

MOTOR VEHICLE FLEET MAINTENANCE PLANS GENERAL GUIDELINES

	CONTENTS	PAGE		CONTENTS	PAGE
1.	GENERAL	1		C. Outside Fleet Contractor	11
	A. Purpose	1		D. Guaranteed Maintenance	11
	B. Considerations	2		E. Outside Repair Shop and Dealer Services	12
	C. Required Items	2		F. Inspector-Repairman Plan	12
	D. Additional Resources	2		G. Mobile Automotive Safety Test and Inspection Center (MASTIC)	13
2.	MAINTENANCE QUALITY MEASUREMENT	2		5. PERSONNEL AND WORKING ENVIRONMENTS	13
	A. General	2		A. General	13
	B. Quality Observation and Inspection Plan	2		B. Qualifications	14
	C. Maintenance Records	2		C. Foreman Responsibilities	14
	D. Maintenance Cost Comparisons	2		D. Supervisor Responsibilities	14
3.	MAINTENANCE PLAN REQUIREMENTS	3		E. Nonmanagement Employee Responsi- bilities	14
	A. General	3		F. Physical Work Environment	14
	B. Legal Requirements	3			
	C. Preventive Maintenance	3			
	D. Repairs	4			
	E. Manufacturer Warranty	6			
	F. Appearance	6			
	G. Lubrication	8			
	H. Tires	10			
4.	MAINTENANCE PLANS	10			
	A. General	10			
	B. In-House	11			
				1. GENERAL	
				A. Purpose	
				1.01 This section provides a general description of methods and requirements for motor vehicle fleet maintenance. It contains guidelines for the administration and management of a motor vehicle fleet in implementing maintenance plans for particular fleets and operating conditions, and can be used to evaluate an existing maintenance plan and/or alternate plans.	

SECTION 720-500-100

B. Considerations

1.02 The plans may be used by maintenance force groups either singly or in combination. Their purpose is to satisfy the user requirements and provide economic and efficient fleet maintenance.

1.03 Motor vehicles require proper maintenance to ensure that they are:

- **Safe** to operate
- **Dependable**, with minimum occurrences of "out-of-service" and road failures
- **Efficient** and **economical** to operate.

C. Required Items

1.04 Some of the items which **must** be incorporated in a maintenance plan are as follows:

- (a) Maintenance of vehicle emission standards
- (b) Performance of required vehicle inspections and/or preparation for them
- (c) Maintenance of the exterior appearance.

D. Additional Resources

1.05 Various computer systems are planned to aid in the following:

- (a) Sizing of fleets
- (b) Recording and measuring maintenance costs
- (c) Scheduling replacement of vehicles.

These systems will serve as tools to be used for proper fleet management, and should be considered when selecting a fleet maintenance plan.

2. MAINTENANCE QUALITY MEASUREMENT

A. General

2.01 Within each company, operating area, or division, maintenance quality levels must be established and audited to correctly administer a particular fleet. An overall quality plan, using a quality observation and inspection program with recorded complaints and cost audits, will provide

the fleet managers a measure of maintenance quality.

B. Quality Observation and Inspection Plan

2.02 A quality observation and inspection plan is a primary tool in determining the maintenance quality level being accomplished. A selected sample of vehicles is physically inspected, test driven, and rated as to quality level. Summaries and analysis of these observations will provide management and those responsible for administration of the motor vehicle fleet with a tool to measure work performance and condition trends.

C. Maintenance Records

2.03 Information from the vehicle user groups and maintenance records also reflects a measure of quality level. This includes such items as:

- (a) Frequency of complaints on vehicle conditions
- (b) Number of road calls
- (c) Vehicle unavailability.

D. Maintenance Cost Comparisons

2.04 Maintenance cost results, as reflected in corporate reports on motor vehicle investment and expenses, are also a measure of maintenance performance. However, it is difficult to determine from an analysis of maintenance expense the quality level of the vehicles in the fleet. High costs may be due to costly maintenance, or the vehicles may be overmaintained. Low costs also may reflect a lack of maintenance, resulting in poor appearance and down time.

2.05 Different environmental and operating conditions throughout the Bell System make maintenance cost comparisons between various operating units, without an adjustment for these variances, a poor measure of quality. Comparisons may be valid within a company or between companies or areas where there is little or no variance, and where a well-defined quality plan is being used. Cost and quality then can be measured to index actual performance.

3. MAINTENANCE PLAN REQUIREMENTS

A. General

3.01 Service and repair requirements are important factors in the adoption of a particular maintenance plan. Subparts B through H contain descriptions of these factors.

B. Legal Requirements

3.02 Various governmental agencies set up requirements for operation of a vehicle. These can include equipment requirements, type and frequency of inspection, and proper marking. Federal and state laws also are imposing more technical and sophisticated environmental protection requirements.

3.03 The motor vehicle force must incorporate the various legal requirements into the maintenance plan. In those instances where maintenance is assigned to the vehicle user groups, these legal requirements also are assigned to the user.

3.04 The term "federal laws" as used here applies to Motor Vehicle Safety Standards and Emission Standards. The major federal agencies involved are the Department of Transportation (DOT), and the Environmental Protection Agency (EPA). Levels of responsibility are as follows:

- (a) Vehicle Safety Standards are the direct responsibility of the Federal Highway Administration (FHWA) under the DOT. The FHWA also has become the federal agency responsible for highway safety matters formerly controlled by the Interstate Commerce Commission (ICC).
- (b) Setting and controlling vehicle emission standards is the responsibility of the EPA.

Both of these agencies are active in setting national standards, within the scope of their responsibilities, for the manufacturers of all new vehicles, and where necessary, issuing information on changes and revisions for vehicles currently in use.

3.05 The states are authorized to enforce the standards set by both of these agencies for **vehicles in use**. In addition, the states have their own individual vehicle codes or regulations, which

have been written and revised to follow recommendations from the National Committee on Uniform Traffic Laws and Ordinances.

3.06 With the advent of the DOT and EPA, the states have become responsible for establishment and enforcement of regulations to maintain the federal standards prescribed by the DOT and the EPA. The states also may impose additional standards as required to achieve and maintain the National Ambient Air Quality Standards and compliance with National Safety Standards.

C. Preventive Maintenance

3.07 Preventive maintenance (PM) is a term used to describe a method of procedures developed to maintain motor vehicles economically in a safe operating condition, while allowing maximum availability. The major purpose is to **prevent** breakdown and to **prevent** mechanical defects from creating an unsafe vehicle. To be effective, all PM plans must incorporate procedures for systematic inspection, servicing, required work, and anticipated work.

