Tiller Truck Company
Maintenance and Lubrication
Why are we here?

To learn proper maintenance and lubrication procedures to avoid costly repairs and out-of-service time.
The modern day fire apparatus is a very sophisticated and extensive piece of firefighting equipment. Its reliable function is vital for fire ground operations. To ensure reliable performance, daily inspections and maintenance schedules need to be followed.
Without regular maintenance, the reliability of the apparatus will suffer and the repairs will become time consuming and costly.
THANK YOU!

To all the fire mechanics that keep our trucks rolling!
Responsibility

• Vehicle Operators
  – Shall perform all daily and Pre-Trip inspections
  – Shall adhere to all maintenance schedules
  – Shall ensure the usage of correct fluid and amounts
Responsibility

• Site supervisors
  – Shall ensure the vehicle operator
    • Checks and maintains the vehicle properly
    • Operates the vehicle safely
  – Assigns a responsible person if no one permanently assigned
As operators of commercial vehicles, the law requires that a Pre-Trip inspection be completed every morning prior to moving the vehicle.

Following that Pre-Trip inspection, a “Circle-of-Safety” shall be performed each time the vehicle is moved after an extended stop.

- Code of Federal Regulations Title 49
  - Part 390 - Federal Motor Carrier Safety Regulations
  - Part 396 - Inspection, repair, and maintenance
- California Vehicle Code, California Commercial Driver Handbook
- NFPA 1915 & 1002

The Law
**Pre-Trip Inspection**

(Includes, but is not limited to the following)

- Overall appearance and condition
- All lights, signals, and reflectors
- Windows and mirrors
- Compartment and cab doors
- Equipment attached
- Engine fluids
- Engine belts
- Engine components
- Fuel system
- Pumping equipment

- Suspension components
- Tire and wheels
- Drive line / Drive train
- Frame
- Brake systems
- Air brake leakage test
- Steering components
- All gauges
- Safety devices
- Apparatus logs

* For more information contact the Department DMV Coordinator
Out Of Service Criteria

- NFPA
  - Seatbelt issues (broken, torn, broken buckles)
  - Tire problems (same as Pre-Trip)
  - Class 3 leaks (Axles, steering, transmissions)
  - Contaminated fuel or coolant
  - Air filter restriction
  - Ignition malfunctions
  - Clutch, transmission, shift linkage broken or missing parts
  - Automatic transmission over heating
  - Air brake problems
  - Hydraulic brake leaks (Class 2)

- California Commercial Driver Handbook
  - All NFPA requirements
  - 1/4 spring missing, shifted, broken
  - Steering wheel free play of 10 degrees

* For more information contact the Department DMV Coordinator
Leak Classes

• Class 1 - Leakage of fluid, as indicated by wetness or discoloration, NOT great enough to form drops.

• Class 2 - Leakage of fluid great enough to form drops, but NOT enough to cause drops to fall from item being inspected.

• Class 3 - Leakage of fluid great enough to cause drops to fall from item being inspected.
Photo Broken Torque Arm / Spring

- Note torque arm / spring is completely broken
- Usually torque arm / springs will only crack
- Very common occurrence
- Causes
  - Fast driving / turning
  - Rapid acceleration
  - Speed bumps
  - Overloaded vehicles
Photo Popped Air Bag Suspension

- Air bag completely destroyed
- Many times they will only have a hole in them and leak
- Look for
  - Shifted appearance of vehicle
  - Handling problems
This wheel was cracked through 3 lug nuts
Personnel complained of steering problems and squeaking / cracking noises for 2 weeks.
This is a front steering wheel
Covered and concealed by a wheel cap.
This vehicle was check out by a mechanic hours before leaving a brush fire.

While returning to the station, steering became loose.

This was noted at the station.

