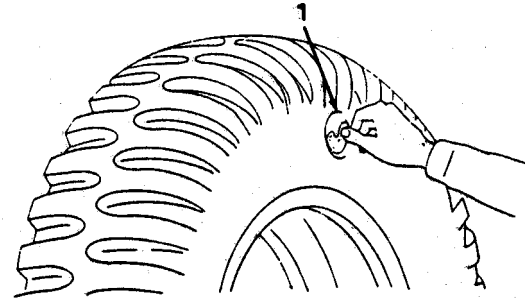
4. Brush one coat of primer cement onto buffed area. Primer cement may also be applied to cord body. Allow primer cement to dry for a minimum of 1 hour to a maximum of 24 hours. If allowed to dry more than 24 hours, clean area with rubber buffer fluid and repeat this step.
5. Mix approximately equal amounts of A and B tire repair filler together in sufficient quantities to fill damaged area.
6. Brush one coat of vulcanizing fluid over dried primer cement.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-40. TIRE REPAIR PROCEDURES, SELF-VULCANIZING SPOT REPAIR (Con't).

7. Apply mixed A and B tire repair filler by spreading over prepared area (1) in thin layers, stitching each layer thoroughly with stitcher, and building damaged area up to just above surface of tire.
8. 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 (see paragraph 2-41)



CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)
SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-41. TIRE REPAIR PROCEDURES -SPOT REPAIR USING SPOTTER PRESS FOR HEAT AND PRESSURE.

This Task Covers: Repair

Equipment Conditions:

- Tire prepared as described in paragraph 2-40, prior to mounting tire on spot press.

- Spot press vulcanizer (see note below)

Materials/Parts:

- Metal foil (Item 93, Appendix C)

Tools/Test Equipment:

- Air cooled finishing rasp, 120-grit (Item 45, Appendix B)

NOTE

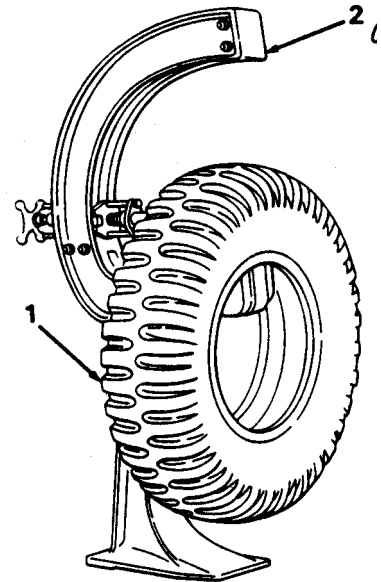
Spot press vulcanizers (2) are currently not available through the military supply system. The instructions below are provided for those General Support units who are authorized and have locally purchased spot press vulcanizers from commercial sources.

1. 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.

2. Set up spot press (2) with tread, shoulder, sidewall contour plates, or contour bags as applicable to the repair.
3. Mount tire (1) on spotter press (2).



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 (0.8 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 (0.8 mm) depth of filler used.

4. Vulcanize repair at 280°F-300°F (138°C-149°C) for the period of time specified in note.
5. Remove tire (1) from spotter press (2). When tire has cooled to room temperature, repair may be buffed smooth with an air cooled finishing rasp.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-42. TIRE REPAIR PROCEDURES, SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER.

This Task Covers: Repair

Initial Setup:

Tools/Test Equipment:

- Drill cutter
- Awl scratch (Item 4, Appendix B)
- Vacuum cleaner (Item 14, Appendix B) or air nozzle
- Air Cooled finishing rasp, 36-grit (Item 45, Appendix B)
- Cementing and vulcanizing stitcher (Item 50, Appendix B)

Materials/Parts:

- Tee unit (Item number as needed for repair, see Table 2-11, Appendix C)
- Marking crayon (Item 82, Appendix C)
- Rubber buffer fluid (Item 100, Appendix C)
- Vulcanizing fluid (Item 85, Appendix C)
- Rag (Item 98, Appendix C)

a. REPAIR

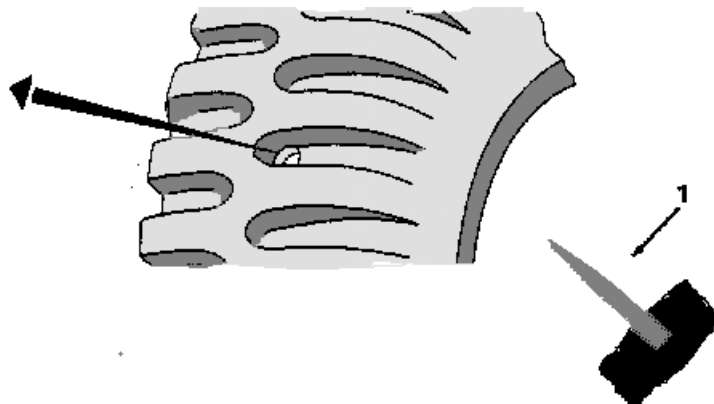
WARNING

Use cleaning fluids and vulcanizing fluids in a well-ventilated area. Read all warnings and cautions on containers. Prolonged inhalation of fumes could cause health hazards.

NOTE

Sectional repairs can be made on any size tire. This type of repair is commonly called tee unit repair, and is available in a range of sizes that will repair injuries 1/4 Inch (6.4 mm) to 2 Inches (5.1 cm) in diameter. The tee unit method offers the greatest advantage in sectional repairs, with respect to effort, tools, equipment, mobility, tire preservation, and repair time. For specifying tee units and drill cutters, see Appendix C.

1. Probe damage with awl, removing any glass, metal, or other debris, and determine angle of penetration.
2. Drill out all damaged material using smallest hollow drill cutter available, and select tee unit (1) (see Tables 2-9 through 2-11 at the end of this section).

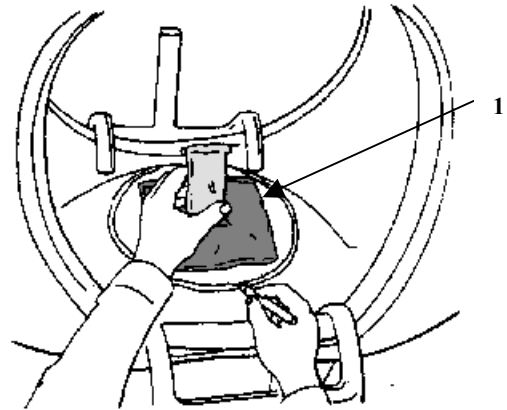
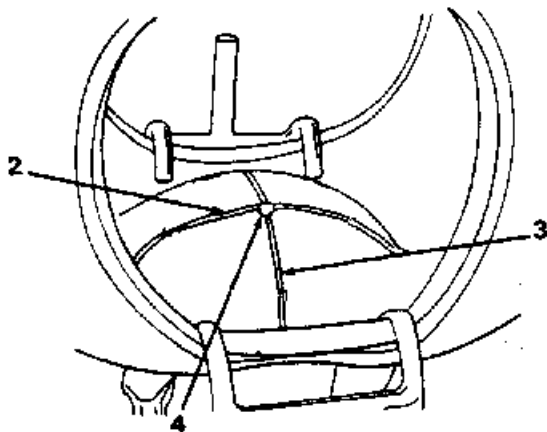


CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-42. TIRE REPAIR PROCEDURES, SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER (Con't).

3. Using a marking crayon, draw two straight lines (2 and 3) through center of drilled hole (4). The lines should cross the center of hole at right angles, one parallel with and one perpendicular to beads of tire.
4. Using tee unit as a template, mark inside of tire 2 inches (5.1 cm) larger than the patch of the tee unit.



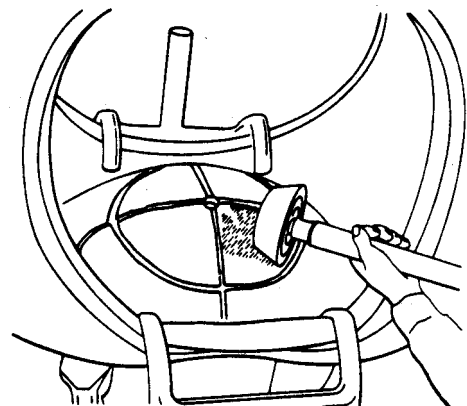
WARNING

Use cleaning fluids and vulcanizing fluids in a well-ventilated area. Read all warnings and cautions on containers. Prolonged inhalation of fumes could cause health hazards.

5. Using an air cooled finishing rasp and, being careful not to buff through inner tire liner, buff patch area to a smooth velvet surface.

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).



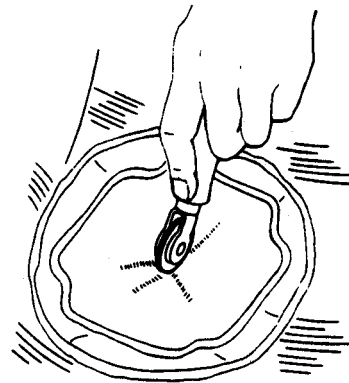
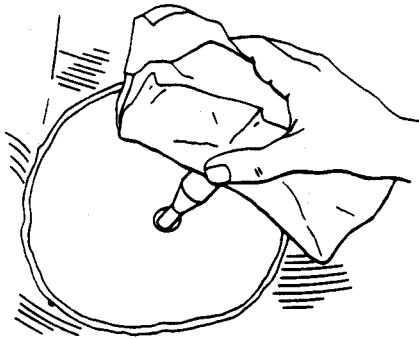
6. Using a vacuum cleaner or air nozzle, remove buffing dust. Clean only buffed area with a rag wet with rubber buffer fluid.
7. Brush one coat of vulcanizing fluid onto buffer area and inside plug hole.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-42. TIRE REPAIR PROCEDURES, SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER (Con't).

8. 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.
9. Pull stem of tee unit with enough force to seat patch firmly against inner liner of tire.
10. Thoroughly stitch patch with stitcher, working progressively from center of patch to edge of patch.



NOTE

After tee unit has been installed and excess plug length properly trimmed, tire may be returned to immediate service.

11. Trim excess plug length to 1/8 inch (3.2 mm) above surface of tire.

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-42. TIRE REPAIR PROCEDURES, SECTION REPAIR WITH PREVULCANIZED PLUG AND PATCH UNIT TWO INCHES AND UNDER (Con't).

Table 2-9. 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

Table 2-10. 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/10	1 3/8	3.49	10	25.40
8BC	TBC/10	2	5.08	10	25.40
8CC	TBC/15	2	5.08	15	38.10

Table 2-11. 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/20	3	7.62	20	50.80
10CT	T1OE/24	3	7.62	24	60.96

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-43. PRELIMINARY INSPECTION AND CONDITION CLASSIFICATION OF TIRES.

a. 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:

- (1) 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.
- (2) Identifying unserviceable and economically repairable tires (CRC F).
- (3) 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 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:

- (1) Used tires that are serviceable are to be retained and reused within the installation whenever possible (see note on next page and Table 2-12). If the used tire no longer has an application it should be turned into the Defense Reutilization and Marketing Office (DRMO).
- (2) Used tires that are unserviceable but repairable are to be repaired, if it is within the repair criterion, and turned into DRMO if unrepairable.
- (3) 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 (nonretreadable) they should be turned into the DRMO as unserviceable, uneconomically repairable.

Depots do not have the responsibility for any of the above actions.

b. Condition Readiness Codes.

The following condition codes are applicable to pneumatic tires and are defined as follows:

- (1) Code A: New, unused tire or unused retread free of defects.
- (2) Code B:
 - Serviceable used and repaired (not retreaded) tire free of defects. Refer to the note on the next page and Table 2-12.
 - Any new, unused tire where the manufacture date cannot be determined.
- (3) Code F: Unserviceable, economically repairable tire that requires repair or retreading to become serviceable.
- (4) Code H: Unserviceable, uneconomically repairable tire. Any tire not used within 60 months from date of manufacture or since the last retread.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)**SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)****2-43. PRELIMINARY INSPECTION AND CONDITION CLASSIFICATION OF TIRES (Con't).****b. Condition Readiness Codes (Con't).****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.

NOTE

- Tires will not be retreaded if they have more tread than the minimum specified in Table 2-12 on the next page, 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).

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

Table 2-12. 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
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
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
Nondirection Military Desert Sand (Flotation)	11.00-18, 12.50-20, 11.75-20	6/32
Special Service. Earthmover	13.00-20, 13.00-24, 13.00-25	12/32
Directional, M706	14.00-20, 26 ply sidewall 12 ply rated	
Grader, Tractor Industrial. Etc.	14.00-20, 14.00-21 14.00-24, 14.00-25 16.00-20, 16.00-21 16.00-24, 16.00-25 18.00-24, 18.00-25 21.00-24, 21.00-25	13/32 15/32 17/32 19/32
Industrial, Earthmover Type Tread DRC	20.50-25, 24.00-25, 24.00-29 32.50-25 26.50-25 27.00-33 29.50-25, 29.50-29 33.53-33 30.00-33, 30.00-41 36.00-41 37.50-33, 37.50-39	18/32 21/32 22/32 23/32 24/32 25/32 26/32 28/32
Low Platform Trailer . Highway Design	7.50-15, 8.25-15 9.00-15, 10.00-15	8/32
Nondirectional Cross Country, Mud and Snow Design	6.00-16, 6.50-16, 7.00-16, 7.50-16, 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	8/32 10/32 12/32

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)**SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)****2-43. PRELIMINARY INSPECTION AND CONDITION CLASSIFICATION OF TIRES (Con't).****c. Preliminary Inspection.**

The following are two types of visual preliminary inspections used to classify a tire:

(1) 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.

