



## FIX-N-FAX

Equipment Standard

Number 22

Mandatory Compliance

Revised: May, 2011

### Tires and Wheels

The intent of this Fix-N-Fax is to cover Cal Fire policy and service information regarding tires and wheels on Cal Fire-owned or operated mobile equipment as well as mobile equipment owned by local government and under contract with Cal Fire.

The following will be covered in detail:

- **The size, weight load rating, and speed rating of tires installed on a vehicle at the time of purchase or release from the Davis Mobile Equipment Facility is the mandatory tire size and type required for the vehicle.**
- **Tires on all fleet vehicles shall not be less than four thirty-second of an inch tread depth at all points in all major grooves on any axle.**
- **Regardless of appearance and tread wear, all on-highway fleet vehicle tires over 7 years old shall be replaced with new ones.**
- **Under no circumstances shall recap tires be run on any front axle or steer axle.**
- **Heavy duty truck, bus, and trailer tires of the same size and type can be mounted on very different types of non- interchangeable wheels (Hub Piloted versus Stud Piloted).**
- **Never install wheel, hub, or lug nut covers that inhibit visual inspection procedures of truck wheels and lug nuts. This type cosmetic vehicle enhancement prevents easy visual inspection of lug nuts and wheels.**
- **Studded tires are not an alterative for snow chains. Extreme caution should be used when using studded tires and should only be used in areas that experience long periods (several weeks) of icy road conditions.**

Tire Size and Type

The size, weight load rating, and speed rating of tires installed on a vehicle at the time of purchase or release from the Davis Mobile Equipment Facility is the **mandatory** tire size and type required for the vehicle. The tire size and type is recorded on each individual Mobile Equipment record and can also be found on the final stage manufacturer's certification label in the cab located near the driver's door or, in the case of pickups, sedans and utility vehicles check the original equipment manufacturer's label located in the driver's door jam.

## **Size and Type Change**

Tire size and or type change is a vehicle modification and requires prior written approval from the "Senior Fleet Manager". **No exceptions**

## **Tread Design Change**

Tread design of replacement tires is at the discretion of the "Unit Fleet Manager" except on four-wheel drive fire engines. The required tire for four-wheel drive engines is a self-cleaning tread design to match the off-highway intent of this type of equipment.

## **Tire Replacement Policy**

In general, tires are required to be replaced for three reasons:

- 1. *Wear or minimum tread depth***
- 2. *Tire age***
- 3. *Tire damage***

Being outside of one or more of these criteria will require the tire to be replaced. For example, a tire can have near new tread depth and be free of damage but if the tire is over the age limit, it must be replaced.

## **Tread Depth**

Historically, tread depth has been used as one factor for determining tire replacement. The [California Vehicle Code, Section #27465](#) when talking about light vehicles under 10,000 pound weight rating states that, "no person shall use a pneumatic tire on a vehicle axle when the tread depth is only one thirty-second of an inch tread depth in any two adjacent grooves at any location on a tire is reached". Vehicles with a 10,000 pound weight rating or larger cannot go below four thirty-second of an inch tread depth at all points in all major grooves on a tire on any steering axle; and two thirty-second of an inch tread depth at all points in all major grooves on all other tires on the axle of the vehicle. These are the very minimum tread depths that can be legally used on a public road and only takes into consideration normal vehicle use. Because Cal Fire is primarily an all risk emergency government agency that require fleet vehicles to perform under extreme conditions in weather, fire, earthquake, etc., the department minimum tread depth criteria is a higher standard than the minimum legal limit.

**All tires on all fleet vehicles shall not be less than four thirty-second of an inch tread depth at all points in all major grooves on a tire on any axle.**

## **Tire Age**

Tires degrade over time even when not being used. UV exposure, high ambient temperature, and exposure to oil and ozone gas are all causes of deterioration. Steel belts can rust inside tires if inflated by air with moisture in it. When in use tires deteriorate from heat caused by hot climates, high speeds, and high loading conditions.