Note
- Missing bolt
- Space between pitman arm and steering box
- 1/4 inch more, steering would be completely gone.
Tiller Truck Maintenance & Lubrication

- Break time
Safety Equipment

- Extinguishers
Safety Equipment

- Flares/Triangles
Safety Equipment

• Fuses/Circuit Breakers
Safety Equipment

- Seatbelts/Airbags
Brake System

- Brake Test
  - Cut out < 130 psi
  - Cut in > 85 psi
  - Static Air 2/60 or 3/60
  - Applied Air 3/60 or 4/60
  - Low Air > 60 psi
  - Pop Out > 20 psi
  - Recovery < 45 seconds
  - Parking / Emergency
Brake System

- Brake Lining/Drums/Rotors
Brake System

- Brake Hoses
Brake System

- Brake Chambers
Brake System

- Slack Adjusters < 1”
Wheels/Tires

- Space (duals)
Wheels/Tires

- Tires (C,I,D) Condition, Inflation, Depth of tread. 2/32” rear/drive tires, 4/32” front & tiller/steering tires
Wheels/Tires

- Axle Seals
Wheels/Tires

• Rims/Lug Nuts
Undercarriage

- Exhaust
Undercarriage

- Fuel Tank / Fuel Gauges
Undercarriage

- Frame
Undercarriage

- Drive Line
Undercarriage

- Steering Components
Undercarriage

- Springs / Mounts
Undercarriage

- Shocks / Air Bags / Mounts
Undercarriage

- Axles
In Cab

- Heater / Defroster
In Cab

- Horns / Sirens
In Cab

- Wipers & Washers
In Cab

- Windshield & Windows
In Cab

- Mirrors
In Cab

- Parking Brake
In Cab

- Steering Wheel / Column
In Cab

- Gear Shifter
In Cab

- Gauges
  - Air Brakes
  - Volts / Amps
  - Oil Pressure
  - Temperature
Engine Compartment

- Hoses / Lines
Engine Compartment

- Air Compressor / Brake Fluid
Engine Compartment

• Belts / Pulleys
Engine Compartment

- Power Steering Fluid
Engine Compartment

- Coolant
Engine Compartment

- Oil
Exterior

- Batteries and Boxes
Exterior

- Mud Flaps
Exterior

• Equipment
Exterior

- Pump & Pump Panel
Exterior

- Body
Exterior

- Lights / Reflectors
  - Emergency (Reds)
  - Brake
  - Marker
  - Reverse
  - Turn / Four Way
  - Tail
  - Head
• Break time
<table>
<thead>
<tr>
<th>Month</th>
<th>Year</th>
<th>Equipment Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Notes: The table above represents the Daily Checklist for Apparatus / Equipment for the County of Los Angeles Fire Department. Each row corresponds to a specific piece of equipment, and the status column indicates whether the equipment is operational or requires attention. The format allows for comprehensive tracking of equipment status and maintenance needs.
Trailer - Class A

- 5th Wheel System
  - Catwalk
  - Platform / Kingpin / Gap
  - Release Arm
  - Safety Lock Jaw
  - Mounting Bolts
Trailer – Class A

• Brakes
  – Lining / Drums / Rotors
  – Brake Hoses
  – Brake Chambers
  – Slack Adjusters <1”
Trailer – Class A

- Wheels / Tires
  - Space (Duals)
  - Tires / Space (I,C,D)
  - Axle Seals
  - Rims / Lug Nuts
Trailer – Class A

- Mud Flaps
- Frame
- Shocks / Air Bags / Mounts
- Springs / Mounts
- Doors / Equipment
- Landing Gear
Trailer – Class A

- Lights / Reflectors
Aerial

- Generator
- Hydraulic Fluid
- Aerial Nozzle
- Water Pipe / Hoses
- PTO
Aerial

- Outriggers / Pads
- Turntable
Aerial

- Safety Pins / Locks
Aerial

- Ladder
- Ladder Controls
Aerial

- Ladder
  - Raise
  - Rotate
  - Extend
  - Return

» weekly
Passenger

- Loading Lights
- Baggage Area
- Seat Belts
- Seating
- Emergency Exits
- Passenger Entry Doors
Pumping Apparatus