(2) 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, Appendix E.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-44. TIRE INSPECTION CRITERIA.

a. GENERAL.

This section applies to those categories of maintenance authorized to repair or retread pneumatic tires or to determine the repairability/retreadability of tires.

b. RETREAD/REPAIR METHODS.

Refer to subparagraph d, 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.

c. TIPS FOR THE INSPECTOR.

(1) Remove foreign objects using long-nosed pliers (Item 43, Appendix B). The presence of foreign objects is dangerous during buffing.

(2) Keep in mind that fabric fatigue is evident if discoloration or streaks are noted in the inside shoulder area.

(3) 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.

(4) 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.

(5) Recognize that there is no substitute for a thorough primary inspection. The inspector must:

(a) Have adequate tools. Recommended tools and equipment:

- Awl, Saddler's Pad (Item 3, Appendix B)
- Tire Crayon, Marking (Item 82, Appendix C)
- Depth Gage Rule (Item 22, Appendix B)
- Light, Extension (Item 40, Appendix B)
- Pliers (Item 44, Appendix B)
- Tire Spreader (Item 48, Appendix B)
- Tire Spreader (Item 49, Appendix B)

(b) Have adequate lighting for the inspection spreader.

(c) Use proper markings in the classification of repairs/retreading.

(d) Know the characteristics of the tire being inspected to properly determine the type of repair/retreading required.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-44. TIRE INSPECTION CRITERIA (Con't).

d. INSPECTION MARKING OF TIRES.

(1) During inspection of tires, clearly mark with yellow marking crayon (Item 82, Appendix C) the locations of deficiencies as stipulated below.

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-Precured Tread Method		
Top	Type III	T2

(2) 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).

(3) 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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-44. TIRE INSPECTION CRITERIA (Con't).

e. TIRE INSPECTION CHECKLIST.

(1) The Tire Inspection Checklist and criteria, on the next page, provides the minimum requirements for the proper control in the classification of tires. It's recommended that this page be removed and copied for regular and frequent use.

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 _____

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-44. TIRE INSPECTION CRITERIA (Con't).

f. 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.

- (1) Ply separation.
- (2) Tread, shoulder, or sidewall separation (between rubber and cord).
- (3) Weather checking that cannot be satisfactorily removed by buffing or with openings extending 2/32 inch or deeper or to the cord body or when 2 or more cracks join together to form a straight or arced line.
- (4) Radial split(s) that cannot be completely removed without damage to cord.
- (5) Any groove or shoulder cracking that cannot be satisfactorily removed by buffing.
- (6) Nonrepairable sidewall splits or cuts.
- (7) Loose cords on the inner ply or evidence of having been run flat.
- (8) Exposed, kinked, or damaged bead wires.
- (9) Generally weakened or deteriorated condition due to age, moisture, or exposure to other severely destructive influences.
- (10) Oil-soaked or permanently deformed due to faulty maintenance or storage conditions.
- (11) Casing that, when processed will not meet dimensional requirements.
- (12) Any injury requiring a reinforcement or sectional repair or evidence of having had a previous repair of this type.
- (13) 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.
- (14) 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.
- (15) 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.
- (16) 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.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)**SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)****2-44. TIRE INSPECTION CRITERIA (Con't).****g. Light, Medium, And Heavy Truck/Trailer (Including Military) And Industrial Tire Inspection Criteria.**

All tires, as specified in this paragraph, to be considered for repair and retreading shall be free from all of the following defects:

- (1) 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 paragraph 2-39 for repair limits).
- (2) Beads with fabric cut or damaged more than 25 percent of the body plies in depth on tube tires.
- (3) Chafer fabric injuries in tubeless tires.
- (4) Broken, kinked, or exposed bead wires.
- (5) Fabric flex break (this defect is indicative of progressive fatigue and failure of body structure and will not be repaired regardless of size).
- (6) Loose cords on the inner ply or evidence of having been run underinflated or overloaded.
- (7) Tread separation, other than that, which can be removed by buffing.
- (8) 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.
- (9) Tubeless tires with nonrepairable liner.
- (10) 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 paragraph 2-39.
- (11) 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.
- (12) Any tire so worn that buffing to the proper contour will damage outer body plies.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-45. INSPECTION OF REPAIRED OR RETREADED TIRES.

a. GENERAL.

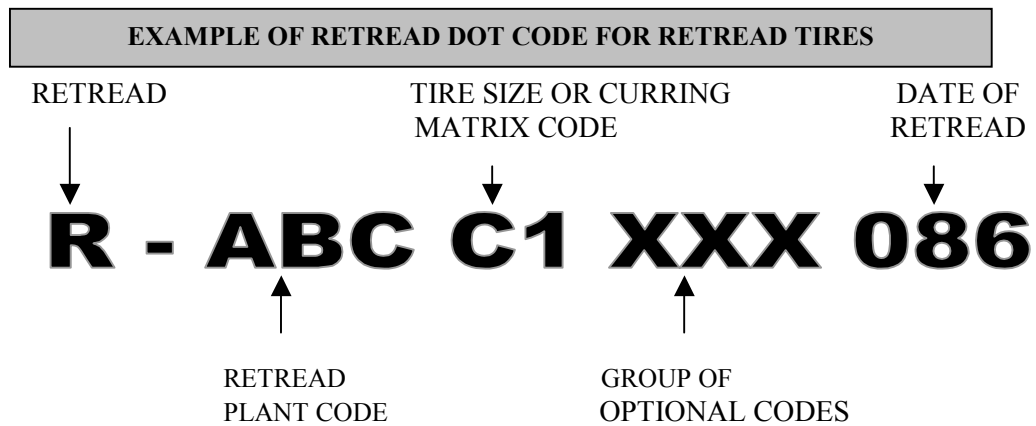
All incoming shipments of retreaded and repaired tires must be examined to verify satisfactory workmanship and to ensure that only dependable, safe retreaded tires are accepted and used. The following instructions provide standard criteria for acceptance inspection of retreaded or repaired tires. Any of the defects listed below are cause for rejection of tires.

b. MARKINGS.

(1) 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. 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 and not more than a 2 inch space between symbols.



(2) 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

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)**2-45. INSPECTION OF REPAIRED OR RETREADED TIRES (Con't).****c. OTHER DEFECTS.**

- (1) **Sidewall Separation:** Separation of tread from sidewall along the circumference more than 1/4 inch (6.3 mm) into joint.
- (2) **Sidewall Cracks:** Exposed cords or sidewall cracks extending to the cord body.
- (3) **Tread Craters:** Any visible evidence of craters or voids.
- (4) **Bulges:** Bulges that are indications of ply or tread separations, improper repairs, or improper molding techniques.
- (5) **Buckles:** Buckles or creases inside tire surface.
- (6) **Open Splice:** Open splices in retread area.
- (7) **Open Liner Splice:** Open liner splice in tubeless tires that expose ply fabric.
- (8) **Nail Holes:** Nail holes and cuts not repaired or improperly repaired as indicated by dimples, buckles, or separation of patch.
- (9) **Damaged Plies:** Any visible evidence of cuts and loose or damaged plies or cords.
- (10) **Foreign Material:** Foreign material cured into inside or outside surface of tire.
- (11) **Damaged Beads:** Exposed or damaged bead wires.
- (12) **Damaged Chafer Strip:** Damaged or missing bead chafer strip on tubeless tires.
- (13) **Bead Kinks:** Bead kinks horizontally or vertically more than:
 - (a) 1/16 inch (1.6 mm) -passenger car tires
 - (b) 1/8 inch (3.2 mm) -light truck tires
 - (c) 1/4 inch (6.2 mm) -truck, bus, or trailer tires
- (14) **Off Register Treads:** Lug tread pattern off register more than:
 - (a) 1/16 inch (1.6 mm) -tire rim size 8.55 or less
 - (b) 1/8 inch (3.2 mm) -tire rim size over 8.55
- (15) **Tread Design Rounding:** Any evidence of imperfectly formed tread elements or rounded lug edges.
- (16) **Mold Misalignment:** Tire halves in misalignment by more than:
 - (a) 1/16 inch (1.6 mm) -tire rim size 8.55 or less
 - (b) 1/8 inch (3.2 mm) -tire rim size over 8.55
- (17) **Obvious Physical Defects:** Defects such as cuts, flat surfaces, or other distortions of the tire that could affect tire performance or safety.

CHAPTER 2. CARE, MAINTENANCE, AND INSPECTION (Con't)

SECTION V. GENERAL SUPPORT MAINTENANCE (Con't)

2-45. INSPECTION OF REPAIRED OR RETREADED TIRES (Con't).

DISPOSITION OF DEFECTIVE TIRES.

(1) 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.

(2) 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.

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.

SECTION VI. VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES

Paragraph Number	Paragraph Title	Page Number
2-46.	GENERAL.	2-105
2-47.	BEAD AREA CONDITIONS.	2-106
2-48.	SIDEWALL AREA CONDITIONS.	2-108
2-49.	TREAD CROWN AREA CONDITIONS.	2-111
2-50.	INSIDE TIRE/INNER LINER CONDITIONS.	2-114
2-51.	RETREAD CONDITIONS.	2-116

2-46. GENERAL.

PURPOSE.

(1) This section 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 nonrepairable defects.

NOTE

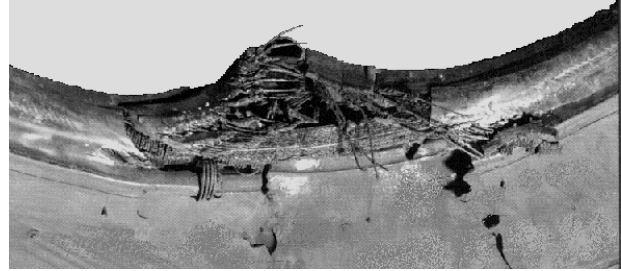
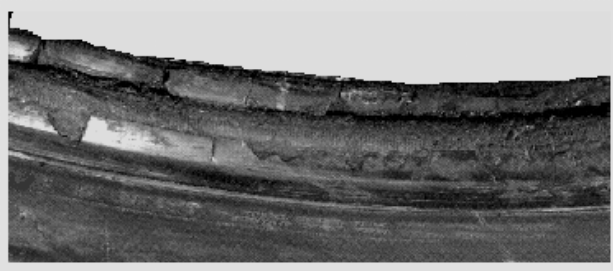
- **Some of the illustrations in this chapter represent tires sent in by users.**
- **If the tire being classified is a high-dollar off-the-road tire, such as one used on earthmover equipment, a bead-to-bead repair may be authorized by TACOM. This repair entails replacing the sidewall rubber and is performed as an exception only.**

(2) 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 throwaway a reusable casing and expensive to process nonreusable 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 paragraph 1-7 for more information about TACOM's tire training program.

**VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES
(Con't)**

2-47. BEAD AREA CONDITIONS.

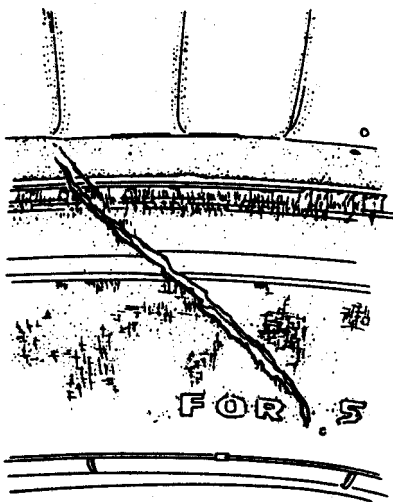
a. Burnt Beads. The beads below are examples of burnt beads. This is usually caused from a heat build up from frequent hard braking or improperly adjusted brakes. The first indications of this type of the problem are rough, brittle and discolored rubber in the bead area as the first example shows. Advanced 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.



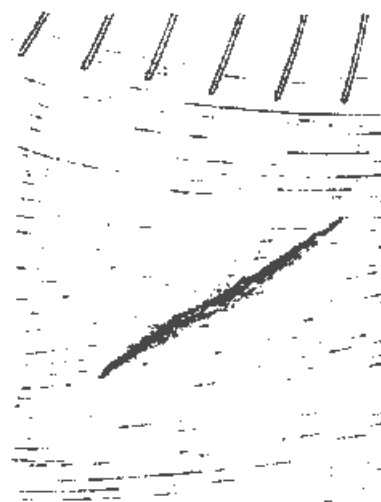
b. Torn Beads. The example below shows a destroyed bead and was caused by removing the tire from the rim without using a proper demounting tool and tire lubricant. If the bead wire is exposed, rusted, kinked or broken it cannot be repaired and should be classified CRC H.



c. Cuts or Punctures to close to bead. The injuries shown on the left or right below, can not be repaired as they run into the non-repairable bead area. Correct classification is CRC H.