Most manufacturers design their tires for automobile and commercial truck applications where miles are more important than years. Basically, tires are expected to wear out long before they rot out. As a result, the stabilizers in many tire rubber compounds are formulated to offer protection for only a limited time. Failures can include sudden sidewall blowouts or bead separations.

Tire age can be determined by checking the DOT code on the sidewalls. For tires manufactured before the year 2000, the last three digits represent the week and year of manufacture. For example, if the last three digits are "229", the tire was produced in the 22<sup>nd</sup> week of 1999. For tires made after Jan. 1, 2000, a four digit code is used: the first two digits represent the week of production, and the last two digits represent the year of production. So, if the last four digits are "2205", it means the tire was manufactured in the 22<sup>nd</sup> week of 2005.

**Regardless of appearance and tread wear, all on-highway fleet vehicle tires over 7 years old shall be replaced with new ones.**

**Note:** Warehouses should not stock more tires than can be used in 6 months. Even tires that have never been mounted on a rim can not be used if older than 7 years.

### **Tire Damage**

On occasion, a tire lug may be torn off from one of the drive (rear) tires or front tires on four-wheel drive vehicles. The lugs are usually torn from the outside edge of the tire. Replacement of these tires will be determined by the following criteria:

1. If there are no cords/steel belts showing in the location of the torn lug, the tire is still serviceable and does not need to be replaced.
2. Conversely, if the cords/steel belts are visible, the tire shall be replaced.
3. If multiple **adjacent** lugs are torn off, the tire shall be replaced regardless of the lack of visible cords/steel belts.
4. If multiple lugs are torn off but they are not adjacent, the tire may remain in service. The tire shall be replaced if there are cords/steel belts visible at the point of any torn lug.

Other damage can occur to a tire that requires the tire to be replaced.

1. Any damage to the side wall of any tire where the tire cording or belting can be seen shall be replaced.
2. Any tire with visible bumps or knots related to tread or sidewall separation shall be replaced.

### **Load Range**

Personnel performing tire maintenance or involved with replacing tires shall reference either the final stage manufacturer's certification label in the cab located near the driver's door or in the case of pickups, sedans and utility vehicles, check the original manufacturer's label located in the driver's door jam for appropriate tire rating. The specific weight rating for tires is found molded on the sidewall. Never install a tire on a vehicle that is not designed to carry the vehicle's Gross Vehicle Weight Rating (GVWR) or Gross Axle Weight Rating (GAWR).

## **Recommended Tire Pressures**

The Manufacturer maximum tire pressure is imprinted on the sidewall of all tires specific to application (single or dual) but may not be the correct tire pressure for that specific vehicle. For the recommended tire pressure for a specific vehicle, reference either the final stage manufacturer's certification label in the cab located near the driver's door or in the case of pickups and utility vehicles, check the original manufacturer's label located in the driver's door jam for appropriate tire air pressure. For special circumstances (lightly-loaded utility vehicles or erratic wear patterns), contact the Unit Fleet Manager for alternative pressures.

## **Recap Tires**

Recap tires may be utilized on drive axles or trailer axles. When recap tires are used, the manufacturer's maximum load carrying capacity, manufacturer's maximum inflation pressure and, where applicable, speed-rating restriction shall be clearly imprinted on the sidewall. The use of recapped tires is at the discretion of the Unit Fleet Manager.

**Under no circumstances shall recap tires be run on any front axle or steer axle.**

## **Speed Rating**

This critical information is printed on the sidewall. Passenger car tires have ten common speed ratings signified by a letter. Never mix and match tires on a vehicle with different speed rating. (See chart below)

<b>Q-</b> Up to 100mph	<b>U-</b> Up to 124mph	<b>W-</b> Up to 168mph
<b>R-</b> Up to 106mph	<b>H-</b> Up to 130mph	<b>Y-</b> Up to 186mph
<b>S-</b> Up to 112mph	<b>V-</b> Up to 149mph	<b>Z-</b> 149mph and over
<b>T-</b> Up to 118mph		

Truck tires sold for use in the U.S. generally are not "speed rated" like passenger tires. Truck tires have a published "max speed" which is determined by the manufacturer. This information is available from the servicing dealer or tire manufacturer. Commercial truck, bus, and trailer tires can have a restricted speed rating. For correct application, contact the Unit Fleet Manager.