- Foam Systems
- Hose
  - Hand
  - Supply
Pumping Apparatus

- Pump
  - Plumbing
  - Valves / Handles
  - Pump Panel Gauges
  - Priming Pump
  - Relief Valves
  - Main Pump
# Lubrication Record

**County of Los Angeles Fire Department**

### Form AL-9A

#### Los Angeles County Fire Department Lubrication Record

<table>
<thead>
<tr>
<th>Equipment Number</th>
<th>29-2004</th>
</tr>
</thead>
</table>

#### Weekly

- Date
- Odometer
- V (OK)
- A (Added)
- C (Cleaned)
- L (Lubricated)
- B (Blueprint Required)
- N/A (Not Applicable)

#### Monthly

- Oil Change
- Filter Change
- Air Filter Change
- Fuel Filter Change
- Hose and Line Inspection
- Coolant Level
- Battery Check
- Brake Fluid Level
- Tire Pressure Check
- Paint Check

#### Yearly (15,000 Miles)

- Engine Oil Change
- Differential Oil Change
- Axle Oil Change
- Transmission Oil Change
- Radiator Flush
- Air Compressor System Check
- Fuel System Inspection
- Turbocharger Inspection
- Engine Compartment Inspection

Refer to Apparatus Maintenance / Lubrication Policy in Volume D, Chapter 2, Subject 1 for further information and procedures.
Weekly Lubrication

- Lubricate and Check Fuel Separator
Clutch Linkage Clevis Pins

• Lubricate all areas
  – Engine oil or dripless oil
Photo of Clutch Linkage / Clevis Pins

- 1981 American La France
- Note arrows
  - Clutch cable
  - Clevis pins
Throttle

• Check
  – Pivot point
  – Linkage
    • Lubricate with engine oil or dripless oil
Discharge Gate Control
Linkages

• Lubricate all areas with engine oil or dripless oil
  – Linkage
  – Ball joints
  – Clevis pins
  – Bell cranks
  – Guides
Fuel Separator

- Check for contamination
  - Water
  - Debris
- Drain as needed
Monthly Lubrication

- Allison Trans Fluid Inspection
- Main Fire Pump Trans Oil Inspection
Monthly Lubrication

- Differential Oil Inspection
- Radiator Fins Cleaned
- Steering Column Lubricated
- Steering Gear Oil/Power Steering Fluid Inspection
Differential Oil

• Check level with a wire
  – Normal
    • Less than 2 inches low
  – Not normal - Notify area mechanic immediately
    • Over 2 inches low

• Fill
  – 85/140 differential oil
  – Check with and notify area mechanic
Photo of Rear Differential

- KME
Photo of Rear Differential

- 1995 KME
- Note arrow
  - Oil fill / check
Hydraulic Brake Fluid Reservoir

• If equipped
  – Check fluid level
    • Normal
      – 1/4 inch from top
Automatic Transmission Fluid

- Check level at operating temperature
- Cycle transmission through all gears to fill clutch cavities
- Check as per indicated - usually on dip stick
  - Some indicate “park”
  - Other indicate “neutral”
- Ensure parking brake is applied
- Normal level
  - Between “add” and “full”
- Fill only at operating temperature
Automatic Transmission Fluid

• If equipped with an auto-check capability such as the newer KME apparatus
  – Heat up transmission by driving
  – Cycle the transmission through the gears
  – Place into “neutral”
  – Push both the up and down arrows simultaneously
  – Read the shift indicator
    • OK = Good proper level
    • HI = High
    • LO = Low
    – If high or low, there will be a code to follow
Radiator Fins

• Clean with compressed air
  – Back to front
• Do NOT obstruct radiator air intake


Steering Box Gear Oil

- 1977 American La France 3-axle trucks
  - Lubricated by the power steering fluid
  - No maintenance check required
- All other Engines, Trucks, and Quints
  - Lubricated by power steering fluid
  - No maintenance check required
• KME Quint
• Note
  – There is a steering box on both side of the front axle
Photo of Steering Box