3.08 The size of the fleet and the maintenance plan in use are important factors in determining whether the PM schedules will be based on a time or mileage basis. A review of historical data is used initially to determine time or mileage intervals required for a PM schedule. Data reviewed should include past needs for repairs, failure intervals for mechanical components and systems, and the desired level of minimum overall maintenance quality. Usually, some compromise can be made without incurring any penalty. For example, if the average vehicles in a fleet travel approximately 1000 miles per month and the interval for lubrication services has been determined adequate for the fleet at 6000 miles, the service for the majority of the fleet could be scheduled on a time basis at six months. To properly care for a high-mileage group of vehicles (messenger, coin, and possibly pool cars), a separate schedule should be established.

3.09 The concept of providing a one-stop service on a scheduled basis has proven to be the most effective approach for administering preventive maintenance. In order to have minimal expense

SECTION 720-500-100

and minimum out-of-service time, the one-stop PM service should include:

- (a) **Inspection**—All items of vehicle safety, mechanical systems, and all other legally required items, plus certain comfort-convenience items, ie, upholstery, cleanliness, air conditioning (when equipped), etc. This should include any legal inspection required if it can be done by the company maintenance personnel.
- (b) **Servicing**—Applied to vehicle maintenance, it includes lubrication, oil and filter changes, antifreeze, tire and battery service, hoses and belts, etc.
- (c) **Required Work**—Repairs found necessary during course of inspection.
- (d) **Anticipated Work**—Items or subsystems that are still functioning, but will require repair or replacement prior to the next scheduled PM service.

3.10 An appropriate form should be available and used as a guide for performing PM work. It also provides a history record. Figure 1 is an example of a PM form. Trend information can be developed from these records to assist in future maintenance planning.

D. Repairs

General

3.11 Repairs to motor vehicles can be categorized in three basic groups:

- (1) Regular mechanical repairs
- (2) Collision—body damage repairs
- (3) Associated equipment repairs.

3.12 Regular mechanical repairs cover all types of work due to ordinary wear and mechanical failure caused by abuse, age, or neglect. This includes work on all systems and subsystems when performed as scheduled PM, or as immediately required breakdown work.

3.13 Assuming a high quality of repair work, the main considerations must relate to economy and minimum out-of-service time. Quite

often, a premium must be paid for fast repair service if the vehicle is urgently needed. There must be rational decisions made in balancing economics with the importance of keeping the vehicles in service. It is seldom practical to perform "patch-up" jobs, because work of substandard quality usually costs more in the final analysis. Jobs that fail and must be redone usually cost more than having them fixed correctly the first time. A possible exception to this policy would be repairing a vehicle the cheapest way for a specified short period, eg, just prior to replacement while waiting for the new vehicle to be placed in service. However, it is necessary that any repairs be made in a manner that will keep the vehicles in **safe** operating condition.

Classes of Repair

3.14 Two classes of regular repair work must be considered. The approach to each class of work is as follows:

(a) **Minor Work**—Includes maintenance work where the expense or time is relatively low, eg, replacing a wheel cylinder in the brake system, a fan belt, or a hose. The cost limits for minor work can be determined by individual fleet managers and can be set as desired. Minor work is usually performed as a regular part of a PM service, but occasionally small jobs are done between service intervals to correct troubles reported by a driver. The limits usually are set locally.

(b) **Major Work**—Covers mechanical repairs other than minor jobs. When major work is required as a result of the PM inspection, the work should be scheduled to meet the needs of the vehicle user group without hindering their operation. The greatest advantages to the vehicle users and the motor vehicle personnel can be obtained by getting the work done at the same time as the PM service. Obviously, this eliminates tying up the vehicle a second time.

Breakdown Repairs

3.15 Breakdowns requiring major repairs can impose severe obstacles for vehicle users; consequently, intelligent planning by the motor vehicle force must be used to minimize both out-of-service and repair expenses. Items that cannot be taken care of at the PM time should be carefully scheduled for correction as soon as possible.