TEAR IN BEAD AREA (OUTSIDE)



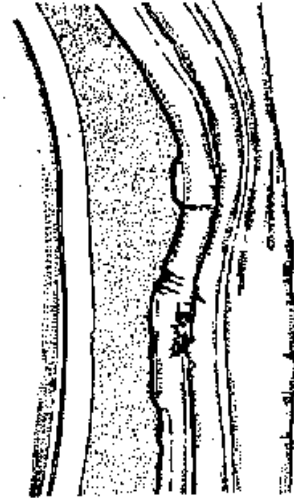
TEAR IN BEAD AREA

VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

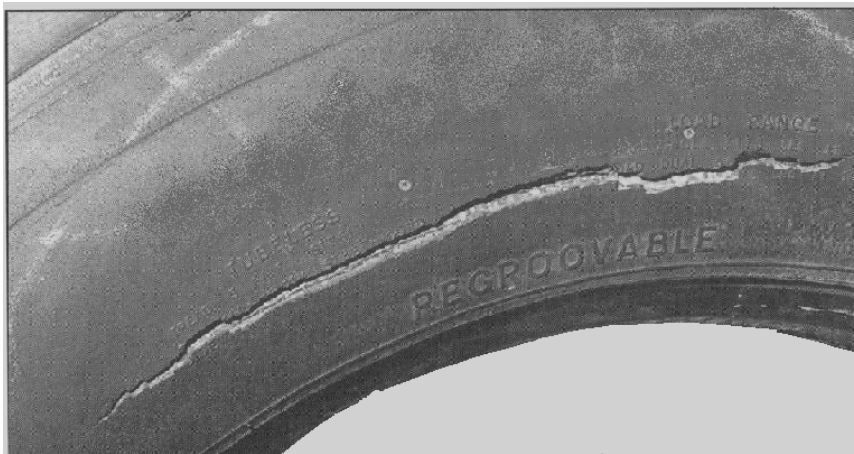
2-47. BEAD AREA CONDITIONS (Con't).

d. 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 at the right. The bead rubber does not have to be torn. Any bends or deformations in the bead is non-repairable. Correct classification is CRC H.

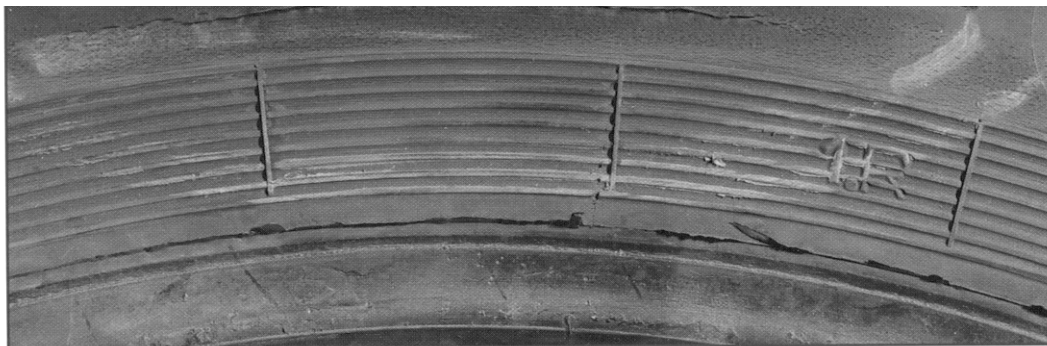
e. Bead Chafer Separation. As shown below this type of damage is identified by circumferential cracks just above the bead area with cord material exposed. This type of damage is usually caused by improper rim size, overload conditions, underinflation, impacts and sometimes a manufacturing defect. This damage is non-repairable and the correct classification for this tire would be CRC H.



KINKED BEAD DAMAGED



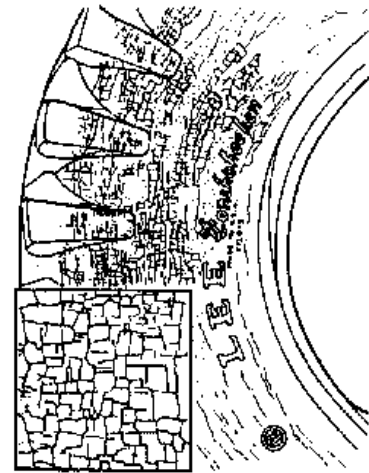
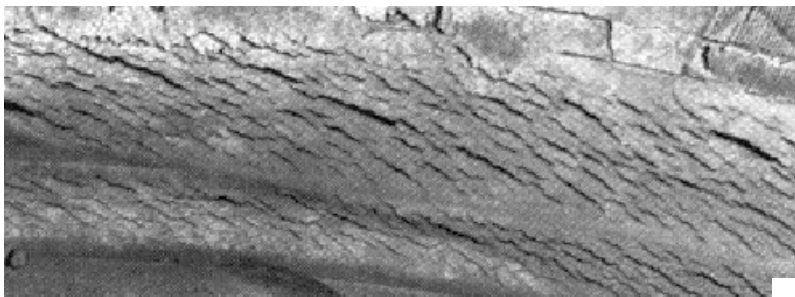
f. Bead Area Flow Cracks. Not to be confused with bead chafer separation (above), flow cracks are distinguished by a circumferential crack that is a cleaner crack with no bead wire exposed as illustrated below. This is caused by a manufacturing process problem. The tire is non-repairable and correct classification would be CRC H.



VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

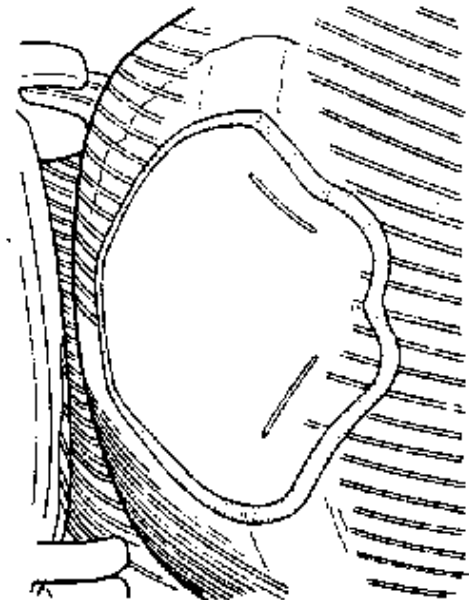
2-48. SIDEWALL AREA CONDITIONS.

a. 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 deeper or deeper or do not join together in a straight or arced line as shown in the example below. Because of the extent of weatherchecking, both examples would be classified CRC H.



OXIDATION OF SIDEWALL

b. Previous Tire Repair. This tire on the right 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.



TIRE PREVIOUSLY REPAIRED

c. Spread or Damaged Cord. This is indicated by a pencil shape bulge on the sidewall of a radial tire. 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" 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.



VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-48. SIDEWALL AREA CONDITIONS (Con't).

d. Diagonal Cracking or Flexbreak Injury. This type of injury, which looks like a series of breaks, 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.

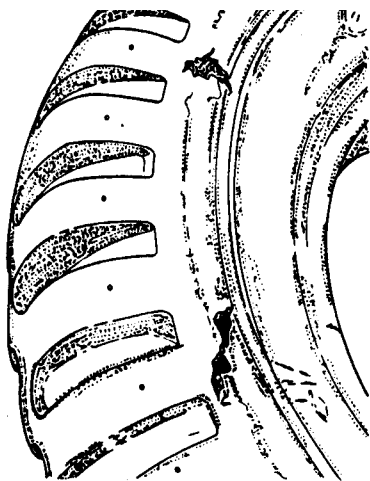


e. Tires Run Flat.

(1) The tire below and on the left 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 nonrepairable. Note the signs of shearing on the outside. Correct classification is CRC H.

(2) 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.

(OUTSIDE SIDEWALL)



DAMAGED TIRE WHEN RUN FLAT

(INNER SIDEWALL LINER)

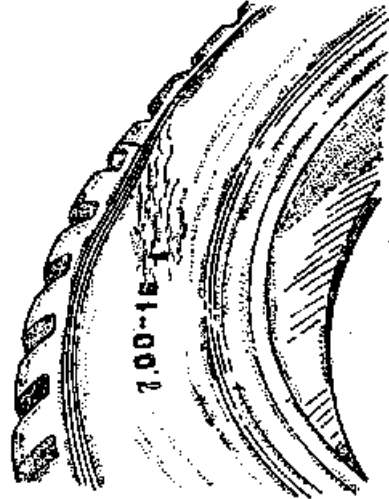


DAMAGED TIRE WHEN RUN FLAT

VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-48. SIDEWALL AREA CONDITIONS (Con't).

f. Tires Sitting Flat. This tire on the right 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 nonrepairable. Correct classification is CRC H.



SITTING IN FLAT STATE TOO LONG

g. Sidewall Separation.

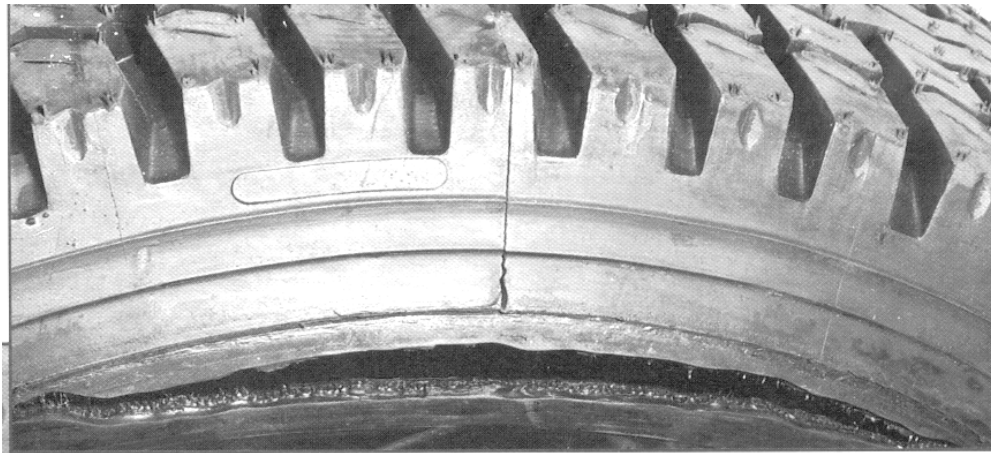
The illustrations below show two different stages of sidewall separations. Separations usually begin with an irregular shaped bulge in the mid to upper sidewall as shown in the first example, or breaks in the sidewall as shown in the second example. Eventually the damage may progress to complete separation 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 manufacturers 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.



VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

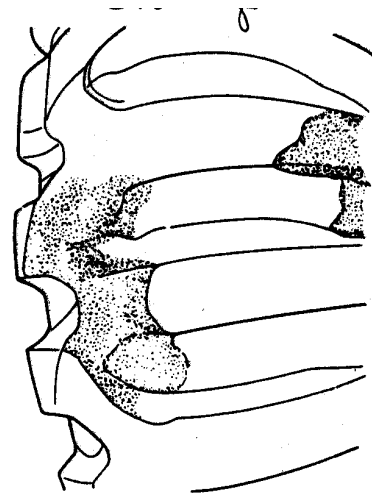
2-48. SIDEWALL AREA CONDITIONS (Con't).

h. Circumferential Fatigue Rupture (Zipper). This is a phenomenon which has become more frequent with radial tires in recent years. It's caused by cord fatigue, and results in the cords breaking (or unzipping), suddenly, in a circumferential direction. 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 hold a light off-set, 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.



2-49. TREAD CROWN AREA CONDITIONS.

a. Burned Tire Tread. This tire tread 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.

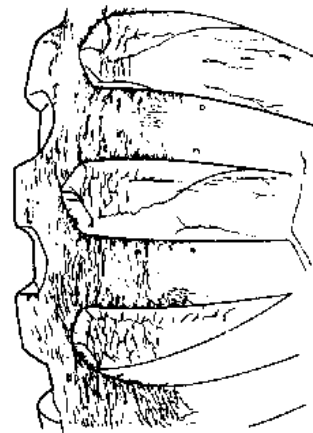


SURFACE BURNS TO TIRE

VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

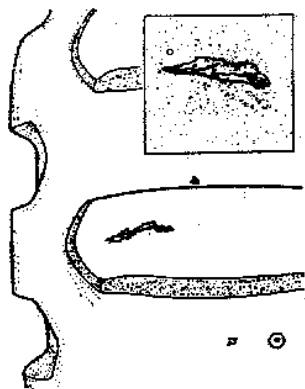
2-49. TREAD CROWN CONDITIONS (Con't).

b. Ozone Cracking or Weatherchecking on Tread. The cracks in this tire extend down into the tread. If the cracks do not extend to 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 deeper 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.



OXIDATION OF TIRE TREAD

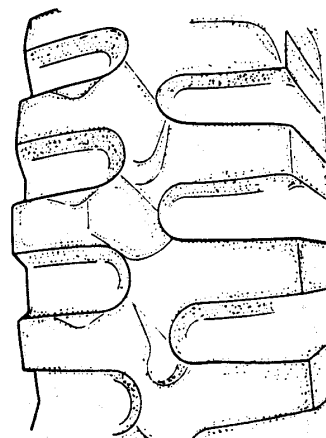
c. Tread Area Tears and Penetrations of Foreign objects. The tire below and to the left is torn in the tread area close to the tire crown. The insert shows what the tear looks like inside the tire. The tire on the right has a nail stuck in a tread groove. Both examples are probably repairable with a 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.



TORN AREA IN TREAD



d. Heel and Toe Wear. The damage shown 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.



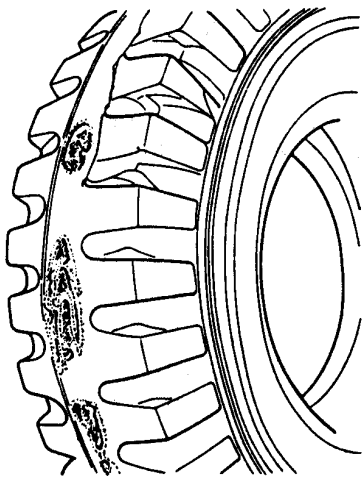
IRREGULAR TREAD WEAR

VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

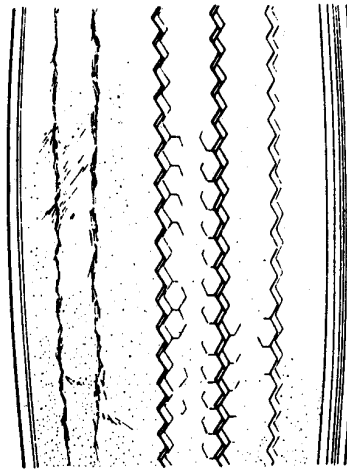
2-49. TREAD CROWN CONDITIONS (Con't).

e. Plies Worn Through. This tire, shown below and to the left, has been used too long and is destroyed beyond repair. The wear has progressed into the cord body. Correct classification is CRC H.

f. Uneven Wear. This condition, shown below and 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.