## **Dual Tire Matching**

Mismatched duals have the same effect on the life of tires as low inflation or overload. An under-inflated tire on a dual assembly shifts its share of the load to its mate. The properly inflated tire then becomes overloaded, overheats and frequently fails prematurely. A difference of 15 pounds per square inch inflation pressure may result in the less inflated tire supporting 500 pounds less than the tire with proper inflation. A similar action occurs when one tire's diameter is smaller than its mate. A difference of 1/4 inch in diameter may result in

the larger tire carrying 600 pounds more than the smaller. The shift in load becomes more prevalent as the difference in diameters or inflation becomes greater.

Improperly matched duals are subject to rapid tread wear because the larger tire carries more load and will wear fast and unevenly. Although the mismatched duals have different diameters they must rotate at the same speed. The smaller tire then also wears unevenly because it is forced to scuff over the road. The overall result is abnormal and unequal tread wear for both tires.

Improperly matched duals may also lead to blowouts as a result of one tire being required to flex severely in doing more than its share of the work.

In addition to matching diameters and inflation pressures on dual installations, it is **very important not to mix radials and bias ply tires** on the same vehicle due to different load/deflection characteristics of these two types of tires. Radial tires deflect more under a given load than bias ply tires. If radial and bias ply tires are mixed in dual installations on the same axle, the bias ply tires will bear the greater part of the axle load and may operate in an overload condition that will lead to reduced mileage and early failure. Mixing radial and bias ply tires on a vehicle can cause adverse handling characteristics.

Radial tire overall diameter will govern the revolutions per mile obtained from a given tire. It is necessary to closely match tire revolutions per mile with tandem drive axle units coupled directly together as when an inter-axle differential does not exist or is locked out. Otherwise, the drive transmission may freeze up or fail in some way and/or excessive slip on one of the sets of tires will lead to a loss in traction and uneven wear.

Twin screw, tandem drive rear axles require the eight tires to be matched so that the average tire diameter on one axle is no more than 1/4 inch different from the average tire diameter on the other axle. This rule holds true for all tire sizes used on over-the-road trucks. Equal tire pressures should also be maintained.

The difference in dimensions of the tires on a dual assembly should never exceed the figures shown in the chart below.

<b><u>Dual Matching Tolerances</u></b>			
<b>Tire Size</b>	<b>Diameter (Inches)</b>	<b>Circumference (Inches)</b>	<b>Radius (Inches)</b>
8.25R20 and under	0 to 1/4	0 to 3/4	0 to 1/8
9.00R20 and up	0 to 1/2	0 to 1-1/2	0 to 1/4
Twin screw (all sizes)	0 to 1/4	0 to 3/4	0 to 1/8

The measurement and mating of duals is very important when mounting a new set of radial retreads. Just because the retreads are all on the same type and size of casing does not

mean they all have the same overall diameter. The service they were subjected to prior to retreading may have an effect on the size of the retreaded tire.

When mounting duals on a truck, there will generally be some difference in the diameter of the two tires (within the limits described above). The outside tire generally wears faster than the inside tire. As it wears its diameter will approach that of the inside tire. Additionally, any crown on the road will favor the placement of the smaller diameter tire on the inside.

At the time of mounting duals on a vehicle, locate the two valves diametrically opposite (180 degrees apart) for accessibility. Hand holes on disc wheels must be located so that the inside valve is accessible.