Programmed Maintenance Safety Test & Inspection Form

VEHICLE NO. _____ MILEAGE _____ MAKE _____ YEAR _____ BODY TYPE _____ DISTRICT _____ LOCATION _____

<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">A GENERAL INSPECTION</th> <th>S</th> <th>U</th> </tr> <tr><td>1. W/S WIPER (OPR.) (BLADES)</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. HORN</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. BODY</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. WINDOWS</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. MIRRORS</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. HDLIGHTS ADJUST SWITCHES</td><td></td><td></td><td></td><td></td></tr> <tr><td>7. TAIL LIGHTS</td><td></td><td></td><td></td><td></td></tr> <tr><td>8. STOP OR TURN LIGHTS</td><td></td><td></td><td></td><td></td></tr> <tr><td>9. LICENSE PLATE LIGHT</td><td></td><td></td><td></td><td></td></tr> <tr><td>10. INSTRUMENT LIGHT</td><td></td><td></td><td></td><td></td></tr> <tr><td>11. SEATS</td><td></td><td></td><td></td><td></td></tr> <tr><td>12. APPEARANCE - OUTSD - INSD</td><td></td><td></td><td></td><td></td></tr> <tr><td>13. S/B SHOULDER HARNESS</td><td></td><td></td><td></td><td></td></tr> <tr><td>14. FLARES</td><td></td><td></td><td></td><td></td></tr> <tr><td>15. FIRST AID KIT</td><td></td><td></td><td></td><td></td></tr> </table>	A GENERAL INSPECTION			S	U	1. W/S WIPER (OPR.) (BLADES)					2. HORN					3. BODY					4. WINDOWS					5. MIRRORS					6. HDLIGHTS ADJUST SWITCHES					7. TAIL LIGHTS					8. STOP OR TURN LIGHTS					9. LICENSE PLATE LIGHT					10. INSTRUMENT LIGHT					11. SEATS					12. APPEARANCE - OUTSD - INSD					13. S/B SHOULDER HARNESS					14. FLARES					15. FIRST AID KIT					<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">D UNDER CAR INSPECTION</th> <th>S</th> <th>U</th> </tr> <tr><td>1. BALL JOINTS - KING PINS</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. SHOCK ABSORBER</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. ENGINE OIL LEAKAGE</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. SPRINGS</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. SPRING SHACKLES</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. GAS TANK</td><td></td><td></td><td></td><td></td></tr> <tr><td>7. FRAME</td><td></td><td></td><td></td><td></td></tr> <tr><td>8. HEADER PIPE</td><td></td><td></td><td></td><td></td></tr> <tr><td>9. MUFFLER</td><td></td><td></td><td></td><td></td></tr> <tr><td>10. TAIL PIPE</td><td></td><td></td><td></td><td></td></tr> <tr><td>11. EXHAUST PIPE SUPPORTS</td><td></td><td></td><td></td><td></td></tr> <tr><td>12. HEAT RISER VALVE</td><td></td><td></td><td></td><td></td></tr> <tr><td>13. EXHAUST MANIFOLD</td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">E TIRES</th> <th>S</th> <th>U</th> </tr> <tr><td>1. RIGHT FRONT</td><td>/32</td><td></td><td></td><td></td></tr> <tr><td>2. LEFT FRONT</td><td>/32</td><td></td><td></td><td></td></tr> <tr><td>3. RIGHT REAR</td><td>/32</td><td></td><td></td><td></td></tr> <tr><td>4. LEFT REAR</td><td>/32</td><td></td><td></td><td></td></tr> <tr><td>5. WHEELS</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. TIRE PRESSURE</td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">F LUBRICATION</th> <th>S</th> <th>U</th> </tr> <tr><td>1. CHASSIS LUBE SERVICE</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. OIL CHANGE</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. OIL FILTER CHANGE</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. AIR FILTER - OIL - PAPER</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. TRANSMISSION FLD. LEVEL</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. DIFFERENTIAL LEVEL</td><td></td><td></td><td></td><td></td></tr> <tr><td>7. WHEEL BEARINGS</td><td></td><td></td><td></td><td></td></tr> <tr><td>8. BRAKE FLUID LEVEL</td><td></td><td></td><td></td><td></td></tr> <tr><td>9. P.C.V. - VALVE</td><td></td><td></td><td></td><td></td></tr> <tr><td>10. STEERING GEAR LEVEL</td><td></td><td></td><td></td><td></td></tr> </table>	D UNDER CAR INSPECTION			S	U	1. BALL JOINTS - KING PINS					2. SHOCK ABSORBER					3. ENGINE OIL LEAKAGE					4. SPRINGS					5. SPRING SHACKLES					6. GAS TANK					7. FRAME					8. HEADER PIPE					9. MUFFLER					10. TAIL PIPE					11. EXHAUST PIPE SUPPORTS					12. HEAT RISER VALVE					13. EXHAUST MANIFOLD					E TIRES			S	U	1. RIGHT FRONT	/32				2. LEFT FRONT	/32				3. RIGHT REAR	/32				4. LEFT REAR	/32				5. WHEELS					6. TIRE PRESSURE					F LUBRICATION			S	U	1. CHASSIS LUBE SERVICE					2. OIL CHANGE					3. OIL FILTER CHANGE					4. AIR FILTER - OIL - PAPER					5. TRANSMISSION FLD. LEVEL					6. DIFFERENTIAL LEVEL					7. WHEEL BEARINGS					8. BRAKE FLUID LEVEL					9. P.C.V. - VALVE					10. STEERING GEAR LEVEL					<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">G SMOG DEVICE</th> <th>S</th> <th>U</th> </tr> <tr><td>1. P.C.V. SYSTEM</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. EXHAUST SYSTEM</td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">H ENGINE MECHANICAL</th> <th>S</th> <th>U</th> </tr> <tr><td>1. NOISY</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. COMPRESSION</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. OIL CONSUMPTION</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. CRANKCASE BLOW BY</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. TIMING CHAIN</td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">I DRIVE TRAIN</th> <th>S</th> <th>U</th> </tr> <tr><td>1. CLUTCH OPERATION</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. CLUTCH FREE TRAVEL</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. TRANS. OPERATION</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. TRANS. LINKAGE</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. TRANS. - REAR SEAL</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. DRIVE SHAFT</td><td></td><td></td><td></td><td></td></tr> <tr><td>7. U-JOINTS</td><td></td><td></td><td></td><td></td></tr> <tr><td>8. DIFF. OPERATION</td><td></td><td></td><td></td><td></td></tr> <tr><td>9. PINION SEAL</td><td></td><td></td><td></td><td></td></tr> <tr><td>10. AXLE REAR</td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">J COOLING SYSTEM</th> <th>S</th> <th>U</th> </tr> <tr><td>1. RADIATOR</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. RADIATOR HOSE</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. HEATER OR HOSE</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. FAN BELT</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. WATER PUMP</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. FREEZE PLUG</td><td></td><td></td><td></td><td></td></tr> <tr><td>7. PRESSURE CAP TEST</td><td></td><td></td><td></td><td></td></tr> <tr><td>8. COMBUSTION LEAK TEST</td><td></td><td></td><td></td><td></td></tr> </table>	G SMOG DEVICE			S	U	1. P.C.V. SYSTEM					2. EXHAUST SYSTEM					H ENGINE MECHANICAL			S	U	1. NOISY					2. COMPRESSION					3. OIL CONSUMPTION					4. CRANKCASE BLOW BY					5. TIMING CHAIN					I DRIVE TRAIN			S	U	1. CLUTCH OPERATION					2. CLUTCH FREE TRAVEL					3. TRANS. OPERATION					4. TRANS. LINKAGE					5. TRANS. - REAR SEAL					6. DRIVE SHAFT					7. U-JOINTS					8. DIFF. OPERATION					9. PINION SEAL					10. AXLE REAR					J COOLING SYSTEM			S	U	1. RADIATOR					2. RADIATOR HOSE					3. HEATER OR HOSE					4. FAN BELT					5. WATER PUMP					6. FREEZE PLUG					7. PRESSURE CAP TEST					8. COMBUSTION LEAK TEST					<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">K ENGINE ANALYZATION</th> <th>S</th> <th>U</th> </tr> <tr><td>1. POINT RESISTANCE</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. TIMING</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. TOTAL ADVANCE</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. DWELL</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. SCOPE ANALYSIS</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. CYLINDER BALANCE</td><td></td><td></td><td></td><td></td></tr> <tr><td>7. SPARK PLUGS</td><td></td><td></td><td></td><td></td></tr> <tr><td>8. PLUG WIRING</td><td></td><td></td><td></td><td></td></tr> <tr><td>9. DIST. WEAR</td><td></td><td></td><td></td><td></td></tr> <tr><td>10. POINT ARCING</td><td></td><td></td><td></td><td></td></tr> <tr><td>11. CONDENSER</td><td></td><td></td><td></td><td></td></tr> <tr><td>12. CAP OR ROTOR</td><td></td><td></td><td></td><td></td></tr> <tr><td>13. PRIMARY VOLTAGE</td><td></td><td></td><td></td><td></td></tr> <tr><td>14. SECONDARY VOLTAGE</td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">L STARTING & CHARGING SYSTEM</th> <th>S</th> <th>U</th> </tr> <tr><td>1. BATT - CABLES - HOLD DOWN</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. MAX. REGULATOR VOLTAGE</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. MAX. REGULATOR AMP.</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. BATTERY TEST</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. WIRING INSPECTION</td><td></td><td></td><td></td><td></td></tr> </table> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="3">M FUEL SYSTEM</th> <th>S</th> <th>U</th> </tr> <tr><td>1. FUEL PUMP</td><td></td><td></td><td></td><td></td></tr> <tr><td>2. CARBURETOR</td><td></td><td></td><td></td><td></td></tr> <tr><td>3. IDLE ADJUSTMENT</td><td></td><td></td><td></td><td></td></tr> <tr><td>4. VACUUM</td><td></td><td></td><td></td><td></td></tr> <tr><td>5. CHOKE</td><td></td><td></td><td></td><td></td></tr> <tr><td>6. ACCELERATOR PUMP</td><td></td><td></td><td></td><td></td></tr> <tr><td>7. FUEL AIR RATIO</td><td></td><td></td><td></td><td></td></tr> <tr><td>8. IDLE 1500 RPM</td><td></td><td></td><td></td><td></td></tr> <tr><td>9. FUEL FILTER</td><td></td><td></td><td></td><td></td></tr> </table>	K ENGINE ANALYZATION			S	U	1. POINT RESISTANCE					2. TIMING					3. TOTAL ADVANCE					4. DWELL					5. SCOPE ANALYSIS					6. CYLINDER BALANCE					7. SPARK PLUGS					8. PLUG WIRING					9. DIST. WEAR					10. POINT ARCING					11. CONDENSER					12. CAP OR ROTOR					13. PRIMARY VOLTAGE					14. SECONDARY VOLTAGE					L STARTING & CHARGING SYSTEM			S	U	1. BATT - CABLES - HOLD DOWN					2. MAX. REGULATOR VOLTAGE					3. MAX. REGULATOR AMP.					4. BATTERY TEST					5. WIRING INSPECTION					M FUEL SYSTEM			S	U	1. FUEL PUMP					2. CARBURETOR					3. IDLE ADJUSTMENT					4. VACUUM					5. CHOKE					6. ACCELERATOR PUMP					7. FUEL AIR RATIO					8. IDLE 1500 RPM					9. FUEL FILTER				