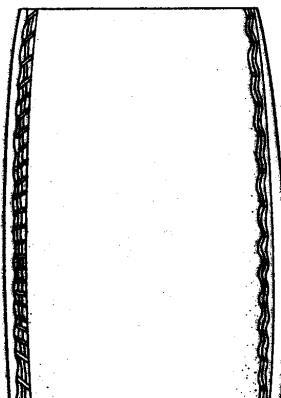
TIRE WEAR THROUGH PLYS



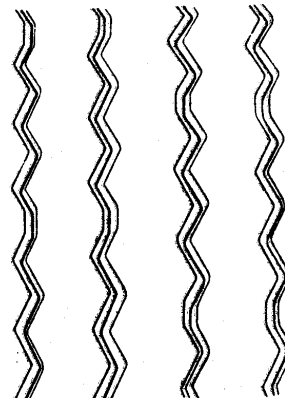
UNEVEN TREAD WEAR

g. Excessive Tire Wear. The tire below and to the left 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 problem. Since the classification inspector can not see how deeply the wear extends, it would be better to let the retreader try to save the tire rather than to discard it.

h. Premature Removal. Less than 50 percent of the tread has been worn on the tire shown below and to 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.



TIRE WORN SMOOTH

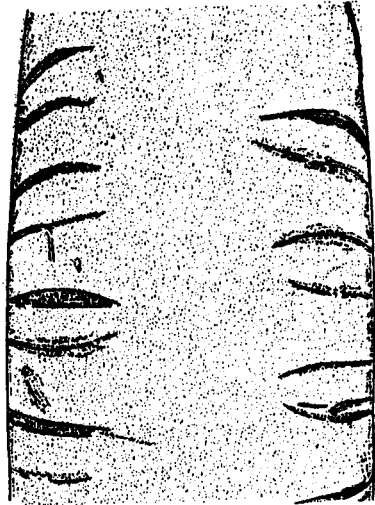


TREAD WEAR (50%)

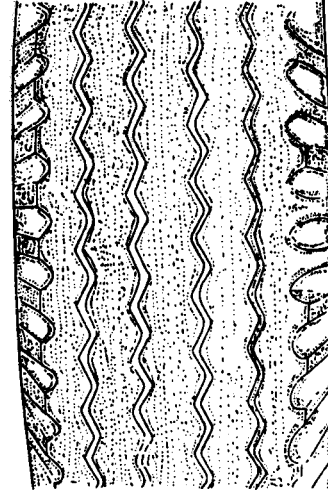
VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-49. TREAD CROWN CONDITIONS (Con't).

i. **Proper Timing for Tire Turn-in.** Illustrations below 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.



PROPER TIME FOR RETREADING (TYPICAL)

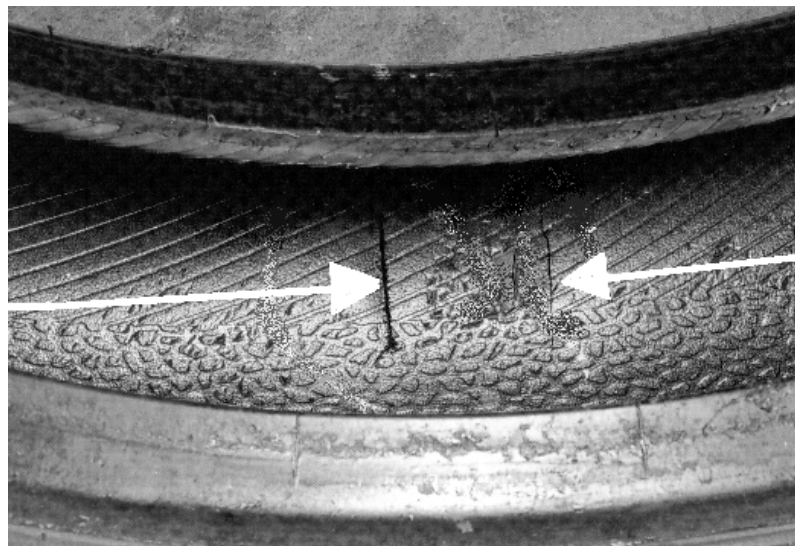


PROPER TIME FOR RETREADING
(SUFFICIENT WEAR)

2-50. INSIDE TIRE/INNER LINER CONDITIONS.

a. **Inner Liner Cracks.**

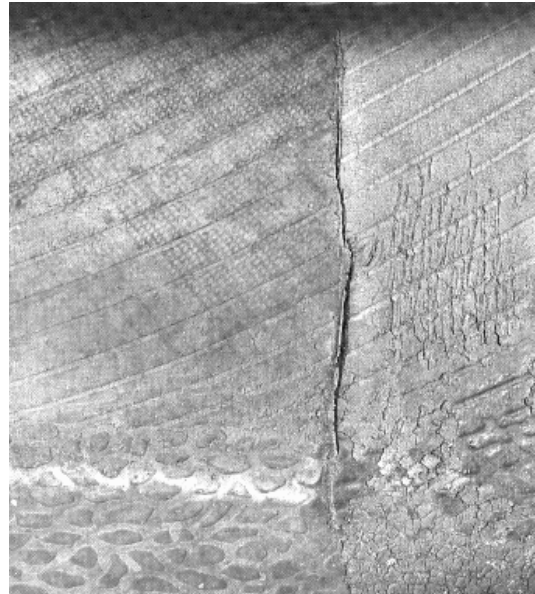
The example to the right shows two diagonal cracks in an area other than the inner liner splice area. This is caused from heat buildup as a result of underinflation or a manufacturing problem. These cracks are not repairable and the tire should be classified CRC H.



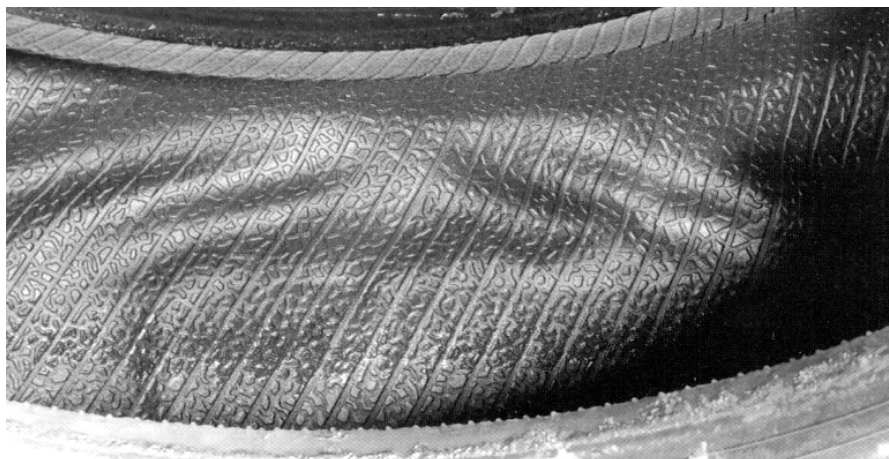
VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-50. INSIDE TIRE/INNER LINER CONDITIONS (Con't).

b. Open Splice, Inner Liner. The condition as shown at the right should not be confused with other inner liner cracks and as previously described. It is a split in the inner liner, and is localized at 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 aren't evident it may or may not be repaired during the retread and should be CRC F to give to the retreader for repair.



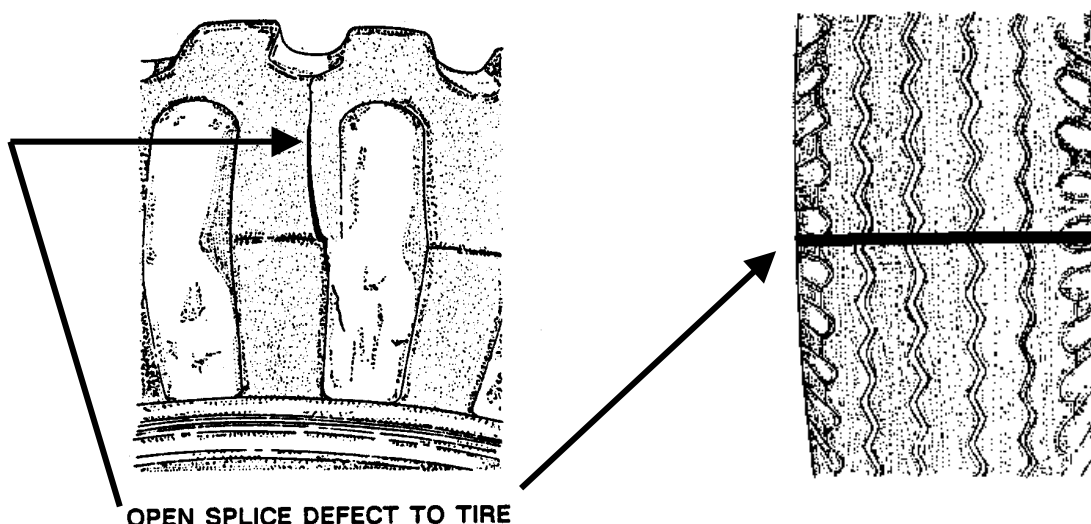
c. Bubbles, Blisters or Discoloration Inner Liner. Bubbles or blisters with discoloration are an indication that the tire has been run too long after loss of inflation pressure and the tire should be scrapped, CRC H. If there are just bubbles and blisters without discoloration it's an indication that 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.



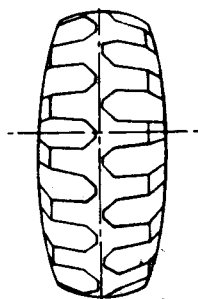
VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-51. RETREAD CONDITIONS.

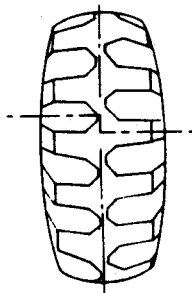
a. Open Tread Splice. This type of defect is peculiar to retreads and is a gap between the tread joint. Tread splices are normal with pre-cured, top-cap retreads but most retreaders will butt the ends up tightly and evenly so the gap isn't that evident. It's a result of poor retread workmanship as the tread was cut to short when applied top the casing. In most cases this will not cause any problems unless the crack goes deeper than the tread rubber, at any location. But even if the crack does not go deeper than the tread rubber, but the gap is obviously to big, as with the example, it should be returned to the retreader for correction and the tire classified CRC F until fixed.



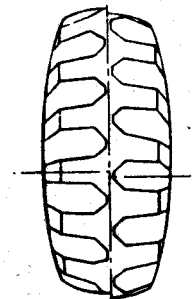
b. Off Center Tread/Mold Misalignment. Off center tread is one of the most common defects produced by careless retreader. It is caused by improper alignment of the retread mold. In most cases the tire is probably marginal. Nevertheless, it should be returned to the retreader for adjustment under terms of contract.



REGULAR DESIGN



**OFF REGISTER TREAD LUG
TREAD PATTERN OFF
REGISTER**

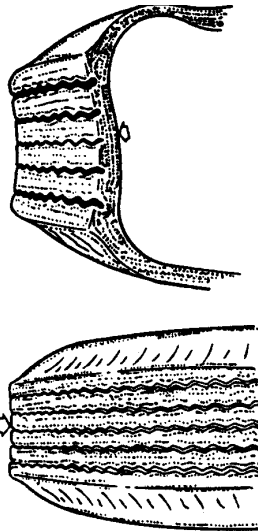


**TIRE HALVES IN
MISALINEMENT**

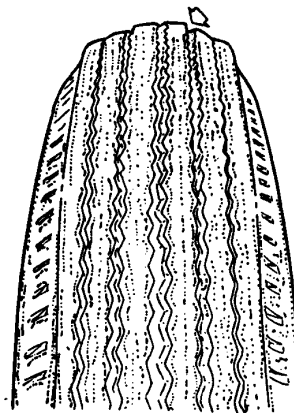
VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-51. RETREAD CONDITIONS (Con't).

c. **Buckled Crown (Mounted).** Some tires are manufactured with a concave crown while deflated but assume a flat shape when inflated. The illustration below and on the right shows a buckled crown with the tire mounted. 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.



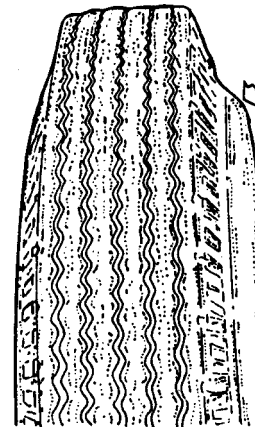
CROWN OF TIRE BUCKLED (UNMOUNTED)



CROWN OF TIRE BUCKLED (MOUNTED)

d. **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 above illustrations 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.

e. **Buckled Sidewall.** Sidewall buckling, as shown in the example on the right, 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.