- Steering column to steering box linkage
- Note U-Joints
Photo of Steering Box

- KME Quint
  - Tiller axle steering
Steering Column

- Apparatus with U-Joints in steering column
  - Lubricate with chassis lube
Photo of Steering Column

- 1989 KME “Kovach”
- Note arrows
  - U-Joints on column
Power Steering Reservoir

• Check fluid level
  – Check while engine at operating temperature
  – Normal
    • 1/2 to 1 inch below top

• Fluid type
  – Engines, Trucks, and Quints
    • 15W40 engine oil
2 Month Lubrication

- Chassis Lubricated
- Engine Breather Tube
- Control Cables
- Pump Panel Controls
- Main Fire Pump
Photo of Rear Drive Line

KME Quint
2 Month Lubrication

- Drive Line Slip Joints/U-Joints
- Disc Brakes
** (Mechanic Only)
Picture of Slip Joint / Spline

- Note arrows.
  - Zerk fitting fill
  - Relief hole
Photo of Brake System

- 2006 KME
- Note arrow
  - Slack adjuster
- Note 2 air lines
  - Indicates maxi / spring brake system
  - Rear brakes
- Note 90° angle
  - Applied position
Photo of Brake System

- KME Quint
- Photo from front of front axle
Photo of Brake System

- KME Quint
- Photo from front of front axle
6 Month or 6,000 mile Lubrication

- Oil
- Oil Filter
- PCV Valve
  (6 mos/5,000 mi.)
- Air Compressor Filter
  (6 mos/5,000 mi.)
Yearly or 12,000 mile Lubrication

- Cummins/Caterpillar Fan Hubs
- Spark Arrestors
Lubrication Preparation

• Prior to the lubrication process always
  – Inspect the supply of lubricants for
    • Contamination
      – Dirt
      – Water
      – Other greases, oils, foreign material
  – Inspect dispensing equipment
    • Function and cleanliness
      – Measuring cans
      – Funnels
      – Grease guns
• Clean the area with a rag
  – Prevent the contamination of new grease
Photo of Zerk Fitting

- Arrow is pointing at the nipple of the Zerk fitting.
- Grease is to be applied with a grease gun.
- Always replace cap after lubrication is completed.
Fill Plugs

• Types
  – Square lug
  – Recessed square
  – Large stamped sheet metal plug

• Never remove or loosen a screw or bolt provided with a lock nut. This would indicate an adjustment point, NOT a fill plug.
Removing Fill Plugs

• Clean the area with a rag
  – Prevent contamination of new oil
Fitting or Plug Problems

• Have them replaced if
  – Broken
  – Damaged
  – Missing
• By
  – Area mechanic
  – Yourself
• Do not use a damaged fitting or plug
Clean Up

• Always clean up excess grease and oil from parts so it:
  – Does not attract dirt
  – Does not get thrown around onto other parts
  – Keeps vehicle and yourself looking professional
  – Is easier to detect problems and damage during inspections
Breather Tubes

- What are they?
  - Small flexible tubes to ventilate enclosed casings
- Locations
  - Top of units
    - Differentials
    - Standard transmissions
    - Engine crankcase
    - Pump transmissions
- Purpose
  - Prevent pressure build up inside the unit
  - Prevent lubricant from escaping / leaking from seals and gaskets
Breather Tubes

- Maintenance
  - General
    - Keep clean and clear
    - Do NOT kink tubes
  - Periodic cleaning by area mechanic or during PM maintenance
  - Station personnel
    - Engine crankcase
      - Wash with solvent
      - Dry with compressed air
        » Every 60 days
        » 1,000 miles
        » After operation in dusty conditions
Weight / Strain / Pressure

- Relieve when lubricating when possible
  - Bushings and bearings
  - Jack up vehicle
  - Release brakes
    - Ensure chock block installed
  - Move part being lubricated
2006 KME Oil Plug

Note arrow
- Drain plug
PCV
Positive Crankcase Ventilator Valve

• Replacement
  – County owned vehicles (F and 49000)
    • By area mechanic
      – Every 6 months
      – Every 5,000 miles
Restriction Gauges / Indicators