A GENERAL INSPECTION			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. W/S WIPER (OPR.) (BLADES)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. HORN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. BODY																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. WINDOWS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. MIRRORS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. HDLIGHTS ADJUST SWITCHES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
7. TAIL LIGHTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
8. STOP OR TURN LIGHTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
9. LICENSE PLATE LIGHT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
10. INSTRUMENT LIGHT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
11. SEATS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
12. APPEARANCE - OUTSD - INSD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
13. S/B SHOULDER HARNESS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
14. FLARES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
15. FIRST AID KIT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
D UNDER CAR INSPECTION			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. BALL JOINTS - KING PINS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. SHOCK ABSORBER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. ENGINE OIL LEAKAGE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. SPRINGS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. SPRING SHACKLES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. GAS TANK																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
7. FRAME																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
8. HEADER PIPE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
9. MUFFLER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
10. TAIL PIPE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
11. EXHAUST PIPE SUPPORTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
12. HEAT RISER VALVE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
13. EXHAUST MANIFOLD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
E TIRES			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. RIGHT FRONT	/32																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
2. LEFT FRONT	/32																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
3. RIGHT REAR	/32																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
4. LEFT REAR	/32																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
5. WHEELS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. TIRE PRESSURE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
F LUBRICATION			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. CHASSIS LUBE SERVICE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. OIL CHANGE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. OIL FILTER CHANGE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. AIR FILTER - OIL - PAPER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. TRANSMISSION FLD. LEVEL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. DIFFERENTIAL LEVEL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
7. WHEEL BEARINGS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
8. BRAKE FLUID LEVEL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
9. P.C.V. - VALVE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
10. STEERING GEAR LEVEL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
G SMOG DEVICE			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. P.C.V. SYSTEM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. EXHAUST SYSTEM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
H ENGINE MECHANICAL			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. NOISY																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. COMPRESSION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. OIL CONSUMPTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. CRANKCASE BLOW BY																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. TIMING CHAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
I DRIVE TRAIN			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. CLUTCH OPERATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. CLUTCH FREE TRAVEL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. TRANS. OPERATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. TRANS. LINKAGE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. TRANS. - REAR SEAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. DRIVE SHAFT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
7. U-JOINTS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
8. DIFF. OPERATION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
9. PINION SEAL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
10. AXLE REAR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
J COOLING SYSTEM			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. RADIATOR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. RADIATOR HOSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. HEATER OR HOSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. FAN BELT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. WATER PUMP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. FREEZE PLUG																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
7. PRESSURE CAP TEST																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
8. COMBUSTION LEAK TEST																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
K ENGINE ANALYZATION			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. POINT RESISTANCE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. TIMING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. TOTAL ADVANCE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. DWELL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. SCOPE ANALYSIS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. CYLINDER BALANCE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
7. SPARK PLUGS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
8. PLUG WIRING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
9. DIST. WEAR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
10. POINT ARCING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
11. CONDENSER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
12. CAP OR ROTOR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
13. PRIMARY VOLTAGE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
14. SECONDARY VOLTAGE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
L STARTING & CHARGING SYSTEM			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. BATT - CABLES - HOLD DOWN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. MAX. REGULATOR VOLTAGE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. MAX. REGULATOR AMP.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. BATTERY TEST																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. WIRING INSPECTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
M FUEL SYSTEM			S	U																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
1. FUEL PUMP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
2. CARBURETOR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
3. IDLE ADJUSTMENT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
4. VACUUM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5. CHOKE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
6. ACCELERATOR PUMP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
7. FUEL AIR RATIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
8. IDLE 1500 RPM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
9. FUEL FILTER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															