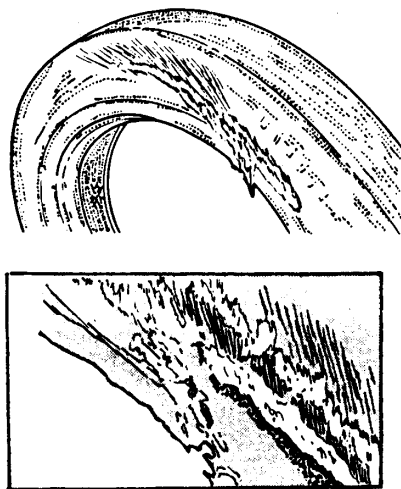
SIDEWALL OF TIRE BUCKLED

VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

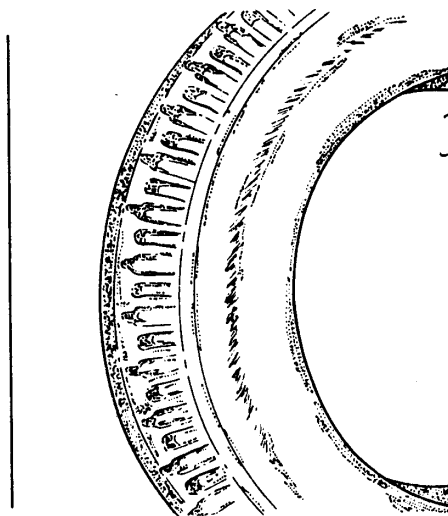
2-51. RETREAD CONDITIONS (Con't).

f. **Excessive Buffing.** When the tire below and on the left lost its tread, it became apparent that the failure was caused by inadequate bonding of the new tread because the retreader buffed deeply into the sidewall. This tire cannot be reworked because of exposed body plies.

g. **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.

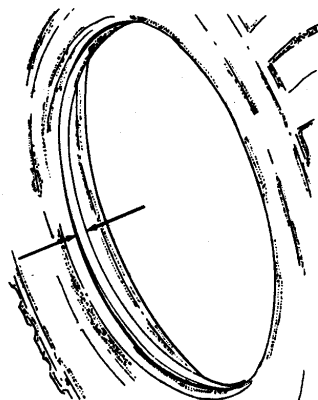


EXCESSIVE BUFFING OF SIDEWALL

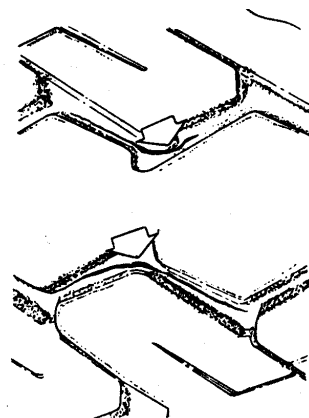


SLIGHT OVERBUFFING OF SIDE

h. **Compressed Beads.** This condition, shown below on the left, 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.



BEADS OF TIRE ARE SQUASHED



TIRE REFLECTING CRACKS IN UNDERTREAD

i. **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.

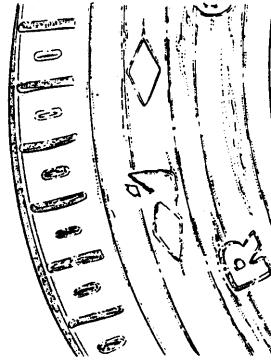
VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-51. RETREAD CONDITIONS (Con't).

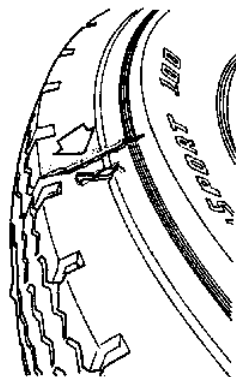
j. Vent String Protruding. Vent or bleeder strings are sometimes put into a tire to vent off air during the molding operation. The protruding string, as shown in the example on the top right, causes no harm, but should be clipped off flush to the tire surface.

k. 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.

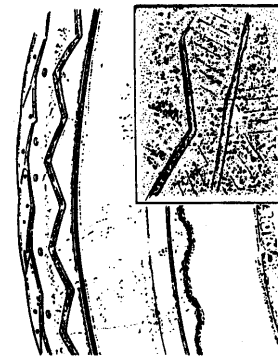
l. Improper Rubber Flow at Splice. The illustration below shows improper buildup prior to retread molding and should be returned to the retreader for rework.



PROTRUSION OF BLEEDER STRINGS



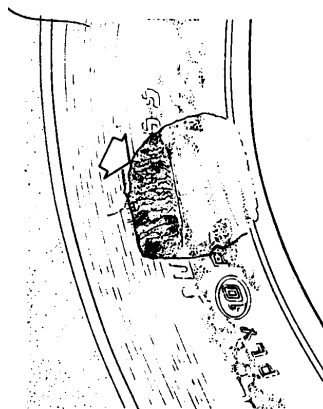
INSUFFICIENT FLOW OF RUBBER AT SPLICE



POROUS CONDITION

m. Improper Spot Repair. The repair, below and to the left, is too close to the bead on the tire should have deemed non-repairable by the inspector or the retreader.

n. Cut in Sidewall. This defect, below on the right, is not readily spotted by the retreader but should have been.



SIDEWALL SHOWING PATCH



CUT IN SIDEWALL

VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES (Con't)

2-51. RETREAD CONDITIONS (Con't).

o. Insufficient Undertread.

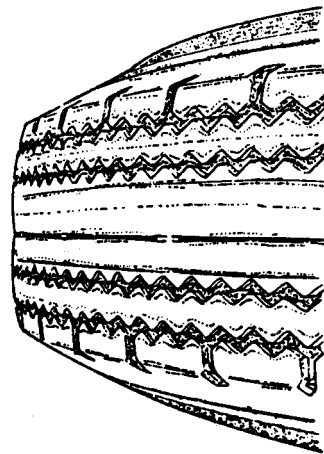
(1) The undertread of the tire on the right should be about 1/4 inch (6.3 cm) thick and part of the tread itself. When this is insufficient, it means that the retreader did not build up enough rubber or else the mold was open and the rubber flowed out.

(2) This defect is often present when the tire buckles in the mold due to squeezing. When this happens, the tire is permanently deformed.



INSUFFICIENT AMOUNT OF UNDERTREAD

p. No Design on Spacer. This condition will not cause a tire failure, but will also result in loss of traction and should be returned to the retreader.



LACK OF DESIGN ON SPACER

**VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES
(Con't)**

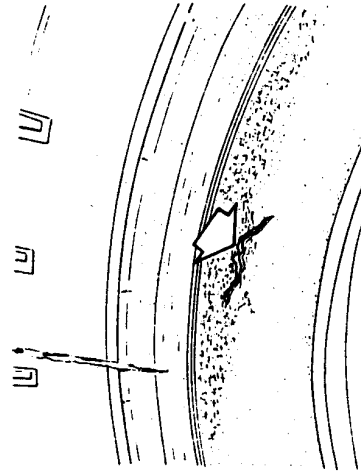
2-51. RETREAD CONDITIONS (Con't).

q. Retread Over Retread. With the tire below, on the left, 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.

r. Tire Injured During Retreading. The tire below, of the right, shows an injury that was caused by improper retreader handling and was missed by the retreaders final inspection.



**RETREADING OVER EXISTING
RETREAD CONDITION**



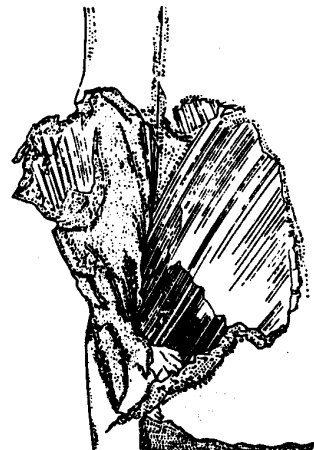
**INJURY TO TIRE DURING
RETREAD OPERATION**

s. Tread Separation. With the example, below and on the left, 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.

t. 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.



TREAD SEPARATION



TREAD SEPARATION FROM CASING

SECTION VII. STORAGE OF TIRES AND TUBES

Paragraph Number	Paragraph Title	Page Number
2-52.	GENERAL	2-122
2-53.	STORAGE OF MOUNTED TIRES.	2-122
2-54.	STORAGE OF UNMOUNTED TIRES AND TUBES	2-122
2-55.	TIRE SHELF LIFE	2-122

2-52. GENERAL.

a. 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.

b. 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 lengths of time and are exposed to highly reflective surfaces such as ground covered snow or sand, or heat absorbent surfaces such as black asphalt. (Note, unmounted tires should be stored inside a building. Preferably off the ground in a clean, cool, dry, dark place.).

2-53. STORAGE OF MOUNTED TIRES.

a. Block up the vehicle in accordance with the applicable vehicle TM. Wrap each tire and wheel assembly with plastic sheet (Item 96, Appendix C). Secure with twine or pressure-sensitive tape. Inspect semiannually to ensure that the cover is in good condition and deterioration has not begun. Tires should not be dormant for more than 60 months. A schedule for occasional exercise of vehicles and tires in storage, should be established and implement.

b. 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 mention 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.

2-54. STORAGE OF UNMOUNTED TIRES AND TUBES.

a. 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. Unwanted tires or tires and wheel assemblies will be enclosed in polyethylene material NSN 8135-00-579-6487, secured with twine or pressure sensitive tape when stored in sheds or open for periods exceeding 90 days.

2-55. TIRE SHELF LIFE

a. 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 manufacturer or the last retread or use. Consult the TACOM Item Manager for disposition instructions of any tire not issued and used within 60 months of date of manufacturer, retread or last use.

APPENDIX A: REFERENCES (Con't)

A-10. 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

APPENDIX B: TOOLS AND SUPPORT EQUIPMENT LIST

SECTION I. INTRODUCTION

SCOPE.

This appendix lists tools and other support equipment required for pneumatic tire and inner tube maintenance.

EXPLANATION OF COLUMNS.

- a. **COLUMN (1) -ITEM NUMBER.** Sequential number of 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, CAGE/PART NUMBER.** The Federal item name followed by the Commercial and Government Entity Code (CAGE) (in parentheses) and the part number.

SECTION II. TOOLS AND SUPPORT EQUIPMENT

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description CAGE/Part Number
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 (55719) SRES18
3	H	5120-00-223-8191	Awl, Saddler's Pad (7970) 2S
4	O	5120-00-221-1542	Awl, Scratch (30327) 364-FNA-02
5		4910-01-093-0167	Balancer, Vehicle Wheel (81349) MIL-B-45989
6		4910-00-773-9341	Bead Breaker, Pneumatic Tire (00994) 814D1100
7		4910-01-325-2974	Bead Breaker, Pneumatic Tire 4Y282 (BB105289)
8	O	5180-01-355-2166	Tool Kit, Tire Servicing (Gaither Bead Saver System) 12880 (0JXA9)
9		4910-01-022-9721	Bead Seater, Tire (17124) 50-961
10	O	5120-00-308-3807	Bending Tool, Pneumatic Tire Valve (81349) MIL- T -4873
11		5210-00-605-7656	Caliper, Slide (58447) 30680
12		4730-00-277-6948	Chuck, Air, Inflating (On Female) (64113) 104CA
13		4730-00-729-7076	Chuck, Air, Inflating (On Male) (09187) 409S
14		7910-00-530-6260	Cleaner, Vacuum, Electric (81349) MIL-C-52074
15		4910-00-138-1819	Constrictor, Bead Expanding, Pneumatic Tire (31989) TC28
16		4910-00-437-7215	Constrictor, Bead Expanding, Pneumatic Tire (85803) 93-242

SECTION II. TOOLS AND SUPPORT EQUIPMENT (Con't)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description CAGE/Part Number
17		4910-01-132-4933	Constrictor, Bead Expanding, Pneumatic Tire (75204) 31432
18		5130-00-293-1849	Drill, Electric, Portable, 1/2 Inch Reversible (81348) W-D-661
19		5130-01-087-6835	Drill, Electric, Portable, 3/4 Inch (00988) E5212WSTAND
20	O	5110-00-234-6557	File, Hand (58536) AA-2318
21	O	5120-00-516-4220	Fishing Tool, Pneumatic Tire Valve (27783) 991
22	O	5210-00-019-3050	Gage, Depth, Rule (94894) 940
23		4910-00-204-3170	Gage, Tire Pressure, Self-contained (27783) 7188BH
24		5130-01-038-1451	Grinder, Pneumatic (28954) 10730-00
25		3415-00-517-7754	Grinding Machine, Utility (81349) MIL-G-80260
26		4940-00-333-5541	Gun, Air Blow (17431) DGA520
27		5120-00-242-3915	Hammer, Hand (28085) 303BG
28	O	5110-00-263-0349	Handle, File (81348) NN-H-00106
29		5120-00-223-9346	Holding Tool, Valve, Tire Repair (27783) 7799
30	O	4910-00-441-8685	Inflator-gage, Pneumatic Tire (in-line, with 10' hose) (97403) 13213E9569
31	O	4910-00-522-3778	Inflator-gage, Pneumatic Tire (81348) GG-G-91

SECTION II. TOOLS AND SUPPORT EQUIPMENT (Con't)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description CAGE/Part Number
32	O	5120-00-545-4370	Iron, Tire (75204) T41
33	O	5120-00580-8924	Iron, Tire, Curved Bead Breaker: 33 Inch Overall Nominal Length (75204) T52
34	O	5120-00-277-4071	Iron, Tire, Curved Flat Type: 24 Inch Overall Nominal Length (75204) 182A
35	O	5120-00-765-8536	Iron, Tire, Lockring: 40 Inch Long (75204) T48A
36	O	5120-00-313-3036	Iron, Tire (Rim) (19207) 8366453
37	O	5120-00-422-8558	Iron, Tire: 18 Inch Overall Nominal Length (75204) T2X
38	O	5120-00-449-7073	Iron, Tire: 18 Inch Overall Nominal Length (81348) GGG- T -350
39		5110-00-240-7073	Knife, Craftsman's (Skiving Knife) (76970) 479
40	H	6230-00-729-9259	Light, Extension (81349) W-L-661-1-1-1
41		5120-00-222-2220	Mallet, Rawhide (81348) GGG-H-33
42		4910-01-370-9855	Mounter and Demounter, Pneumatic Tire (59678) DFP-355
43	H	5120-00-247-5177	Pliers (57712) 108285
44		5120-00-595-9551	Pliers, Retaining Ring (79588) 407