• Notify area mechanic
  – Continued reading of 13 or more inches of restriction
  – Continued reading in the red

• Locations
  – In cab on dash
  – Pump panel
Tiller Truck Maintenance & Lubrication

- Break time
## AL – 9B Aerial Lubrication Record

### Form AL-9B

<table>
<thead>
<tr>
<th>Year</th>
<th>Los Angeles County Fire Department Aerial Lubrication Record</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Equipment Number</td>
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</tbody>
</table>

#### Weekly

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lubricant Type</th>
<th>Lubricant Location</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

#### Monthly

<table>
<thead>
<tr>
<th>Month</th>
<th>Schedule</th>
<th>Lubricant Type</th>
<th>Lubricant Location</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

#### 6-Monthly

<table>
<thead>
<tr>
<th>Mileage</th>
<th>Schedule</th>
<th>Lubricant Type</th>
<th>Lubricant Location</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Time-Based

<table>
<thead>
<tr>
<th>Time</th>
<th>Schedule</th>
<th>Lubricant Type</th>
<th>Lubricant Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

**Legend:**
- OK: Indicates the lubricant was applied.
- AL: Indicates an adjustment was made.
- E: Indicates an emergency was handled.
- L: Indicates lubrication was performed.
- M: Indicates maintenance was performed.
- H: Indicates a hose was replaced.

Refer to Appendix D, Chapter 3, for further information and procedures.
Weekly Aerial Lubrication

• Check & Lubricate
  – Ladder Rollers
  – Ladder Guides
  – Ladder fly support pads
  – Ladder Extension / Retraction Cables
  – Ladder Cable Drum
  – Ladder Angle Indicator
Weekly Aerial Lubrication

• Check & Lubricate
  – Ladder Water Way
  – Turntable Center Pin
  – 5th Wheel Assembly
  – Outriggers
** Inspect Hydraulic Oil
Aerial Lubrication
Instructions
Weekly
Aerial Equipment

- Lubricate
  - Ladder rollers
  - Ladder guides
  - Fly supports
  - Ladder extension / retraction cable
  - Cable drum
  - Ladder angle indicator
- Ladder water way
- Turntable center pin
- Hydraulic oil
- 5th Wheel Assembly
- Outriggers
- Heel Pin / Bushings (1998-2007) KME
Ladder Rollers
Weekly

• Lubricate with chassis lube
  – Zerk fittings located in the ends of the roller support shafts
Ladder Rollers
Weekly

- Grease gun zerk fittings
Ladder Guides
Weekly

• Lubricate with “Molykote” (Molly Dri-Lube) spray lube
  – Furnished by area mechanic
Ladder Cable and Cable Drum

Weekly

- **Cable**
  - Lubricated with chain and cable lube aerial spray
    - Furnished by area mechanic
  - Check for cable damage

- **Cable Drum**
  - Lubricate ends with chassis lube
    - Until visible
Ladder Angle Indicator

Weekly

• Lubricated with WD40
Ladder Water Way
Weekly

- Wipe down with an oily rag
Turntable Center Pin

Weekly

- Lubricated with chassis lube
Hydraulic Oil

Weekly

• Check level
  – Each week
  – After extensive use

• Check for contamination
  – Report to area mechanic
Aerial Ladder Truck
5th Wheel Assembly
Weekly

- Note Zerk fittings
- Lubricate with chassis lube
- Until visible around joints
Aerial Ladder Truck

Outrigger

Weekly

- Zerk fitting on outrigger – Seagrave
- KME – No zerk fitting
- Lubricate with chassis lube
- Until visible around joints
Heel Pin / Bushings
KME Quint
Weekly

- Start with the right aerial ladder heel pin bushing with the ladder in the bedded position and pump chassis lube grease into the right zerk fitting.
- Elevate the ladder 10-degrees and pump more chassis lube grease into the zerk fitting.
- Continue to raise the ladder in 10-degree increments and add chassis lube grease at each position until the ladder reaches the 90-degree point.
- Use a hand pump grease gun and chassis lube grease.
- Do NOT attempt to lubricate the ladder while it is in motion.
With the ladder in the 90-degree position, change to the left aerial ladder heel pin bushing. Pump chassis lube grease into the left zerk fitting.