INSPECTED AND SERVICED DATE _____ BY _____ ALL WORK COMPLETED DATE _____ BY _____

ITEM NEEDING REPAIRS		MATERIAL LIST				
REMARKS (Indicate by Item Number)	CONDITION CORRECTED (INTLS)	ITEM	R/C	QNTY.	PART NO.	PRICE
		OIL				
		OIL FILTER				
		AIR FILTER				
		SMOG VALVE				
		HOSE				
		SPARKS PLUGS				
		POINTS				
		CONDENSER				
		ROTOR				
		DIST. CAP				

Fig. 1—Programmed Maintenance Safety Test and Inspection Form

SECTION 720-500-100

Collision Repairs

3.16 Collision repairs, including painting, glass, and upholstery work usually are done by outside specialists. Few Bell System motor vehicle force groups are structured to include facilities for this work. Collision work in most cases involves insurance claims and legal matters, requiring bids or estimates of damage, and several outside body repair companies must be consulted. It is very important to analyze collision repair estimates, because often there are major discrepancies, and not all estimates will cover the same items. It also is important for motor vehicle supervision to establish a good working relationship with company people who are responsible for the legal aspects involved with company motor vehicle accidents.

Associated Equipment Repairs

3.17 Associated equipment items include all power-operated equipment installed on vehicles such as diggers, derricks, winches, personnel lifts, and power units, etc. It can involve other equipment such as trailers, small engines, etc, which are normally charged to the tool account. Repairs to any of this special equipment must be closely supervised by qualified motor vehicle personnel to assure safe operation when repairs are completed. The greatest concern must be given to inspection of aerial lift equipment, power ladders, derricks, etc, prior to releasing the equipment for use after repairs. This inspection must include visual and operational testing to assure complete safety for the work force. Figure 2 is an example of an Aerial Device Inspection Form. The ladder and lift equipment is especially important, since it holds the workmen in the air.

3.18 Repairs to associated equipment can be scheduled as an integral feature of a PM plan. Many necessary maintenance items, such as lubrication, hydraulic filter changes, checks of safety devices, and minor repairs, can be performed on the scheduled PM basis. Scheduling of major repairs should be coordinated with the vehicle users. Where an actual PM plan is not in use, a separate inspection plan must be used. All inspections and subsequent repairs must conform to *manufacturers' specifications* and *approved company practices*. Modifications must be performed only after consultation with the manufacturer.

E. Manufacturer Warranty

3.19 Manufacturer warranty work is an important part of any fleet maintenance plan for the following reasons:

- (a) Economic considerations
- (b) Vehicle safety and legality.

3.20 Unnecessary repair expense often is incurred when full warranty rights are not used. This is a common problem with nearly all fleet maintenance groups, and is caused by difficulties in scheduling vehicles for return to dealers or agencies. Serious problems may affect the vehicle user because of out-of-service time required.



Because of the increasing requirements for safety and emission standards, the practice of repairing new or nearly new vehicles without factory concurrence or proper technical specifications should be avoided.

3.21 Warranty reimbursement can be obtained for work done by telephone employees in telephone garages or centers. However, prior agreement for the program must be obtained from factory fleet service before this can be done. Local or regional factory representatives should be consulted when there are questions regarding application of warranty rights.

F. Appearance

General

3.22 Appearance has become a significant factor in the maintenance of the Bell System fleet. Appearance items include washing, polishing, repainting, and all other costs associated with maintaining and improving the appearance of company-owned vehicles. The new vehicles are bright and attractive, and it is important to maintain them. The public image presented, as well as employee morale, depends on how well the appearance of the fleet is preserved.

Washing

3.23 Vehicle washing is generally performed on a regular basis, and scheduling is determined by type of service, environmental conditions, and

SECTION 720-500-100

special appearance requirements. Because conditions and requirements vary, several methods are used to wash vehicles. Employee washing (usually in conjunction with carwash machines) is used in some places, but often a contractor for washing is used. Normally, the contractor will wash the vehicles on company premises, eliminating the need for moving vehicles.

Polishing

3.24 Polishing is a very expensive appearance-improvement method. It should be considered only for unusual requirements, since it is a short-life improvement in appearance.

Repainting

3.25 For vehicles that require appearance improvement and will remain in service for over one year, repainting should be considered. The new standard two-tone paint with striping is expensive and cannot be considered for vehicles which are scheduled for replacement. A first class paint job with decals and striping on a van can cost \$250 per vehicle, and is recommended only for vehicles expected to be in service for at least two to three years.

Graffiti Removal

3.26 In large metropolitan areas, a rather expensive problem is graffiti, or the defacing of vehicles. Rapid removal is desirable for two reasons:

- (a) Most forms of graffiti are easily removed when fresh.
- (b) Clean, unmarked vehicles seem to be a less likely target for vandalism.

There are effective chemicals to remove graffiti, but occasionally spot repainting is required to restore the vehicle to proper appearance standards. (Spray cans for this are available through Western Electric Company).

G. Lubrication

3.27 Lubrication services are most effectively performed as a part of systematic PM procedure. Although lubrication needs vary due to vehicle service demands, weather conditions, etc, the fleet as a whole has similar requirements.

The Bell System fleet, because of its size and type of vehicles, lends itself better to lubrication and PM work being scheduled on a time basis rather than on mileage. The combined PM inspection and lubrication service also is an opportunity for visual inspection.

3.28 Due to advances that have been made in recent years with extended life engine oils and other lubricants, motor vehicle manufacturers have been able to extend recommended lubrication intervals. Most manufacturers now recommend the use of multiviscosity engine oils (10W-30 or 10W-40), and the recommended oil change intervals for many engines have been extended to 6000 miles. Engine oil filters should be changed at the same time as crank-case oil for two reasons:

- (1) Leaving a quart or more of contaminated oil in the system lessens the advantages gained in changing the oil.
- (2) Filtration is lost due to the partially plugged oil filter.

Chassis lubrication also has been extended to the same or longer intervals. The six months (or 6000-mile) interval has resulted in proper operation. Six months or 6000 miles oil change and lubrication intervals are recommended except where vehicle warranties prohibit or lubrication is recommended at greater mileage.

3.29 Generally, the major oil companies produce comparable lubricants, and the use of high-quality products from a reputable manufacturer ensures satisfactory results. The American Petroleum Institute (API) has provided a standard system of classifying engine oils and other lubricants. The American Society for Testing Materials has established tests for these materials. These designations, along with SAE viscosity ratings, are specified by vehicles manufacturers for particular applications.

3.30 Although different requirements are specified for certain vehicle makes and models, a typical lubrication and maintenance chart is shown in Fig. 3. Appropriate charts should be available to the maintenance forces as an aid for conducting proper and complete lubrication and maintenance service.