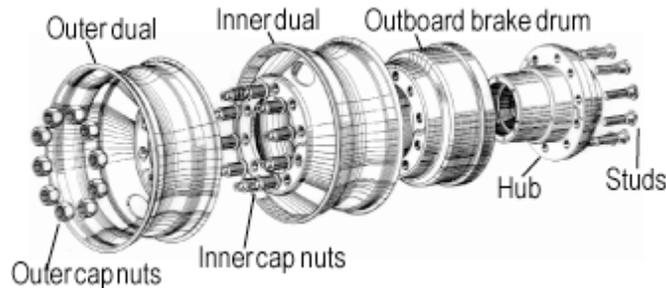
## Wheels

This information is provided to driver/operators to identify the differences between the two (2) non-interchangeable, wheel-mounting systems found on fire engines, CCVs, ECTs, helitenders, stakesides and transports. This information will also help driver/operators determine if their vehicle is safe to drive.

### Types of Wheel Mountings:



- #1 Stud Piloted:**  
(Double Cap Nut-or-Budd Disc. Wheels) (most common on older vehicles)



For dual wheels, this mounting system uses inner and outer cap nuts so that each wheel is tightened individually. For a front or single-rear wheel, a single cap nut is used. Right-hand and left-hand bolts and nuts are required. Wheels of this type can be identified by the spherical countersink surface around the individual bolt holes.

Recommended Wheel Tightening and Torque:  
(Double Cap Nut and/or Budd Disc. Wheels)

### Dual Wheel applications

1. Tighten "inner nut" first to 450-500/ft.lbs. (This is done by tightening in a pattern, opposite or across from previous nut.)
2. Tighten "outer nut" to the same specification and in the same pattern (450-500/ft. lbs.).

## Single Wheel Applications

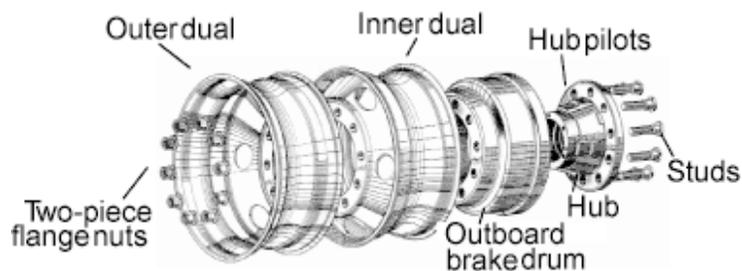
1. Tighten single nut applications (front, and some trailer axles) to 450-500/ft.lbs (should be done in a pattern, opposite or across from previous nut).

### CAUTION:

- Heavy duty truck, bus, and trailer tires of the same size and type can be mounted on very different types of non-interchangeable wheels (Hub Piloted versus Stud Piloted). Close attention should be paid to what type of wheels fit a specific chassis. If there is any uncertainty at all, contact the Unit Fleet Manager.
- For step-by-step instructions on how to perform maintenance and inspect for defects, refer to vehicle owner's manuals, manufacturer's wheel maintenance guide, or contact the local Unit Fleet Manager.
- After a wheel assembly has been installed or serviced, recheck torque at an interval between 50 and 100 miles of operation.
- Torque should be checked on all wheel nuts at regular intervals thereafter.



### # 2 **Hub Piloted Mounting:** (Cone Lock Nut) or Motor Wheel Type Single Stud.



This mounting has one (1) cone lock-nut for each bolt. For dual wheels, one (1) nut tightens both inner and outer wheels at the same time. Single wheels mount similarly with cone lock-nuts. Only right-hand nuts are required. Wheels with this type can be identified by the lack of a deep bolt hole chamber. Also available is a one-piece flange cap nut (similar to the cone lock nut) that is used on many medium-duty applications.

Recommended Wheel Tightening and Torque:  
(Cone Lock Nut {CLN})

Tighten single-Cone Lock-Nut in a criss-crossing sequence to 450 to 500 ft. lbs.

