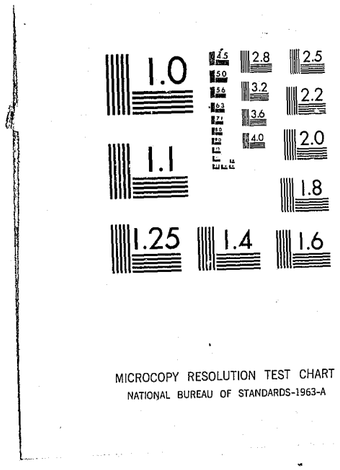

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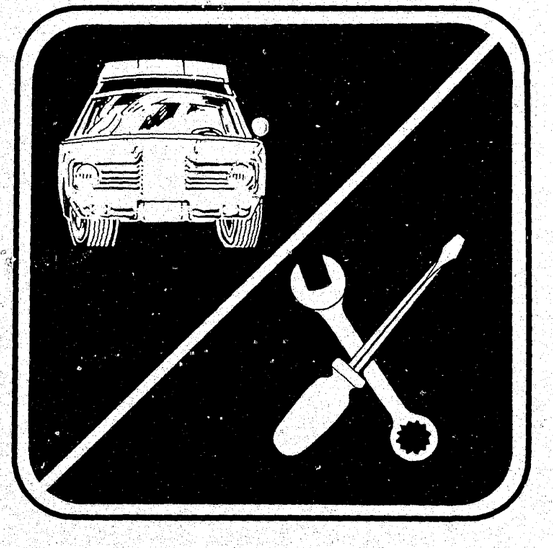
Technology Assessment Program

INFORMATION CENTER

A GUIDE— SCHEDULED PREVENTIVE MAINTENANCE



A Program of the National Institute of Justice conducted by the
INTERNATIONAL ASSOCIATION of CHIEFS of POLICE
Publication Date: June 1981

About the Technology Assessment Program

The Technology Assessment Program is sponsored by the Office of Development, Testing, and Dissemination of the National Institute of Justice (NIJ), U.S. Department of Justice. The program responds to the mandate of the Justice System Improvement Act of 1979, which created NIJ and directed it to encourage research and development to improve the criminal justice system and to disseminate the results to Federal, State, and local agencies.

The Technology Assessment Program is an applied research effort that determines the technological needs of justice system agencies, sets minimum performance standards for specific devices, tests commercially available equipment against those standards, and disseminates the standards and the test results to criminal justice agencies nationwide and internationally.

The program operates through:

The **Technology Assessment Program Advisory Council (TAPAC)** consisting of nationally recognized criminal justice practitioners from Federal, State, and local agencies, which assesses technological needs and sets priorities for research programs and items to be evaluated and tested.

The **Law Enforcement Standards Laboratory (LESL)** at the National Bureau of Standards, which develops voluntary National performance standards for compliance testing to ensure that individual items of equipment are suitable for use by criminal justice agencies. The standards are based upon laboratory testing and evaluation of representative samples of each item of equipment to determine the key attributes, develop test methods, and establish minimum performance requirements for each essential attribute. In addition to the highly technical standards, LESL also produces user guides that explain in nontechnical terms the capabilities of available equipment.

The **Technology Assessment Program Information Center (TAPIC)** operated by the International Association of Chiefs of Police (IACP), which supervises a national compliance testing program conducted by independent agencies. The standards developed by LESL serve as performance bench marks against which commercial equipment is measured. The facilities, personnel, and testing capabilities of the independent laboratories are evaluated by LESL prior to testing each item of equipment, and LESL helps the Information Center staff review and analyze data. Test results are published in Consumer Product Reports designed to help justice system procurement officials make informed purchasing decisions.

All publications issued by the National Institute of Justice, including those of the Technology Assessment Program, are available from the National Criminal Justice Reference Service (NCJRS), which serves as a central information and reference source for the nation's criminal justice community. For further information, or to register with NCJRS, write to the National Institute of Justice, National Criminal Justice Reference Service, Washington, DC 20531.