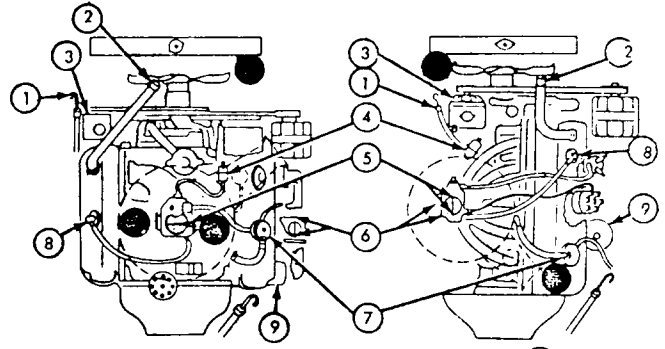
3.31 Associated equipment requirements for lubrication should be scheduled to follow

LUBRICATION AND MAINTENANCE CHART

ENGINE

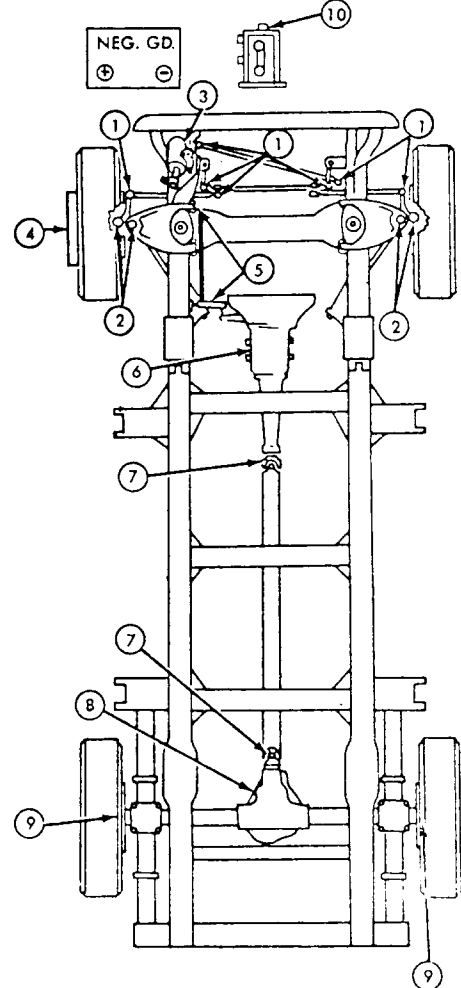
NORMAL SERVICE

- Engine Coolant – Check level when refueling
 Drain Locations
- 1 Crankcase Dipstick – Check oil level when refueling
 - 2 Oil Filter Cap
 - 3 Power Steering Pump – PSF (4) Check fluid level
 - 4 Fuel Filter – (24) Change
 - 5 Carburetor Choke Shaft and Cam – CC (4) Apply Solvent
 - 6 Manifold Heat Valve – S – (4) Apply Solvent
 - 7 Crankcase Inlet Air Cleaner (R) Check function
 - 8 Ventilator Valve (R) Check function
 - 9 Oil Filter – Replace every oil change
- Carburetor Air Cleaner (R) Clean every second oil change
 Distributor Cam and Wick EO, DCL Lubricate during Point Service
- Battery (2) Check electrolyte level
- 10 Brake Master Cylinder – HTF (4) Check fluid level



CHASSIS

- 1 Steering Linkage Ball Joints – MG (4) Lubricate
- 2 Front Suspension Ball Joints – MG (4) Inspect, (24) Re-lubricate
- 3 Steering Gear (Manual) MP or MG (4) Check Lubricant Level
- 4 Front Wheel Bearings and Brakes MG (R) Inspect Lubricant during brake inspection
- 5 Clutch Torque Shaft and Bellcrank MG (4) Lubricate
- 6 Transmission (Manual) – AA or MP (4) Check fluid Level (32) Drain & Refill
- 6 Transmission (Automatic) AA (4) Check Fluid Level (32) (R) Initial Drain and Refill
- 7 Universal Joints (4) Inspect Seals for Leakage
- 8 Rear Axle/Sure Grip – HL or SGL (4) Check Fluid Level: 83/8", Maintain Level 1/8 to 1/4 below Filler Plug. Spicer 60, Maintain Level to bottom of Filler Plug.
- 9 Rear Wheel Bearings – MG (R)
 Semi-Floating: Lubricate when Axle Shafts are removed.
 Full-Floating: Inspect Lubricant every 12 months or 50,000 miles.



COMPLETE BODY LUBRICATION

EVERY ,000 MILES ●●●

- Hood latch and hinges
- Door latches, lock cylinders and door hinges
- Trunk lid (or tailgate) hinges and latches
- Front seat tracks
- Glove box door latch and hinge
- Courtesy light switch buttons
- Apply Silicone lubricant to all door, window, trunk (or tailgate) rubber-weather seals

KEY TO LUBRICANTS

PSF	Power Steering Fluid	MG	Multi-Purpose Grease NLGI Grade 2E.P.
CC	Carburetor Cleaner	MP	Multi-Purpose Gear Oil
S	Mainifold Heat Valve Solvent	AA	DEXRON Automatic Transmission Fluid
EO	Engine Oil	HL	Hypoid Lubricant (Except Sure-Grip)
DCL	Distributor Cam Lubricant	SGL	Sure-Grip Lubricant
HTF	High Temperature Brake Fluid		

Fig. 3—Lubrication and Maintenance Chart—Normal Service

individual manufacturer recommendations. Lubrication time for the vehicle provides an excellent opportunity to incorporate inspection, lubrication, and maintenance of the associated equipment.

H. Tires

3.32 An essential part of any maintenance plan is an effective tire program. Tire repair and replacement can be done by the telephone company employee, or a contractor can be used to supply, repair, and mount tires. As in other vehicle maintenance items, tires play an important part in vehicle safety, out-of-service time, and costs.

3.33 Tires may be purchased on a "confirming" WE requisition, taking delivery of tires and tubes from National Fleet Account suppliers. They can be brought directly from local tire suppliers, and the local tire supplier also can provide the tire service work.

3.34 Tire contractors usually provide out-of-hours servicing, including checking tire pressure, airing of tires, and tread-depth gauging on all vehicles in a garage. They also can answer road services calls, and repair, mount, and balance tires. This type of tire program usually cuts out-of-service time for vehicle users while reducing maintenance personnel requirements. However, sufficient supervision is required to monitor tire inspections, audit the contractor procedures and schedules, and authorize tire replacements.

3.35 Particular importance must be given to the quality of new tires purchased. Tires purchased under National Fleet Account procedures are usually specified as original equipment manufacture (OEM), which are first quality and the standard of quality used by vehicle manufacturers. Close supervision must be used when tires are purchased and delivered locally to prevent substitution of a lower quality tire.

3.36 Significant tire cost savings can be obtained by using recaps or retreaded tires, particularly on heavy trucks, but quality must be assured. This can best be monitored by use of known processors. The subject of tires and tire care is covered in Section 720-305-300.

4. MAINTENANCE PLANS

A. General

4.01 The maintenance plan or combinations of plans must fit the needs of the specific area and groups involved. Continued surveillance and evaluation of the maintenance methods should determine the need for changes and improvements.