**CAUTION:**

- Never attempt to switch or mix Stud Piloted wheels with Hub Piloted wheels.
- Close attention should be paid to what type of wheels fit the chassis. If there is any uncertainty, contact the local Fleet Manager.
- For step-by-step instructions on how to perform maintenance and inspect for defects, refer to the vehicle owner's manuals, Manufacture published wheel maintenance guide, or contact the Unit Fleet Manager.
- After any wheel assembly that has been installed or serviced, recheck torque at an interval of between 50 and 100 miles of operation
- Torque should be checked, on all wheel nuts at regular intervals thereafter.

***Be sure not to mix instructions between wheel types!***

**Full Wheel covers and Cosmetic Wheel Enhancements**

Vehicle accidents, near miss accidents and damage to private property, can be due to loose wheel lug nuts. Wheels are repeatedly damaged beyond repair by being operated with loose lug nuts. Cracked wheels caused by loose wheels are discovered every year on our fire engines, CCVs, helitack units, transports and trailers. When these deficiencies occur in wheels and wheel mounting systems, it is cause for putting a vehicle out of service.

One of the early warning signs that can easily be seen of loose lug nuts and cracked rims is rust tracking around loose lug nuts. Cracks can be seen radiating out from around the lug nuts. Installing wheel, hub, or lug nut covers, can hide the early warning visual evidence the driver/operator needs to detect a loose or cracked wheel.

**Caution: *Never install wheel, hub, or lug nut covers that inhibit visual inspection procedures of truck wheel lug nuts and wheels. This type cosmetic vehicle enhancement prevents easy visual inspection of lug nuts and wheels.***

**Tire Studs**

Studded tires should never be considered an alternative for snow chains. **Extreme Caution** should be used when using studded tires and should only be used in areas that experience long periods (several weeks) of icy road conditions and removed from the vehicle as soon as icy road condition are no longer a threat. Studded tires may not offer any safety advantages in comparison to modern radial winter tires in non-icy road conditions. In fact, studs decrease tire-road friction on non-icy road surface situations and cause a longer stopping distance. Studded tires can give the operator a false sense of security. Drivers using studded tires can have a tendency to drive faster than conditions allow because of the false sense of security.

The State of California restricts the use of studded tires and the amount of studs that can be inserted in the tire. The California Vehicle Code states: "*Pneumatic tires containing metal-type studs of tungsten carbide or other suitable material and which are so inserted or constructed that under no conditions will the number of studs or the percentage of metal in*

*contact with the roadway exceed 3 percent of the total tire area in contact with the roadway, between the first day of November and April 30”.*

## **Tire Snow Chains**

Snow chains are the best choice for all snow and ice driving. Chains have been the traditional ice and snow gripping solution for vehicles for decades. They are relatively easy to install when needed and easily removed when the road conditions improve. There are various types and designs available for all vehicle types in the Cal Fire fleet. The Unit Fleet Manager shall be consulted to insure the correct type and size is provided. The Unit Fleet Manager shall have oversight and approve all snow chain type and size applications and provide training as needed for chain installation. The Unit Fleet Manager may request advice, assistance and resource information from the Region Fleet manager.

State of California Chain Requirements and Traffic Control Definitions	
R-1:	Chains or snow tread tires required. Snow tires must have a tread depth of 6/32" with a "M & S" imprint on the tire's sidewall.
R-2:	Chains required on all vehicles except four-wheel drives or all-wheel drives with snow tread tires on all four wheels.
R-3:	Chains required - ALL VEHICLES- no exceptions
R-1 and R-2 are the most common chain controls. The highway will often be closed before an R-3 control is imposed.	
C	Road Closed
S	Split Control - Chains or snow tread tire requirements are set at two separate points of the highway for different requirements. It is not uncommon to have R-1 conditions from point A to point B and R-2 conditions from point B to point C.
T	Truck Hold - During major storms when traffic flow is heavy, Caltrans may hold commercial tractor-trailer combinations at specific points below the snow line. These points typically are: Eastbound I-80 at Applegate (east of Auburn, CA) Westbound I-80 at Verdi, Nevada (west of Reno, NV)
H	Hold Traffic - Traffic is held due to spinouts and accidents. When the spinout or accident is cleared, traffic is then released.