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Office of Development, Testing,
and Dissemination
National Institute of Justice

A GUIDE—
SCHEDULED PREVENTIVE MAINTENANCE

Prepared by the

TECHNOLOGY ASSESSMENT PROGRAM INFORMATION CENTER
RESEARCH DIVISION
INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE
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June 1981

PREFACE

This guide for Scheduled Preventive Maintenance for Police Vehicles is intended to establish a *basic* reference tool for the average small fleet.

This report should be used by departments who would normally rely on the owner's manual supplied with vehicles intended for use by the general public. The service cycles recommended in the owner's manual are not suited to vehicles in daily patrol use; and those recommended in this report have been found to be better for this purpose by the committee. This document is not expected to find extensive use in major police departments which have had to develop extensive and detailed schedules of their own. It is not an operations manual or a fleet managers handbook and should not be expected to replace such a manual.

It should be noted that the committee which formulated this guide was composed of experienced fleet managers, automotive manufacturers service representatives and highly knowledgeable persons in the field of police vehicle maintenance. This level of detail was suggested by their first-hand experience in the field.

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A GUIDE—SCHEDULED PREVENTIVE MAINTENANCE

INTRODUCTION

Scheduled preventive maintenance (PM) is a program of regularly performed inspections, and services to fleet vehicles and related components, at appropriate mileage or time intervals, to maximize safe, reliable, and cost effective operation during each vehicle's service life span.

An effective program provides a method for early detection of actual and potential mechanical and physical appearance problems with a system of corrective actions. A good PM program can prevent costly breakdowns with resultant damage and excessive downtime. In addition, well-maintained vehicles, because of their better condition, enable the agency to realize optimum resale value at time of disposal.

The purpose of this guide is to provide law enforcement administrators and fleet managers with a schedule as to when particular preventive-maintenance items should receive PM service. The 3,000-mile interval is for city vehicles which normally operate at low speeds and have high idle times. The 5,000-mile schedule is for county and state vehicles which see mainly highway driving operation. With today's energy problems, necessitating a decrease in engine idle time, and new SF engine oils, some cities may be able to move from the 3,000-mile schedule to a 4,000-mile schedule and some state and county agencies may be able to move up to a 6,000-mile schedule. If these extended service intervals exceed the manufacturer's recommendations, then have the manufacturer approve your agency's use of extended service intervals.

This program is logically designed around engine oil change, oil and air filter change, lubrication, and emission controls service. Police vehicle operations invariably are in the "severe service" category. Modifying the manufacturer's schedule to accommodate specific agency needs will not invalidate the vehicle warranty conditions, provided the agency's cycle of service is at least equal to the schedule recommended by the vehicle manufacturer.

The following is a representative program which reflects a preventive maintenance concept. This guide is designed to provide the fleet administrator of any agency throughout the law enforcement community with information necessary to develop an effective preventive maintenance program for his specific needs whether service is accomplished in a central garaging facility, satellite operation, or through contracted services.

This guide tells when and what should be checked. Refer to your vehicle manufacturer's shop manual(s) for details on how a mechanic should perform the work properly. Shop manuals should be available for each model, make, and year of vehicle the agency has in its fleet.

A GUIDE
SCHEDULED PREVENTIVE MAINTENANCE CYCLE OF SERVICES
POLICE PATROL CARS
3,000 MILE SERVICE INTERVALS

SERVICE INTERVALS #	MILEAGE	1 SAFETY CHECK	2 INSPECTION— CRITICAL COMPONENTS	3 VEHICLE APPEARANCE	4 ENGINE OIL AND OIL FILTER CHANGE	5 CLEAN AIR FILTER ELEMENT	6 CHANGE AIR FILTER ELEMENT	7 LUBRICATE	8 TIRES— ROTATE & BALANCE	9 SERVICE EMISSION CONTROLS	10 SERVICE AUTOMATIC TRANSMISSION	11 BRAKE INSPECTION	12 SERVICE FRONT WHEEL BEARINGS	13 ANALYZE ENGINE PERFORMANCE	14 CHECK STARTER/ CHARGING SYSTEMS	15 INSPECT COOLING SYSTEM	16 EXTENDED VEHICLE SERVICE
1	3,000	•	•	•	•						•						
2	6,000	•	•	•	•	•		•	•		•						
3	9,000	•	•	•	•					•	•	•					
4	12,000	•	•	•	•		•	•	•			•	•	•	•		
5	15,000	•	•	•	•												
6	18,000	•	•	•	•	•		•	•	•	•	•					•
7	21,000	•	•	•	•												
8	24,000	•	•	•	•		•	•	•			•	•	•	•		
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19	57,000	•	•	•	•												
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REFER TO PROCEDURES