SECTION II. TOOLS AND SUPPORT EQUIPMENT (Con't)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description CAGE/Part Number																																																																												
45			<p align="center">NOTE</p> <ul style="list-style-type: none"> ➤ 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. <p>Rasp, Air Cooled Finishing:</p>																																																																												
			<table border="1"> <thead> <tr> <th data-bbox="667 590 1096 625">Model Number</th> <th data-bbox="1096 590 1412 625">Size (inches)</th> </tr> </thead> <tbody> <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> </tbody> </table>	Model Number	Size (inches)	T-318	3 od x 1/8 wd	T-314	3 od x 1/4 wd	T -338	3 od x 3/8 wd	T -350	3 od x 1/2 wd	T-35-C*	3 od x 1/2 wd	T -358	3 od x 5/8 wd	T-358-C*	3 od x 5/8 wd	T -360	3 od x 6/10 wd	T-360-C*	3 od x 6/10 wd	T -375	3 od x 3/4 wd	T-375-C*	3 od x 3/4 wd	T-310	3 od x 1 wd	T-310-C*	3 od x 1 wd	T-315	3 od x 1 1/2 wd	T-315-C*	3 od x 1 1/2 wd	T -320	3 od x 2 wd	T -33	3 od x 3 wd	T-418	4 od x 1/8 wd	T-414	4 od x 1/4 wd	T-4-316	4 od x 3/16 wd	T-4-516	4 od x 5/16 wd	T -438	4 od x 3/8 wd	T-450	4 od x 1/2 wd	T-450-C*	4 od x 1/2 wd	T-458	4 od x 5/8 wd	T-458-C*	4 od x 5/8 wd	T -460	4 od x 6/10 wd	T-460-C*	4 od x 6/10 wd	T-475	4 od x 3/4 wd	T-475-C*	4 od x 3/4 wd	T-478	4 od x 7/8 wd	T-478-C*	4 od x 7/8 wd	T-410	4 od x 1 wd	T-410-C*	4 od x 1 wd	T-415	4 od x 1 1/2 wd	T-415-C*	4 od x 1 1/2 wd	TBN-415**	4 od x 1 1/2 wd
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SECTION II. TOOLS AND SUPPORT EQUIPMENT (Con't)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description CAGE/Part Number
46	O	5120-00-308-3809	Repair Tool, Pneumatic Tire Valve (27783) 3522
47	H	5110-00-203-9642	Shears, Bent Trimmers (81348) GGG-S-00278
48	H	4910-00-190-5245	Spreader, Tire (71082) EF
49	O	4910-00-725-0326	Spreader, Tire (Portable) (06350) 1264425
50		5120-00-293-0392	Sticher, Cementing and Vulcanizing (81349) MIL-S-45179
51		5340-00-980-9277	Strap, Webbing (19207) 10900880
52		4910-00-554-8004	Tank, Testing, Tire and Tube (81349) MIL-T-14608
53		5210-00-221-1875	Tape, Measuring, 3/8 Inch Wide (81348) GGG-T-106
54	O	6635-00-962-6229	Tester, Material Hardness (Durometer) (30878) 1600 Type A
55		4910-01-218-4490	Wheel Assembly Tool (33287) J35193

APPENDIX C: EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

SECTION II. INTRODUCTION

C-1. SCOPE.

a. This appendix lists expendable/durable supplies and materials you will need to repair and maintain tires. These items are authorized to you 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.

b. Section 11, Expendable/Durable Supplies and Materials List is divided into the following tables:

Table	Title	Page
2-13.	Replacement and Repair Valves for Inner Tubes.	C-2
2-14.	Replacement and Repair Valves for Tubeless Tire Rims.	C-2
2-15.	Chemical Cure Section Patches	C-4
2-16.	Chemically Vulcanizing Units	C-5
2-17.	AAA Chemical Cure Repair Units	C-6
2-18.	Tee Units	C-6
2-19.	Tire and Tube Repair Kits.	C-7
2-20.	Cleaners, Lubricants, and Bulk Items.	C-9

C-2. EXPLANATION OF COLUMNS.

a. **COLUMN (1) -ITEM NUMBER.** This number is referenced in the narrative instructions to identify the material.

b. **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*

c. **COLUMN (3) -NATIONAL STOCK NUMBER (NSN).** This is the National stock number assigned to the item; use it to request or requisition the item.

d. **COLUMN (4) -DESCRIPTION, COMMERCIAL AND GOVERNMENT ENTITY CODE/PART NUMBER.** Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Commercial and Government Entity Code (CAGE) in parentheses followed by the part number.

e. **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, inch, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Table 2-13. Replacement and Repair Valves for Inner Tubes

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
1		2640-00-052-0851	Valve, Pneumatic Tire (08588) 151R	ea
2		2640-00-052-0864	Valve, Pneumatic Tire (53477) 9467A	ea
3		2640-00-052-0865	Valve, Pneumatic Tire (27783) 9470A	ea
4		2640-00-052-0867	Valve, Pneumatic Tire (27783) 9469A	ea
5		2640-00-052-0868	Valve, Pneumatic Tire (17875) VS420R	ea
6		2640-00-052-0869	Valve, Pneumatic Tire (53477) 1374	ea
7		2640-00-052-0875	Valve, Pneumatic Tire (53705) 8082A	ea
8		2640-00-251-8050	Valve, Pneumatic Tire (53477) 8178	ea
9		2640-00-877-9667	Valve, Pneumatic Tire (73842) TR220	ea

Table 2-14. Replacement and Repair Valves for Tubeless Tire Rims

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
10		2640-00-052-0868	Valve, Pneumatic Tire (17875) V5420R	ea
11		2640-00-555-2821	Valve, Pneumatic Tire (53477) 570	ea
12		2640-00-555-2824	Valve, Pneumatic Tire (08588) 5204-6R	ea

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Con't)

Table 2-14. Replacement and Repair Valves for Tubeless Tire Rims (Con't)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
13		2640-00-555-2829	Valve. Pneumatic Tire (27783) 501	ea
14		2640-00-555-2834	Valve. Pneumatic Tire (08588) 188-M	ea
15		2640-00-555-2836	Valve. Pneumatic Tire (27783) 423	ea
16		2640-00-555-2838	Valve. Pneumatic Tire (77335) 47-650	ea
17		2640-00-555-2839	Valve. Pneumatic Tire (08588) 183-M	ea
18		2640-00-555-2840	Valve. Pneumatic Tire (17875) T14R	ea
19		2640-00-555-2841	Valve. Pneumatic Tire (08588) 167M	ea
20		2640-00-555-9770	Valve. Pneumatic Tire (79934) TRJ90	ea
21		2640-00-580-5953	Valve. Pneumatic Tire (79934) TR513	ea
22		2640-00-608-0930	Valve. Pneumatic Tire (08588) 5503	ea
23		2640-00-608-0931	Valve, Pneumatic Tire (96906) MS51369-4	ea
24		2640-00-729-6081	Valve, Pneumatic Tire (53477) 7005A	ea
25		2640-00-995-3135	Valve, Pneumatic Tire (08558) 5310	ea
26		2640-00-995-3138	Valve. Pneumatic Tire (08588) 2870-6	ea

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Con't)

Table 2-15. Chemical Cure Section Patches

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
27			Patch, Pneumatic Tire Repair (28954) C7-3	ea
28			Patch, Pneumatic Tire Repair (28954) C14-6	ea
29			Patch, Pneumatic Tire Repair (28954) C22-10	ea
30			Patch, Pneumatic Tire Repair (28954) C24-12	ea
31			Patch, Pneumatic Tire Repair (28954) C3-2	ea
32			Patch, Pneumatic Tire Repair (28954) C4-2	ea
33			Patch, Pneumatic Tire Repair (28954) C8-4SW	ea
34			Patch, Pneumatic Tire Repair (28954) C12-6SW	ea
35			Patch, Pneumatic Tire Repair (28954) C5-2	ea
36			Patch, Pneumatic Tire Repair (28954) C6-3	ea
37			Patch, Pneumatic Tire Repair (28954) C8-4	ea
38			Patch, Pneumatic Tire Repair (28954) C10-4	ea
39			Patch, Pneumatic Tire Repair (28954) C10-6	ea
40		2640-00-489-5996	Patch, Pneumatic Tire Repair (28954) C1R	ea
41			Patch, Pneumatic Tire Repair (28954) C17-8	ea
42		2640-00-489-5999	Patch, Pneumatic Tire Repair (28954) C4R	ea
43		2640-00-489-6000	Patch, Pneumatic Tire Repair (28954) C2R	ea

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Con't)

Table 2-16. Chemically Vulcanizing Units.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
44		2640-00-138-8327	Patch, Inner Tube Repair (28954) 100	ea
45		2640-00-138-8328	Patch, Inner Tube Repair (28954) 101	ea
46		2640-00-138-8329	Patch, Inner Tube Repair (28954) 102	ea
47		2640-00-138-8331	Patch, Inner Tube Repair (28954) 104	ea
48		2640-00-138-8332	Patch, Inner Tube Repair (28954) 105	ea
49		2640-00-138-8333	Patch, Inner Tube Repair (28954) 106	ea
50		2640-00-138-8334	Patch, Inner Tube Repair (28954) 10.7	ea
51		2640-00-138-8335	Patch, Inner Tube Repair (28954) 108	ea

Table 2-17. AAA Chemical Cure Repair Units.

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
52		2640-00-165-3995	Patch, Pneumatic Tire Repair (28954) AAAC17-18	ea

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Con't)

Table 2-18. Tee Units

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
52		2640-00-138-8336	Plug and Patch. Tire (28954) T1P	ea
53		2640-00-138-8337	Plug and Patch. Tire (28954) T3P	ea
54		2640-00-138-8338	Plug and Patch. Tire (28954) T4P	ea
55		2640-00-138-8341	Plug and Patch. Tire (28954) T4	ea
56		2640-00-138-8344	Plug and Patch. Tire (28954) T7	ea
57		2640-00-138-8346	Plug and Patch, Tire (28954) T8A10	ea
58		2640-00-138-8350	Plug and Patch. Tire (28954) T8C13	ea
59		2640-00-138-8354	Plug and Patch, Tire (28954) T10B15	ea
60		2640-00-138-8361	Plug and Patch, Tire (28954) T10E19	ea
61		2640-00-138-8362	Plug and Patch. Tire (28954) T10E22	ea
62		2640-00-157-0097	Plug and Patch, Tire (28954) T3	ea
63		2640-00-157-0099	Plug and Patch, Tire (28954) T5	ea
64		2640-00-157-0100	Plug and Patch. Tire (28954) T6	ea
65		2640-00-157-0105	Plug and Patch. Tire (28954) T8C15	ea

Table 2-19. Tire and Tube Repair Kits

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
66	O	2640-00-052-6724	Repair Kit, Tube 5704077, Truflex	ea
67		2640-01-016-5916	RADIAL CROWN PATCHES: Patch, Pneumatic Tire Repair 8 Inches Length X 6 Inches Width (28954) CX87	ea
68		2640-01-013-0677	RADIAL TIRE SIDEWALL PATCHES: Patch, Pneumatic Tire Repair 1 0 Inches Length X 3 Inches Width (28954) CX103	ea
69		2640-01-016-5917	Patch, Pneumatic Tire Repair 10 Inches Length X 5 Inches Width (28954) CX105	ea
70		2640-01-013-0676	Patch, Pneumatic Tire Repair 12 Inches Length X 3 Inches Width (28954) CX123	ea
71		2640-01-013-0675	Patch, Pneumatic Tire Repair 15 Inches Length X 5 Inches Width (28954) CX155	ea
72	O	2610-00-554-0269	REPAIR KITS, PUNCTURE: Repair Kit, Puncture, Pneumatic Tire (97789) 15-196	ea
73	O	2640-00-052-6724	Repair Kit, Puncture, Pneumatic Tire (19207) 5704077	ea
74	O	2640-00-404-0754	Repair Kit, Puncture, Pneumatic Tire (53477) 5447	ea
75	O	2640-00-922-6921	Repair Kit, Puncture, Pneumatic Tire (17705) M100	ea
76	O	2640-00-969-3098	Repair Kit, Puncture 001-33005-23, Truflex	ea
77	O	2640-00-922-6921	STRING REPAIR KITS: Repair Kit, Tubeless Tire (String Repair) 100, Adams PSP	ea
78	O	2640-00-404-0754	Repair Kit (String Repair) AR25, Truflex	ea
79		2640-00-849-0521	TUBELESS TIRE PLUGS: Plug, Pneumatic Tire (02710) 603	ea
80		2640-00-849-0537	Plug, Pneumatic Tire (02710) 234	ea

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Con't)

Table 2-20. Cleaners, Lubricants, Preservatives, and Bulk Items

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
81	O	7510-00-282-6924	Chalk Assortment. Marking, Colored (70362) 510	ea
82	H	7510-00-281-4849	Crayon. Marking (81348) ZZT416TY1VCLG	ea
83	O	7930-00-282-9699	Detergent. General Purpose (83421) 7930-00-282-9699	gl
84	H	2640-00-137-5720	Filler, Tire Repair A and B Compound. 4 lb (28954) 64	lb
85	O	2640-00-242-3467	Fluid, Vulcanizing 8 Oz Can. (28954) 21	cn
86	O	2640-00-405-0222	Fluid, Vulcanizing 1 at Can, (28954) 22	qt
87	O	2640-00-157-0107	Fluid. Vulcanizing 1 GI Can. (28954) 23	gl
88		4240-00-269-7912	Goggles, Industrial (58536) A-A-1814	ea
89	O	2640-01-195-1826	Lubricant Pack 89307	ea
90	O	2640-00-256-5526	Lubricant. Tire and Rim Qt Can, (96980) AA 17	qt
91	O	2640-00-256-5527	Lubricant. Tire and Rim 1 GI Can. (96980) AA 18	gl
92	O	2640-00-256-5529	Lubricant, Tire and Rim Carton (5-1 GI Cans) (96980) AA2	gl
93	H	9530-00-684-4668	Metal Foil 475 Ft Roll (81348) QQ-A-1876	ro
94		2640-00-157-0021	Padding Stock, Tire Repair Rubber, All Purpose, Low Temperature Cure, 1/16 Inch Thick, 25 Lb Roll (28954) 91	lb

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (Con't)

Table 2-20. Cleaners, Lubricants, Preservatives, and Bulk Items (Con't).