Lower the ladder 10-degrees and pump more chassis lube grease into the zerk fitting.

Continue to lower the ladder in 10-degree increments and add chassis lube grease at each position until the ladder reaches the bedded position.

Use a hand pump grease gun and chassis lube grease.

Do NOT attempt to lubricate the ladder while it is in motion.
Monthly Aerial Lubrication

- Lubricate Turntable Support Rollers
6 Month Aerial Lubrication

- Clean Ladder
- Lubricate Ladder
- Lubricate Turntable Ring Gear
Aerial Ladder Cleaning Instructions (6 Months)

• Ladder Cleaning
  – Clean with solvent
  – Remove all old lubricant from ladder
  – Wash with water
  – Thoroughly dry

• Ladder Lubrication
  – Re-lubricate as per instructions
  – Turntable
  – Lubricate rotation ring gears
  • Chassis lube applied with a brush or spray
Hydraulic Oil Change

- Ladder Trucks/ Quints (every 3 years)
Tiller Truck
Maintenance & Lubrication

• Break time
Repairs

- Vehicle preparation
  - Remove all personal and Department equipment
  - Remove log books
- Pumping Apparatus
  - Shall leave intact
    - 50 feet 1 inch hose (minimum)
    - 1 inch nozzle (minimum)
    - Full water tank
    - Suction caps
- Form 173 (Request for Services)
Repairs - Form 173

• Completed stating specific problems

• Distribution
  – Copy of Form 173 to “Shops” with apparatus
  – Original through channels to Support Services
  – “Follow-Up” (yellow) copy to station file
  – “File” (pink) copy will be returned as proof of receipt
  – Upon work completion, fill out bottom of “Follow-Up” (yellow) copy – “work completed” - and return it to Support Services
Tire Repair

- All tires brought in by Utilities for exchange or repair shall:
  - Be turned in at Fire Shops
  - Have the vehicle number clearly marked on the wheel (NOT the tire)
  - Have damage area marked on the tire
  - Have an accompanying Form 47
Tire Repair

- If no tire is available
  - Fill out a Form 47 and leave tire
    - Station and Battalion Headquarters will be notified when it is ready for pick up.
    - NOTE - Must bring the original Form 47 back to get tire.
  - Battalion Headquarters SHALL have spare tires.
  - Each station SHALL have spare tires for the equipment assigned and at least one for each position (AKA – Front and Rear)
Emergency Spare Tire

- Available at Battalion Headquarters if none available at the assigned station
Tire Changing

- All operators of fire apparatus, support vehicles, and transports are responsible for changing flat, damaged, or worn out tires.
  - Front tires
  - Rear tires
  - Rear outside dual tires
    - NOTE - Rear inside dual tire is to be replaced or changed by the area mechanic.
    - NOTE - If three (3) or more tires are needed, notify the area mechanic.
Tire Changing

• 1998 – 2000 KME apparatus
  – Utilize a hub piloted wheel that requires only one (1) set of ten (10) flanged wheel nuts to secure both dual wheels.
    • Contact area mechanic prior to changing wheels / tires.
    • CAUTION - Run up blocks CAN NOT be used to change the outside rear dual wheels / tires on the 1998 and newer KME apparatus.
**Tire Changing**

- **2006 and newer KME apparatus**
  - Utilize a lug piloted wheel that requires only one (1) set of ten (10) flanged wheel nuts to secure both dual wheels.
  - Contact area mechanic prior to changing wheels / tires.
  - **CAUTION** - Run up blocks CAN NOT be used to change the outside rear dual wheels / tires on the 1998 and newer KME apparatus.
Tire Changing

• Always retighten wheel nuts after first 50 to 100 miles of operation after a tire change.
Emergency Repairs

– For after hours or emergency assistance, contact Dispatch at (323) 881-2455 for the duty mechanic (R41).