A GUIDE
SCHEDULED PREVENTIVE MAINTENANCE CYCLE OF SERVICES
POLICE PATROL CARS
5,000 MILE SERVICE INTERVALS

SERVICE INTERVALS #	MILEAGE	1 SAFETY CHECK	2 INSPECTION— CRITICAL COMPONENTS	3 VEHICLE APPEARANCE	4 ENGINE OIL AND OIL FILTER CHANGE	5 CLEAN AIR FILTER ELEMENT	6 CHANGE AIR FILTER ELEMENT	7 LUBRICATE	8 TIRES— ROTATE & BALANCE	9 SERVICE EMISSION CONTROLS	10 SERVICE AUTOMATIC TRANSMISSION	11 BRAKE INSPECTION	12 SERVICE FRONT WHEEL BEARINGS	13 ANALYZE ENGINE PERFORMANCE	14 CHECK STARTER/ CHARGING SYSTEMS	15 INSPECT COOLING SYSTEM	16 EXTENDED VEHICLE SERVICE
1	5,000	•	•	•	•						•						
2	10,000	•	•	•	•	•		•	•		•						
3	15,000	•	•	•	•				•	•	•						
4	20,000	•	•	•	•		•	•	•		•	•	•	•			
5	25,000	•	•	•	•												
6	30,000	•	•	•	•	•		•	•	•	•	•					•
7	35,000	•	•	•	•												
8	40,000	•	•	•	•		•	•	•			•	•	•	•		
9	45,000	•	•	•	•					•	•						
10	50,000	•	•	•	•	•		•	•			•					
11	55,000	•	•	•	•												
12	60,000	•	•	•	•		•	•	•	•	•	•	•	•	•		•
13	65,000	•	•	•	•												
14	70,000	•	•	•	•	•		•	•			•					
15	75,000	•	•	•	•					•	•						
16	80,000	•	•	•	•		•	•	•			•	•	•	•		
17	85,000	•	•	•	•												
18	90,000	•	•	•	•	•		•	•	•	•	•					•
19	95,000	•	•	•	•												
20	100,000	•	•	•	•		•	•	•			•	•	•	•		

REFER TO PROCEDURES

PREVENTIVE MAINTENANCE PROCEDURE— POLICE PATROL VEHICLES

(1) **SAFETY CHECK** ALL SERVICE INTERVALS

- **Tires**
  Visually check condition of tires to include spare. Measure tread depth and adjust inflation pressure. (Note excessive or abnormal wear conditions which may indicate suspension alignment problems.)
- **Lights**
  Check all service, directional, and emergency light systems for proper operation. Replace lamps as needed.
- **Windshield Wipers and Washers**
  Check condition of wiperarms and blades. Check aim and flow of washer spray. Fill washer reservoir with washer solvent.
- **Fluid Levels**
  Check fluid levels in transmission, differential, steering sector or power steering pump, and master cylinder. Low level in any system indicates a problem. Locate and correct the problem or defect and add fluids as required.
- **Battery**
  Check condition of heatshield, hold-down clamps, and cable ends, top off electrolyte level as necessary with distilled water, clean top and terminals as necessary. Refer to your vehicle manufacturer's shop manual for procedures to check "Freedom" batteries.
- **Heater-Defroster-Air Conditioner Systems**
  Check switches, valves, and ducting doors for proper operation.
- **Exhaust System**
  Inspect the complete exhaust system including the catalytic converter and heatshielding. Check for broken, damaged, missing, or poorly positioned parts. Inspect for open seams, holes, or any condition which could allow exhaust fumes to enter the vehicle.
- **Steering and Suspension Components**
  Conduct a "look" and "shake" inspection of the power cylinder/rack assembly, idler arm, tie rods, and drag link. Visually check both upper and lower control arms, shafts, and bushing. Inspect condition of both upper and lower ball joints and shocks. Check springs/torsion bars and rear springs for condition and ride height.
- **Frame/Sub-Frame and Cross Member**
  Visually check for "drive-over" and/or vehicular damage and fatiguing.
- **Drive Shaft—U-Joints**
  Conduct a "look" and "shake" inspection for seal leakage and joint failure. Relubrication is not recommended. Replace U-joints as necessary.