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description, CAGE/Part Number	(5) U/M
95		7510-00-264-4612	Pencil (58536) A-A-87	dz
96		8135-00-579-6487	Plastic Sheet 100 Ft Roll (81348) L-P-378	ro
97	H	2640-00-138-8323	Primer, Cement 1 qt can (28954) 52	qt
98		7920-00-205-1711	Rag, Wiping 50 lb bale (58536) A-A-531	lb
99		2640-00-052-6724	Repair Kit, Puncture, Pneumatic Tire (19207) 5704077	ea
100	O	2640-00-138-8324	Solution, Buffing 16 oz can (28954) 40	oz
101	O	2640-01-108-7256	Tire Brand Refill Contains 100 labels (58139) 405-1	ea
102		7920-00-900-3577	Brush, Wire (17987) 15SS	ea
103		8030-01-314-2213	TIRE PRESERVATIVES: Preservative, Tire Rubber 1 quart	qt
104		8030-01-282-5626	Preservative, Tire Rubber 1 Gallon	gl
105		8030-01-314-2214	Preservative, Tire Rubber 5 Gallon	gl
106		8030-01-314-2215	Preservative, Tire Rubber 55 Gallon	gl

APPENDIX D: OSHA STANDARD 29 CFR 1910.177 (SERVICING MULTI-PIECE AND SINGLE PIECE WHEELS)

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

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

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

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

Charts means the U.S. Department of Labor, Occupational Safety and Health Administration publications entitled "Demounting and Mounting Procedures for 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(i) Demounting of tires (including deflation);

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

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

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

(v) Handling of rim wheels;

APPENDIX D: OSHA STANDARD 29 CFR 1910.177 (Con't)

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

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

(viii) Installation and removal of rim wheels.

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

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

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

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

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

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

ii) Restraining devices and barriers shall be visually inspected prior to each day's use and after any separation of the rim wheel components or sudden release of contained air. Any restraining device or barrier exhibiting damage such as the following defects shall be immediately removed from service:

(A) Cracks at welds;

(B) Cracked or broken components;

(C) Bent or sprung components caused by mishandling, abuse, tire explosion or rim wheel separation;

(D) Pitting of components due to corrosion; or

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

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

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

(i) A clip-on chuck;

(ii) An in-line valve with a pressure gauge or a presettable regulator; and (iii) A sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory.

(5) Current charts 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX D: OSHA STANDARD 29 CFR 1910.177 (Con't)

ment 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 is made.

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

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

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

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

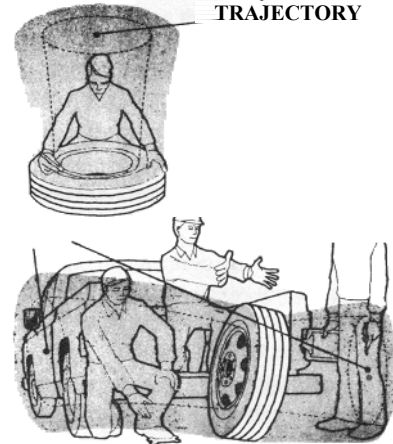
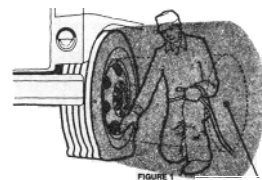
(g) *Safe operating procedure--single piece rim wheels.* The employer shall establish a safe operating procedure for servicing single piece rim wheels and shall assure that employees are instructed in and follow that procedure. The procedure shall include at least the following elements:

- (1) Tires shall be completely deflated by removal of the valve core before demounting.
- (2) Mounting and demounting of the tire shall be done only from the narrow ledge side of the wheel. Care shall be taken to avoid damaging the tire beads while mounting tires on wheels. Tires shall be mounted only on compatible wheels of matching bead diameter and width.
- (3) Nonflammable rubber lubricant shall be applied to bead and wheel mating surfaces before assembly of the rim wheel, unless the tire or wheel manufacturer recommends against the use of any rubber lubricant.
- (4) If a tire changing machine is used, the tire shall be inflated only to the minimum pressure necessary to force the tire bead onto the rim ledge while on the tire changing machine.
- (5) If a bead expander is used, it shall be removed before the valve core is installed and as soon as the rim wheel becomes airtight (the tire bead slips onto the bead seat).
- (6) Tires may be inflated only when contained within a restraining device, positioned behind a barrier or bolted on the vehicle with the lug nuts fully tightened.
- (7) Tires shall not be inflated when any flat, solid surface is in the trajectory and within one foot of the sidewall.
- (8) Employees shall stay out of the trajectory when inflating a tire.
- (9) Tires shall not be inflated to more than the inflation pressure stamped in the sidewall unless a higher pressure is recommended by the manufacturer.
- (10) Tires shall not be inflated above the maximum pressure recommended by the manufacturer to seat the tire bead firmly against the rim flange.
- (11) No heat shall be applied to a single piece wheel.
- (12) Cracked, broken, bent, or otherwise damaged wheels shall not be reworked, welded, brazed, or otherwise heated.

sure that they are properly seated and locked. If further adjustment to the tire or wheel components is necessary, the tire shall be deflated by removal of the valve core before the adjustment

**TRAJECTORY
WARNING
STAY OUT OF
THE TRAJECTORY AS
INDICATED BY SHADED
AREA**

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



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 (202) 219-4667.

APPENDIX E: GLOSSARY

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 semihard 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.

APPENDIX E: GLOSSARY (Con't)

Brittleness	Tendency to crack or snap when subjected to deformation. Buckled Tread Tire distortion caused by improper molding, evidenced by wrinkling on the inside of the casing or other deformations.
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.

APPENDIX E: GLOSSARY (Con't)

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.
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.

APPENDIX E: GLOSSARY (Con't)

Lug Tearing	Rupture of the lug, sometimes resulting in its removal, caused by violent operation 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.
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 .
Overcure	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.
Pinholes	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 to measure temperatures. usually by the generation of electric 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.

APPENDIX E: GLOSSARY (Con't)

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 .
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 replaced 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.

APPENDIX E: GLOSSARY (Con't)

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.
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.

APPENDIX E: GLOSSARY (Con't)

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.
Undercure	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.

INDEX

SUBJECT	PAGE
A	
ADVANCED FLAT-BASED RIM	1-13
AGRICULTURAL TIRES	1-9
AIR BLAST TRAJECTORY	2-3
AIR PRESSURE	2-11
ALL-SEASON TIRES	1-6
ALL-TERRAIN TIRES	1-6
ALPHA-NUMERIC	1-20
AUTOMOTIVE AND LIGHT TRUCK TIRE MAINTENANCE	2-25
B	
BALANCE MARK	1-26
BEAD AREA CONDITIONS	2-106
BEAD CHAFER SEPARATION	2-107
BEAD KINKS	2-103
BEFORE OPERATION	2-13
BELT LIFT	2-19
BELTED BIAS PLY	1-3
BIAS PLY	1-3
BOLT TOGETHER RIMS REPAIR (M939A1 SERIES).	2-47
BRAKE SKID DAMAGE	2-20
BROKEN, KINKED, OR EXPOSED BEAD WIRES	2-101
BUBBLES, BLISTERS	2-115
BUCKLED CROWN	2-117
BUCKLED SIDEWALL	2-117
BUCKLES	2-103
BUFFING	2-118
BULGES	2-103
BURNED TIRE	2-111
BURNT BEADS	2-106
C	
CAGES AND RESTRAINING DEVICES	2-2
CAMBER ANGLE	2-12
CARE, MAINTENANCE, AND INSPECTION	2-1
CATEGORIES AND GROUPS	1-5
CHAFER SEPARATION	2-107
CHAINS	2-10
CHEMICAL CURE REPAIR UNITS	5
CHEMICAL CURE SECTION PATCHES	4
CHEMICALLY VULCANIZING	2-15
CHEMICALLY VULCANIZING UNITS.	5
CIRCUMFERENTIAL CORD FATIGUE	2-19
CIRCUMFERENTIAL FATIGUE	2-111
CLASSIFICATION OF TIRES	2-92
CLEANERS, LUBRICANTS, PRESERVATIVES, AND BULK ITEMS	8
COLD WEATHER	2-7
COMMON TOOLS AND EQUIPMENT	2-1

INDEX

SUBJECT	PAGE
CONDITION READINESS CODES	2-92, 2-93
CONSTRUCTION	1-3
CONSTRUCTION EQUIPMENT TIRE CODES	1-27
CRACKS	2-103, 2-118
CUSHION SEPARATION	2-121
CUTS	2-19
D	
DA FORM 2407	2-59
DA PAM 738-750	1-1, 2-104
DAMAGED BEADS	2-103
DAMAGED CHAFER STRIP	2-103
DAMAGED PLYS	2-103
DATE OF MANUFACTURE	1-25
DEFINITIONS	2-95
DEFLATION	2-12
DEMOUNTABLE FLAT BASE RIM WITH TUBELESS TIRE MAINTENANCE	2-66
DIAGONAL CRACKING	2-109
DIRECT EXCHANGE	1-2
DIRECT SUPPORT MAINTENANCE	2-59
DISC WHEEL	1-11
DISPOSITION OF DEFECTIVE TIRES	2-104
DOT CODE	2-102
DOT CODES	1-25
DOT QUALITY GRADES FOR PASSENGER CAR TIRES	1-28
DRIVE AXLE TIRES	1-8
DROP-CENTER RIM WITH SAFETY RIDGE	1-12
DROP-CENTER RIMS	1-12
DUAL TIRES	2-8
E	
EARTHMOVER RIM MAINTENANCE	2-70
EARTHMOVER RIMS	1-14
EARTHMOVER TIRES	1-8
EFFECTS OF VEHICLE MAINTENANCE	2-10
EFFECTS OF VEHICLE OPERATION	2-10
EIRS	1-1, 2-104
EMIDROP-CENTER RIMS WITH REMOVABLE SIDE FLANGE OR LOCKRING	1-12
EQUIPMENT DESCRIPTION AND DATA	1-3
EQUIPMENT IMPROVEMENT RECOMMENDATIONS	1-1
EQUIPMENT IMPROVEMENT REPORT	1-1
EQUIPMENT IMPROVEMENT REPORT AND MAINTENANCE DIGEST	1-1
EUROPEAN METRIC	1-20
EXCESSIVE SPEED	2-10
EXCESSIVE TIRE WEAR	2-113
EXCESSIVE TIRE WEAR	2-11
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	1

INDEX

SUBJECT	PAGE
F	
FABRIC FLEX BREAK	2-101
FLAP DESCRIPTION	1-15
FLAP USAGE	2-7
FLAT BASE RIM TUBE TIRE MAINTENANCE (MULTIPIECE RIMS).	2-31
FLAT TIRE OPERATION	2-10
FLAT-BASE RIM WITH REMOVABLE SIDE FLANGES AND/OR LOCKRINGS	1-13
FLEXBREAK INJURY	2-109
FLOATATION	1-20
FLOW CRACKS	2-18
FORMS, RECORDS, AND REPORTS	1-1
G	
GAITHER BEAD SAVER SYSTEM	2
GENERAL INFORMATION	1-1
GENERAL SUPPORT MAINTENANCE	2-79
GLOSSARY	1
GRADER RIMS	1-14
GRADER TIRES	1-9
GROOVE CRACKS	2-101
GROUPS	1-5
H	
HEEL AND TOE WEAR	2-112
HIGHWAY TIRES	1-6
HMMWV	2-39
HMMWV TIRES	1-10
HOSE PNEUMATIC	3
HOW TO USE THIS MANUAL	IV
I	
IDENTIFICATION MARK	2-102
IMPLEMENT TIRES	1-9
IMPROPER SPOT REPAIR	2-119
INDUSTRIAL AND AGRICULTURAL TIRES	1-9
INDUSTRIAL TIRES	1-9
INFLATION SAFETY	2-2
INFLATION SAFETY	2-1
INFLATOR-GAGE, PNEUMATIC TIRE (IN-LINE, WITH 10' HOSE)	3
INNER TUBE REPAIR PROCEDURES	2-57
INSIDE TIRE/INNER LINER CONDITIONS	2-114
INSPECTION	2-105
INSPECTION AND CLASSIFICATION OF TIRES	2-105
INSPECTION MARKING OF TIRES	2-97
INSPECTION OF REPAIRED OR RETREADED TIRES	2-102
INSPECTION OF TIRE BEADS	2-18
INSPECTION OF TIRE SIDEWALLS	2-19