4.02 Throughout the System, maintenance requirements are basically decentralized, with the vehicles disbursed to relatively small company garages. For this reason, repair and maintenance work often is contracted to repair shops or dealers. Although this method is a money-saving approach in certain areas, rising labor costs and unavailability of night service have caused consideration of the fleet contractor method or telephone company vehicle maintenance employees. The use of company employees is not always as economical, but it usually assures less down time and improved vehicle availability.

4.03 Within each company there must be administrative standards or administrative plans relating directly to the motor vehicle maintenance job. These should outline procedures for maintenance personnel, as well as define driver/operator responsibilities. Items that should be included in this information are as follows:

- Driver use of Motor Vehicle Trouble Report
- Instructions on how to handle breakdowns or road calls
- Use of work requests or repair orders
- Handling and processing of bills and vouchers
- Vehicle records
- Fueling and servicing instructions
- Purchase of tires, batteries, and antifreeze
- Safety instructions
- Oil and greases
- Special equipment operation instructions
- Policies for vehicle inspection and repairs.

B. In-House

4.04 In-house maintenance is a maintenance operation performed in the company garage, using company employees. Not only inspection and repair work is done in the garages, but also fueling and lubrication. However, with practically all in-house plans, some types of work are sent out or contracted. Tire repairs, major engine repairs, radiator, paint, upholstery, and glass work are examples of repairs commonly done by outside contractors.

4.05 In-house maintenance involves capital investment in garage and shop equipment such as car hoists, lubrication equipment, engine analyzers, air compressors, fuel tanks, dispensing pumps, etc. When these large capital investments are multiplied by the number of garages in a company or area, the total is quite large. Labor and supervision costs are factors that relate directly to job efficiency. When the work force is properly sized and the job well organized, savings can be realized over the amount paid for similar work on the outside, and satisfactory results and performance can be obtained.

4.06 With vehicle personnel working out-of-hours shifts, the vehicle down time (out-of-service time) can be held to an absolute minimum.

C. Outside Fleet Contractor

4.07 The outside fleet contractor as used here is contrasted to the previously discussed "wash contractor" and "tire contractor." It is intended that the purpose of the contractor would be a substitution for the regular vehicle maintenance forces (mechanics, etc) that would normally perform inspections, PM service, and repairs in company garages.

4.08 The outside fleet contractor plan can be an economical method of maintaining a fleet when a competent, willing contractor is available. Down time can be minimal when contractors are properly scheduled. However, caution should be used in selecting a contractor. Above average supervision is required until complete confidence in the contractor is assured through demonstrated results.

4.09 Contractors should be required to have a signed agreement with the company, setting

forth in detail all areas of performance. The agreement must cover details such as security, insurance, costs for labor and supplies, qualifications of contractor personnel, etc. It is imperative that agreements be approved by company legal departments prior to execution.

4.10 The contract maintenance plan has various adaptations and is often used in combination with other maintenance methods. In many instances, it is used to provide only a specific type of work, eg, the use of a mobile brake shop for brake jobs. Contractors also can be used to provide contract labor (mechanics) to augment company forces.

4.11 Fleet contractors may be used for work arranged on a per-job basis. A purchase order is written by the motor vehicle force and a bill rendered by the contractor for each job.

4.12 The two basic approaches for fleet contractor use are contractor use of existing in-house facilities, or the contractor supplies all facilities.

(1) Using existing in-house facilities (hoists, work bays, benches, and major equipment) is most practical and economical when the facilities are already available because the contractor can quote lower prices with his lower investment.

(2) Where contractors are already equipped, it is more economical for the contractor to use his own facilities. The contractor may be reluctant to invest in new equipment. It may be necessary for the company to buy some equipment to obtain the proper contractor.

D. Guaranteed Maintenance

4.13 This plan utilizes a fleet maintenance contractor under actual contract to a company to guarantee the satisfactory operation of a given fleet for a flat sum of money per month or per mile. The plan may be all-encompassing, including lubrication, tires, appearance, towing, road service, all ordinary repairs, and miscellaneous items. An agreement must be signed defining the duties and responsibilities of the contractor. This should include the normal requirements for security, insurance, quality, etc.

4.14 In adopting the guaranteed maintenance plan, it must be recognized that nearly all vehicle maintenance becomes a fixed expense.

SECTION 720-500-100

Contractually, the money must be paid per vehicle whether no work is performed or a complete overhaul is done. Flexibility in controlling maintenance expense is lost for the term of the agreement.

4.15 While the plan appears attractive, experience has shown the following limitations:

- (a) The availability of companies supplying this service is poor, and the quality of the work must be monitored constantly.
- (b) There is little need for company employees other than the necessary supervision to check quality, and if the contractor is lost, there is no motor vehicle force available to assume the maintenance job.

E. Outside Repair Shop and Dealer Services

4.16 The majority of companies use the outside shop-dealer method for maintaining at least part of their fleet. Little use is made of this method by companies with in-house facilities, but some major repairs normally are sent out. Other areas use this method for most of their maintenance. In sparsely populated localities, with few vehicles spread over great distances, the vehicle users take the vehicles to shops and dealers for repairs and service.

4.17 Outside shops are any repair business (general repair, specialist shops, etc) serving the general public. Some of these shops cater to fleet work exclusively. The term dealer denotes the automobile dealer engaged in selling and servicing a particular make of car or truck. The dealer is often used for repairing the particular make he services. Trouble of a highly technical or troublesome nature is best handled by a dealer, because of his factory affiliation and trained personnel. Most warranty work is done by dealers.

4.18 With large sums of vehicle maintenance money spent in the outside dealer shops, it is imperative that fleet managers have realistic controls and well-qualified people administering them. Few employees besides experienced motor vehicle personnel are qualified to contract for repairs, check for quality of work done, accuracy of bills against the work done, or properly distribute amounts in accordance with standard accounting procedures. Motor vehicle maintenance is a specialty, and as in any technical job, it is much more effective

for one qualified person to present technical information to another. It is more effective when a qualified motor vehicle person takes a vehicle into a repair shop to have trouble corrected, particularly when complicated associated equipment is involved.

4.19 Most outside work is done on a per-job basis.

It is desirable in most instances to have each repair job billed individually (and promptly) so that expenses are kept current and a copy of work done is available for vehicle records. When dealing with outside repair shops (suppliers in general), a written order always should be presented prior to the start of repair work. Verbal repair orders often have the effect of issuing a "blank check." The repair order or purchase order, in addition to requested work items, should show information such as company vehicle number, mileage, and accurate billing address instructions.