(2) **INSPECT CRITICAL COMPONENTS** ALL SERVICE INTERVALS

Check condition of all under-hood heatshields, and the routing of all hoses and wiring to insure maximum protection from radiated exhaust heat. Inspect all coolant hoses, power steering hoses, fuel line hoses, engine mounts, accessory drive belts, and other under-hood plastic or rubber components. Replace immediately if any evidence of degradation is noted.

(3) **VEHICLE APPEARANCE** ALL SERVICE INTERVALS

Visually inspect vehicle exterior for condition of body, paint, and glass area. Inspect vehicle interior to determine condition of seats and upholstery. Check lap/shoulder belts, door latches, lock, and handles for proper operation.

(4) **ENGINE OIL AND OIL FILTER CHANGE** ALL SERVICE INTERVALS

A high-quality engine oil has been installed by the vehicle manufacturer. This oil shall be drained at 3,000 or 5,000 miles and an SAE 30 viscosity oil meeting A.P.I. designation "for service SE," or "for service SF" when available, shall be used thereafter, except for certain winter operations in ambient temperatures below 32 degrees Fahrenheit (F.), when SAE 10W-40 oil will be used. Should it be necessary to add oil to the engine prior to the initial change, use the same SAE weight oil used at the initial change e.g., SAE 10W-40 or SAE 30. In very high temperature areas and when sustained high speed pursuits are routine, SAE 40 weight may be used for better shear stability and engine protection. (Note—Engine oils which do not have both a SAE grading number and the "SE" or "SF" service classification indicated on the container should not be used.) Change engine oil filter at each engine oil change. Use only the filter type recommended by the vehicle manufacturer or a high quality equivalent replacement.

(5) **CLEAN AIR CLEANER ELEMENT** EVERY 2nd SERVICE INTERVAL

Remove air cleaner element at 6,000- or 10,000-mile intervals for inspection. Shake dust, dirt, and other foreign material from the filter element. If element is not contaminated with oil or clogged with debris, inhibiting "free breathing," wipe dust from inside the filter housing and reinstall the air cleaner element.

(6) **CHANGE AIR CLEANER ELEMENT** EVERY 4th SERVICE INTERVAL

Air cleaner elements may be changed more frequently if operating conditions warrant it; however, changes should not exceed the recommended interval of 12,000 or 20,000 miles.

(7) **LUBRICATE CHASSIS** EVERY 2nd SERVICE INTERVAL

Clean accumulated dirt and grease from around the "zerk" fitting on each component fitted for relubrication. (Note—On vehicles originally fitted with "plugs," remove plugs and replace with an appropriate grease fitting.) Lubricate both upper and lower ball joints and all steering linkages. Check ball joints for excessive wear and grease seal damage. Replace ball joints if end play exceeds tolerances specified by manufacturer.

(8) **TIRES—ROTATE AND BALANCE** EVERY 2nd SERVICE INTERVAL

To equalize tread wear, tires shall be rotated at 6,000- or 10,000-mile intervals or per tire manufacturer's recommendations. Should excessive or abnormal wear conditions develop, the cause will be isolated and corrected and tires rotated prior to this scheduled service. Because of the relative change in tire-wheel-brake assembly resulting from rotation, rebalancing is recommended. Refer to the National Bureau of Standards (NBS), Law Enforcement Standards Laboratory (LESL) publication 480-33 entitled *Guide to High Speed Patrol Car Tires* for further details and to the tire manufacturer for proper rotation on your vehicles.

(9) **EMISSION CONTROLS SERVICE** EVERY 3rd SERVICE INTERVAL

Clean the positive crankcase ventilation valve and the crankcase inlet air cleaner, in solvent, initially at 9,000 or 15,000 miles to insure proper operation. Replace both elements at 18,000- or 30,000- mile intervals. Service manifold heat control valve, with approved solvent, not oil, to obtain free "open-close" valve shaft movement in bushings. Check exhaust gas recirculation valve operation per manufacturer's specifications. Adjust air injection pump drive belts tension. Inspect fuel vapor canister for cracks or damage, replace as necessary. (Note—Unless vehicle is operated frequently in dusty condition, canister filter requires no other service.)