INDEX

SUBJECT	PAGE
INSPECTION OF TIRE TREAD AND SHOULDERS	2-19
INSPECTION PROCEDURES	2-18
INSUFFICIENT UNDERTREAD	2-120
IRREGULAR AND EXCESSIVE TIRE WEAR	2-11
K	
KINKED BEAD	2-107
L	
LIGHT TRUCK TIRE MAINTENANCE	2-25
LIGHT TRUCK TIRES	2-22
LIGHT, MEDIUM, AND HEAVY TRUCK/TRAILER (INCLUDING MILITARY) AND INDUSTRIAL TIRE INSPECTION CRITERIA	2-101
LOAD RANGE	1-24
LOADING	2-10
LT METRIC	1-20
M	
M939A1 SERIES	2-47
MAINTENANCE DIGEST	1-1
MARKING OF TIRES	2-7
MATCHING OF TIRES	2-7
MATERIAL CODES	1-26
MECHANICAL IRREGULARITIES	2-10
MILITARY NON-DIRECTIONAL, CROSS COUNTRY (NDCC) TIRES	1-10
MILITARY TACTICAL TIRES	1-10
MILITARY TIRE	2-22
MILITARY TIRE TREAD DEPTH LOCATION MEASUREMENTS	2-22
MILITARY TIRES	2-21
MINIMUM TREAD DEPTH FOR COMMERCIAL TIRES	2-22
MINIMUM TREAD DEPTH FOR INDUSTRIAL VEHICLES AND EARTH MOVING EQUIPMENT	2-22
MINIMUM TREAD DEPTH FOR TRUCK TIRES	2-22
MISALIGNED WHEELS	2-12
MISALIGNMENT OF WHEELS	2-11
MISALIGNMENT OF AXLES	2-11
MIXING	2-7
MOLD MISALIGNMENT	2-103
MUD-AND-SNOW TIRES	1-6
MULTIPIECE RIMS	2-31
MULTI-PIECE RIMS, WITH LOCKRINGS OR SIDERINGS	1-12
MULTI-PIECE RIMS/WHEEL GENERAL MAINTENANCE PROCEDURES	2-5
N	
NAIL HOLE REPAIRS	2-102
NAIL HOLES	2-103
NATURAL RUBBER	1-26

INDEX

SUBJECT	PAGE
NONDEMOUNTABLE FLAT BASE RIM TUBE TIRE MAINTENANCE	2-60
NONDEMOUNTABLE LARGE EARTHMOVER RIM MAINTENANCE	2-70
NON-DIRECTIONAL, CROSS COUNTRY (NDCC) TIRES	1-10
NON-REPAIRABLE AREAS	2-80
NUMERIC	1-20
NYLON CORD	1-26

O

OFF CENTER TREAD	2-116
OFF REGISTER TREADS	2-103
OFF ROAD/LOW SPEED TIRES	1-8
OFF-ROAD TIRE CODES	1-27
OFF-ROAD TIRES	2-22
OIL-SOAKED	2-100
ON/OFF HIGHWAY TIRES	1-7
OPEN LINER SPLICE	2-103
OPEN SPLICE	2-103, 2-115
OPEN TREAD SPLICE	2-116
OPERATOR INSPECTIONS AND SERVICES	2-13
OSHA PUBLICATION OFFICE	2-6
OSHA STANDARD 29 CFR 1910.177	1
OVERBUFFERED	2-118
OVERINFLATION	2-12
OZONE	2-122
OZONE CRACKING	2-108, 2-112
OZONE DAMAGE	2-8
OZONE RESISTANT	1-26

P

PAINTING OF TIRES	2-18
PASSENGER CAR AND LIGHT TRUCK TIRES	2-22
PASSENGER CAR TIRE INSPECTION CRITERIA	2-100
PATCHES	4
PENETRATIONS OF FOREIGN OBJECTS	2-112
PETROLEUM OR CHEMICAL DAMAGE	2-20
PLY RATING	1-24
PLY RATING AND LOAD RANGE	1-24
PLY SEPARATION	2-101
PMCS	2-13
P-METRIC	1-20
PRELIMINARY INSPECTION	2-95
PRELIMINARY INSPECTION AND CONDITION CLASSIFICATION OF TIRES	2-92
PREMATURE REMOVAL	2-113
PUNCTURE REPAIR	2-15
PUNCTURE REPAIR	2-80
PUNCTURE REPAIR LIMITS FOR TREAD CROWN AREA	2-16

Q

QUALITY DEFICIENCY REPORT	1-1, 2-104, 1
QUALITY GRADES	1-28

INDEX

SUBJECT	PAGE
R	
RADIAL SPLIT(S)	2-100
RADIAL TIRES	1-4
RAYON CORD	1-26
RECOMMENDED TOOLS AND EQUIPMENT	2-96
REFERENCES	1, 2
REGULAR RIB TREAD TIRES	1-7
REPAIR AREA MEASUREMENTS	2-82
REPAIR LIMITS FOR TREAD CROWN	2-16
REPAIRABLE AREAS	2-80
REPORTING FIELD FAILURES	1-1
RETREAD CONDITIONS	2-116
RETREAD IDENTIFICATION MARKINGS	2-102
RETREAD OVER RETREAD	2-121
RETREAD TIRES	2-23
RETREAD/REPAIR METHODS	2-96
RETREADING	2-23
RIM	1-11
RIM AND WHEEL COMPONENTS	1-11
RIM TYPES AND VARIATIONS	1-12
RIM VARIATIONS	1-14
ROCK SERVICE TIRES	1-9
ROTATION	2-9
RUBBER	1-26
RUN FLAT.	2-109
RUNFLAT	2-40
RUNFLAT TIRE MAINTENANCE (HMMWV)	2-39
RUPTURE	2-111
S	
SAFETY CAGES AND RESTRAINING DEVICES	2-2
SECTION REPAIR	2-88
SECTION REPAIR LIMITS FOR RADIAL TIRES	2-83
SECTION REPAIRS	2-80
SEPARATION	2-100
SEPARATION	2-103
SERVICEABLE USED TIRE TABLE	2-94
SF 368	1-1, 2-104
SHELF LIFE	2-122
SIDEWALL AREA CONDITIONS	2-108
SIDEWALL CRACKS	2-103
SIDEWALL SEPARATION	2-19
SIDEWALL SEPARATION	2-103, 2-110
SIDEWALL SPLITS OR CUTS	2-100
SINGLE-PIECE RIMS/WHEELS GENERAL MAINTENANCE PROCEDURES	2-5
SIZE CONVERSION	1-21
SIZE DESIGNATIONS	1-20

INDEX

SUBJECT	PAGE
SNOW CHAIN DAMAGE	2-19
SNOW TREAD	1-7
SPEED	2-10
SPOKE WHEEL	1-11
SPOT REPAIR	2-85
SPOT REPAIRS	2-80
SPOTTER PRESS	2-87
STANDARD TIRE CONSTRUCTION	1-3
STEER TIRES	1-8
STORAGE OF MOUNTED TIRES	2-122
STORAGE OF TIRES AND TUBES	2-122
STORAGE OF UNMOUNTED TIRES AND TUBES	2-122
STRAIGHT SIDE INDUSTRIAL TIRES	1-9
STRING REPAIR	2-52
SYNTHETIC RUBBER	1-26
T	
TABLE OF CONTENTS	I
TACOM	1-2
TEE UNITS, EARTHMOVER TIRES	2-91
TEE UNITS, LARGE TRUCK AND GRADER TIRES	2-91
TEE UNITS, PASSENGER CAR AND LIGHT TRUCK TIRES	2-91
TEMPORARY STRING REPAIR	2-15
TEMPORARY STRING REPAIR	2-52
TIPS FOR THE INSPECTOR	2-96
TIRE AND TUBE REPAIR KITS	7
TIRE CATEGORIES AND GROUPS	1-5
TIRE CODES	1-27
TIRE CONSTRUCTION	1-3
TIRE INJURED DURING RETREADING	2-121
TIRE INJURIES AND OZONE DAMAGE	2-8
TIRE INSPECTION	2-18
TIRE INSPECTION CHECKLIST AND CRITERIA	2-98
TIRE INSPECTION CRITERIA	2-96
TIRE MARKINGS AND CODES	1-19
TIRE NON-REPAIRABLE AREAS	2-17
TIRE PRESERVATIVES	9
TIRE REPAIR AND REPAIR LIMITS	2-79
TIRE REPAIR LIMITS	2-16
TIRE REPAIR PROCEDURES -SPOT REPAIR USING SPOTTER FOR HEAT & PRESSURE	2-87
TIRE REPAIR PROCEDURES, SELF-VULCANIZING SPOT REPAIR	2-85
TIRE REPAIRS	2-80
TIRE ROTATION	2-9
TIRE SHELF LIFE.	2-122
TIRE SIZE CONVERSIONS	1-22
TIRE SQUIRM	2-13
TIRE TREAD TYPES – HIGHWAY TIRES	1-6
TIRE WEAR CONDITIONS	2-23
TIRE WEAR PATTERNS	2-11

INDEX

SUBJECT	PAGE
TIRES ON VEHICLES SCHEDULED FOR DISPOSAL	2-104
TOE-IN	2-12
TOE-OUT	2-12
TOOL KIT, TIRE SERVICING	2
TOOLS AND SUPPORT EQUIPMENT	2
TORN BEADS	2-106
TRACTION GRADES	1-28
TRACTOR TIRES	1-9
TRAINING COURSES	1-2
TRAJECTORY	2-3
TREAD AND SHOULDERS	2-19
TREAD AREA TEARS	2-112
TREAD CHUNKING	2-20
TREAD CRATERS	2-103
TREAD CROWN AREA CONDITIONS	2-111
TREAD CROWN CONDITIONS	2-114
TREAD DEPTH GAGE	2-21
TREAD DEPTH LOCATION	2-22
TREAD DEPTH MEASUREMENT	2-20, 2-21
TREAD LIFT	2-20
TREAD SEPARATION	2-121
TREAD WEAR BARS	2-20
TREADWEAR GRADE	1-28
TRUCK/BUS DRIVE AXLE TIRES	1-8
TRUCK/BUS FRONT STEER TIRES	1-8
TUBE AND FLAP USAGE	2-7
TUBE AND TUBELESS TIRES	1-4
TUBE APPLICATIONS	1-15
TUBE REPAIR PROCEDURES	2-57
TUBELESS TIRES	1-4, 1-26
TUBES AND FLAPS	1-15
TYPE II-A	2-102
U	
UNEVEN WEAR	2-113
UNIT LEVEL TIRE INJURY REPAIRS	2-15
UNIT MAINTENANCE	2-15
V	
VALVE CAPS	1-18
VALVE CORE REPLACEMENT	2-24
VALVE CORES	1-18
VALVE POSITIONING	2-7
VALVE STEM	1-18
VALVE STEMS	1-15
VALVES	2
VEHICLE COMPONENTS	2-10
VEHICLE MAINTENANCE	2-10
VEHICLE OPERATION	2-10

INDEX

SUBJECT	PAGE
VENT STRING	2-119
VIBRATION	2-13
VISUAL GUIDE FOR INSPECTION AND CLASSIFICATION OF TIRES	2-105
W	
WEAR	2-100
WEAR CONDITIONS	2-23
WEAR OF VEHICLE COMPONENTS	2-10
WEAR PATTERNS	2-11
WEATHER CHECKING	2-100
WEATHERCHECKING	2-108, 2-112
WEATHERCHECKING CRACKS	2-19
WHEEL	1-11
WHEEL STOPS	2-18
WHEN TO RETREAD TIRES	2-23
Z	
ZIPPER	2-111

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Index-10 (Blank)

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Official:

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General, United States Army
Chief of Staff

JOEL B. HUDSON
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JULY 2000

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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=1000 Millimeters=39.37 Inches
 1 Kilometer=1000 Meters=0.621 Miles

WEIGHTS

1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces
 1 Kilogram=1000 Grams=2.2 Lb
 1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

LIQUID MEASURE

1 Milliliter=0.001 Liters=0.0338 Fluid Ounces
 1 Liter=1000 Milliliters=33.82 Fluid Ounces

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=1000 Cu Millimeters=0.06 Cu Inches
 1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

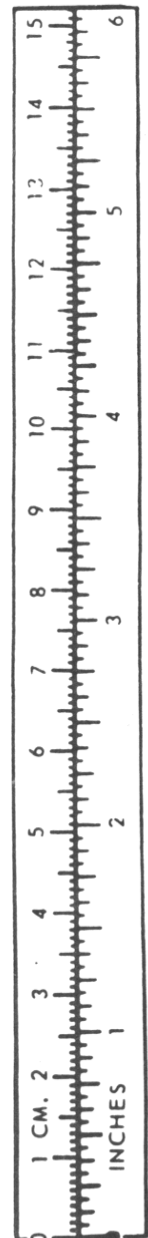
TEMPERATURE

$5/9 (^{\circ}\text{F} - 32) = ^{\circ}\text{C}$
 212° Fahrenheit is equivalent to 100° Celsius
 90° Fahrenheit is equivalent to 32.2° Celsius
 32° Fahrenheit is equivalent to 0° Celsius
 $9/5 \text{ C}^{\circ} + 32 = \text{F}^{\circ}$

APPROXIMATE CONVERSION FACTORS

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
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	0.454
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

<u>TO CHANGE</u>	<u>TO</u>	<u>MULTIPLY BY</u>
Centimeters	Inches	0.394
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	2.205
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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