F. Inspector-Repairman Plan

4.20 This plan is unique in that it enables a company to service fleet maintenance needs with relatively few company motor vehicle employees and minimal capital investments in garage equipment. This contributes to keeping "fixed expenses" at low levels. An inspector-repairman inspects the vehicle regularly and orders the needed repairs from dealers, shops, or contractors. He is able, at times, to make minor adjustments and repairs without help. Normally, work is not performed on a vehicle without his approval.

4.21 This plan is designed to accomplish four major purposes:

- (1) Meet maintenance objectives at the lowest possible cost
- (2) Eliminate in-house maintenance
- (3) Serve a rapidly growing fleet, increasing not only in number of vehicles, but spread over a large geographical area
- (4) Seek improvement in community relations, through the use of outside repair shops and dealers.

4.22 If a "traveling" inspector-repairman has too many vehicles to inspect and covers considerable distance, he has little time for getting vehicles to

shops and checking quality of work that has been done. The fleet manager also can lose control of expenses due to involvement of the vehicle using forces.

4.23 The introduction of the MASTIC plan (see 4.24) in conjunction with inspector-repairmen, lends further effectiveness. Out-of-service time can be greatly reduced through the use of outside fleet contractors (using their own mobile facilities on company premises, and working at night).

G. Mobile Automotive Safety Test and Inspection Center (MASTIC)

4.24 MASTIC is the newest maintenance concept in use. It has proven to be a reliable maintenance method accepted by vehicle users and fleet maintenance personnel.

4.25 As the name implies, MASTIC is mobile, and is actually a portable diagnostic clinic with the following facilities to perform:

- Complete vehicle inspection
- Lubrication services
- Electronic engine analysis
- Tests, adjustments, and servicing
- Minor repairs and parts replacements.

The hardware consists of two basic units:

- (1) A specially designed trailer equipped with ramps which become lubrication racks and under-chassis inspection centers when vehicles are driven onto them
- (2) A large walk-in van truck with the body designed to accommodate parts, supplies, and diagnostic tune-up facilities. Incorporated into these two units are all necessary equipment items required to perform the desired job.

4.26 The MASTIC plan, combined with several other maintenance plans, forms a cohesive strategy. The MASTIC concept is very flexible and can be adapted to serve fleet maintenance needs on any scale. It is adjustable, scaled to perform only certain basic functions of maintenance, or expanded to accomplish a complete PM program.

There would be little advantage for a company to consider MASTIC if garages were already equipped with necessary shop equipment. However, MASTIC could be considered to service outlying areas or a number of garages not outfitted with shop equipment.

4.27 Prior to establishing a MASTIC program, a study should be conducted to determine:

- (a) The size of the fleet to be served
- (b) The extent (amount) of work desired
- (c) How MASTIC will fit into or relate to the other maintenance plans being used or proposed.

4.28 Labor for MASTIC can be provided by company employees or supplied from a fleet contractor. Due to the number of vehicles serviced, parts and supplies can be purchased with substantial savings from automotive jobbers with warehouse facilities. With frequent deliveries of parts, storage problems on the MASTIC unit can be avoided.

4.29 With national interest increasing toward licensing of repair shops and fleet maintenance operations, MASTIC presents a desirable approach for complying with future requirements. Company MASTIC units already have been licensed in California as "Official Emission Stations" by the Bureau of Automotive Repair to meet requirements of the Air Resources Board, and are legally installing the certifying emission control devices on fleet vehicles.

4.30 Capital investment for a MASTIC unit capable of servicing 2000 to 2500 vehicles runs approximately \$50,000. Compared to investments of at least \$20,000 for equipping each fixed garage operation, significant advantages can be seen for MASTIC.

5. PERSONNEL AND WORKING ENVIRONMENTS

A. General

5.01 Automotive systems are becoming more complex, and include more technical and sophisticated environmental protection requirements. It is essential that fleet maintenance be approached with technically competent personnel.

5.02 Management personnel involved in fleet maintenance within the various companies,

SECTION 720-500-100

although performing similar functions in their level of management, have many titles. For simplification here, foreman will denote the first level, supervisor the second level, and manager the third level. Only the line organization will be referred to in this part.

B. Qualifications

5.03 The foreman *must*, and the supervisor *should* be technically qualified, competent to direct the actual maintenance operations, and have abilities to establish and maintain good interdepartmental relationships. Although technical motor vehicle knowledge is desirable for managers, they have a much broader scope of responsibility, and the administrative aspects of their jobs generally require more "professional managerial talent."

C. Foreman Responsibilities

5.04 A foreman is directly concerned with *actual basics* of maintaining the fleet and has responsibilities for all of the facets involved in this highly specialized job. Items included as responsibilities are:

- Preventive maintenance, repairing, and servicing
- Quality, performance, and cost controls
- Coordinating suppliers and contractor services
- Vehicle legal requirements
- Safety—applied to vehicle users and motor vehicle force
- Factory warranty and recall scheduling
- Maintenance of garages and shop equipment
- Inventories and security of parts and supplies
- Authorizing expenditures (within delegated limits)
- Checking and approving bills and vouchers
- Training, evaluations, and personnel relations.

5.05 Foremen can be responsible for maintenance budgets of \$180,000 (100 vehicles) to \$1,000,000 (700 vehicles) or more annually. A large portion of this money is spent with suppliers, shops, and contractors. These responsibilities definitely require a person well-qualified in technical matters, of sound judgment, and of the highest integrity.

5.06 Depending on the particular strategy employed and the structure of the organization, the foreman either has company employees or contractors to supervise. One responsibility which deserves special emphasis is employee and/or contractor honesty and protection of company property. Because of the universal application of automotive parts and supplies, this is a *very* important phase of management responsibility.

D. Supervisor Responsibilities

5.07 Depending on the structure of the organization, supervisors often are responsible for more than just motor vehicle work. In most cases, it is only the "functional" motor vehicle unit (traditionally the in-house operation) that designates supervisors as being devoted exclusively to a motor vehicle job. Staff responsibilities frequently become an additional part of the supervisor's job.

E. Nonmanagement Employee Responsibilities

5.08 Nonmanagement motor vehicle employees are identified by various titles throughout the companies, but basically, those performing maintenance work are skilled mechanics. Usually hired from outside industry as trained specialists, these people dedicate themselves to performing all types of vehicle work (usually within the scope of the in-house plans). Where the inspector-repairman plan is used, this title makes up nearly the entire vehicle force. These personnel also are skilled in all phases of maintenance, and should be able to perform some repairs and function with minimum direct supervision.

F. Physical Work Environment

5.09 Physical work environments vary widely from the open (no equipment center) to completely equipped shops. Each maintenance strategy has its own basic environment requirements, and must be evaluated and designed to fit the prevailing conditions.