(10) **AUTOMATIC TRANSMISSION SERVICE** EVERY 3rd SERVICE INTERVAL

Drain transmission and change filter at 9,000- or 15,000-mile intervals. Transmission adjustments per manufacturer's specifications will be performed each time the pan is removed for fluid change. Replace pan, using new gasket, and refill with fluid type recommended by manufacturer. Use dip-stick to determine exact fill requirement.

(11) **BRAKE INSPECTION** EVERY SERVICE INTERVAL UNTIL PAD LIFE IS ESTABLISHED

Inspect all brake line hoses and master cylinder for signs of leaks or damage. Inspect front brake pads initially at every service interval to establish a pad life projection. Replace pads as necessary, and service calipers to insure proper "sliding" action. Inspect rear brake linings, wheel cylinders, and parking brake cables and linkage at same intervals, again to establish a projected lining life. Replace linings and service components as necessary. Clean dust and dirt from backing plates and rear drums before reassembly.

(12) **FRONT WHEEL BEARINGS SERVICE** EVERY 4th SERVICE INTERVAL

Front wheel bearings should be inspected whenever rotors or drums are removed to service the brake system. Remove and discard the old seal, and thoroughly remove all old lubricant from the bearings and hub by cleaning in solvent. Inspect both inner and outer bearings and races for signs of "pitting" or other surface distress. Discard if either condition is noted. Force clean wheel bearing grease into bearing cage, utilizing a coned pressure type unit. Apply a thin coat of grease to the hub races and sealing surfaces, install a new seal, reassemble, and adjust the wheel bearings per manufacturer's specifications. Use only a high-temperature wheel bearing grease specified for use with disc brakes.

(13) **ENGINE TUNE-UP** EVERY 4th SERVICE INTERVAL

Check cylinder compression. Service automatic choke and linkage to insure proper start-run operation. Analyze engine performance with oscilloscope and infra-red exhaust gas analyzer. Clean or replace spark plugs and other ignition components as required. Adjust carburetor, set idle speed and timing per make/model year vehicle specifications.

(14) **STARTER/CHARGING SYSTEM CHECKS** EVERY 4th SERVICE INTERVAL

Electronically check starter motor cranking speed and current draw. Check alternator charging rate. If deficiencies are noted, correct as necessary.

(15) **COOLING SYSTEM INSPECTION** EVERY 6th SERVICE INTERVAL

Visually inspect entire cooling system for leaks, damage, or other signs of needed repair. Use caution when removing the radiator cap, if coolant is at operating temperature, to avoid contact with coolant or steam. Check condition of coolant. If rusty or dirty in appearance, drain the entire cooling system, flush, and refill with a 50% mixture of ethylene gylcol antifreeze to protect against corrosion, boiling, and freezing to -34 degrees Fahrenheit. (Note—A concentration exceeding 70% ethylene glycol to water inhibits the coolant's ability to dissipate heat and must not be used.) Inspect radiator cap for proper sealing and reinstall. The radiator cap must be fully tightened to prevent loss of coolant and to insure that the coolant will return to the radiator from the coolant recovery system. Maintain coolant level between the "max" and "min" marks on the coolant recovery tank when the engine is at operating temperature. Clean any accumulation of dirt and insects from the radiator, air conditioner condenser, and auxiliary (external heavy-duty) transmission oil cooler, as necessary.

(16) **EXTENDED VEHICLE SERVICE**

Should any vehicle remain in service considerably beyond its normally anticipated service life span, maintenance services shall continue in accordance with this established schedule. Safety and emissions-related repairs will not be deferred because the vehicle is nearing survey.

SPECIAL INTEREST SECTIONS

GASOLINES

Fuel Requirements

Use gasolines having a minimum anti-knock index (octane value) of 87, (R+M)/2. This designation is comparable to a 92 Research Octane Number. (Subscribed to by all vehicle manufacturers with reference to units produced as Police Vehicles.)

UNLEADED GASOLINE ONLY must be used in vehicles equipped with a catalytic emission control system. All automobiles so equipped have labels located on the instrument panel and adjacent to the fuel filler cap or door that state "UNLEADED GASOLINE ONLY." These vehicles also have fuel filler tubes specially designed to accept the smaller diameter unleaded gasoline dispensing nozzles only. Use of leaded gasoline in a catalytic equipped vehicle is a violation of federal law with fines up to $10,000 per vehicle. Leaded gas will cause the converter to eventually clog, thereby making the vehicle inoperable due to extreme exhaust back pressure. Secondly, the converter will heat up to extremely high temperatures which may cause the vehicle to catch on fire.

Vehicles not equipped with catalytic emission control systems may be operated on either LEADED or UNLEADED gasolines providing the same octane values shown above.

Materials Added to Fuel

Indiscriminate use of fuel system additives should be avoided. Many of these materials formulated for gum and varnish removal may contain highly active solvents or similar ingredients that can be harmful to gasket and diaphragm materials used in fuel system components.

ENGINE OILS

Oil is the "life blood" of any engine. It must lubricate and cool, as well as *protect* internal components from rust, corrosion, varnishing, and acids, all of which are contaminating by-products of the combustion process. In normal service, the additives formulated in the engine oil to provide this protection deteriorates and the oil itself becomes contaminated. For this reason, all engine manufacturers recommend frequent oil changes at regular intervals to maximize engine service reliability.

To identify oils, the Society of Automotive Engineers (SAE) and the American Petroleum Institute (API) have devised a two-part classification system for engine lubricants: first, oils are graded by their "viscosity" or "thickness" and ability to flow at various temperatures, and second, they are rated according to their suitability for various kinds of engine service.

Oil viscosities generally have been separated into seven different grades and assigned identifying *SAE numbers.* The thinner oils are assigned lower SAE numbers, while those with higher viscosities are given higher numbers. Hence the origin of the familiar SAE-5W, -10W, -20W, -20, -30, -40, -50 markings on oil cans. With rare exception, oils with viscosity higher than SAE-50 are classified as gear lubricants.

A difference exists, for example, between oils rated SAE-20W and plain SAE-20, but the difference is not significant unless the simple letter designation "W" is understood. The letter was taken from the word "winter" and signifies that the oil has been tested for flow rate characteristics at 0 degrees F., and viscosity graded at SAE-20W. Conversely, it would be appropriate for the plain SAE-20 oil to be given the letter "S" for "summer," as the plain -20 weight oil (and those higher numbers without letters) is tested at high temperatures. The viscosities of these oils are measured at 210 degrees F., or the normal established engine crankcase operating temperature.

Although all oil viscosities change with temperature (hot oil thins, cold oil thickens), they do not change to the same extent. Those oils that thin and thicken relatively little as they are heated and cooled are said to have a "*High Viscosity Index.*" Oils refined from parafinnic crudes have naturally high "V.I." properties. However, not even the finest parafinnic oil had a viscosity index high enough to provide both cold weather cranking capability in winter and adequate film strength characteristics in summer; hence, motorists had to switch between winter and summer grades of oils.

"All Weather" oils were made possible following World War II with the development of synthetic "Viscosity Index Improvers." V.I.-Improvers keep oils from thinning excessively with increases in temperature. As an example, SAE-10W-40 engine oil is basically a 10W (0 degrees F.) quality base stock oil, plus "V.I. Improver" additives. As the formulation is heated, the "V.I. Improver" will stabilize the flow rate characteristics of the "too thin" 10W stock to provide the viscosity of an SAE-40 grade oil at 210 degrees F.

While the SAE number system identifies oils only by viscosity characteristics, the API markings indicate the type engine service and performance standards the oil was formulated to meet:

API letter codes beginning with the letter "S" designate that the oil was formulated for use in spark ignited engine service.

- "SA" rated oils are straight mineral oils not required to meet any API lubricating standards.
- "SB" rated oils are for light duty use and contain only limited additives. They offer some anti-scuff protection and are less apt to oxidize or promote corrosion.
- "SC" rated oils were formulated for automobiles produced in the 1960's. They contain anti-wear additives (zinc derivitives), sludge formation and corrosion inhibitors.
- "SD" rated oils (1968-70) were developed with improved anti-wear additives and other inhibitors to specifically address oxidation and high performance engine valve train problems.
- "SE" rated oils (1971-current), in terms of quality, supersede the "SD" rated oils. They are compounded with a complete package of anti-scuff, anti-wear, anti-oxidation, anti-acid, anti-corrosion, and other additives.

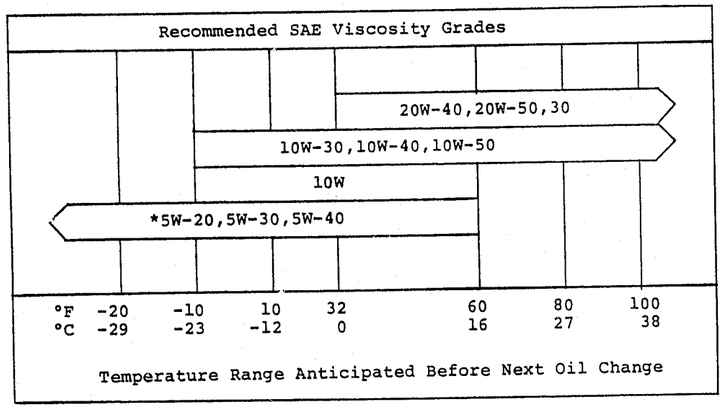
NOTE: Some "SF" rated oils have been formulated to meet new API specifications with upgraded total additive packages.

API letter codes beginning with the letter "C," designate that the oil was formulated for use in compression-ignited engine service (Diesel).

- "CA" rated oils are for light-duty diesel engine service.
- "CB" rated oils are for moderate-duty commercial applications.
- "CC" rated oils are formulated for "supercharged" commercial and/or vehicular applications.
- "CD" rated oils are used in heavy-duty, extended service commercial application.

All major automobile manufacturers recommend for best performance and maximum engine protection, under all types of operation, only those engine oils which:

a. Meet the requirements of API classification "for service SE" (or "for service SF, when available").
b. Have the proper SAE grade number consistent with the ambient temperature range indicated in the following chart:



*SAE 5W-20 NOT recommended for sustained high speed vehicle operation.

Vehicles Equipped with High Performance V-8 Engines

If the vehicle is used for maximum performance service, (very high speed or frequent, very rapid acceleration), the engine requires heavier-than-normal lubricating oil. This is due to the high engine speeds, critical bearing loads, and the extreme frictional temperatures of moving parts developed in these engines under this type of operation.

For maximum engine protection under these conditions, the heaviest available engine oil of "SE" quality (SF if available) that provides satisfactory cold engine starts should be used; while SAE 30 and SAE 40 are recommended, multi-viscosity oils SAE 20W-40 and SAE 20W-50, may also be used.

When outside temperatures are consistently below 32 degrees F., SAE 10W-30 or SAE 10W-40 are recommended for ease in cold engine cranking. It should be noted, however, that these oil grades should not be used, even in cold weather, if the vehicle will be used in maximum performance operations.

INSPECTION OF CRITICAL COMPONENTS

In recent years, under-hood temperatures have increased substantially, particularly in police patrol vehicles. This temperature increase is attributable in part to the addition of several engine components which are required to meet more stringent federal and state emissions standards. The resultant higher temperatures have an adverse effect on various rubber and plastic parts located in the engine compartment.

To provide the best vehicle performance, assure safe operation, and avoid the adverse effects of component failure, it is recommended that the following list of parts be inspected periodically with parts to be replaced immediately if any evidence of degradation is noted.

Inspections of these components should be performed at regularly scheduled maintenance cycles of 3,000- or 5,000-mile intervals.

Parts to be Inspected and Instructions

ROUTING OF HOSES AND WIRING—
Insure maximum protection from radiated exhaust heat and contact with components which will cause mechanical wear.

HOSES FOR COOLANT, POWER
STEERING, FUEL LINE, VACUUM
BRAKE, AND HYDRAULIC FLEX LINES—
Inspect for evidence of mechanical damage, brittle rubber, cracking, while also checking for abrasions, excessive swelling, or leaks which indicate deterioration of the "rubber." Pay particular attention to those surfaces nearest high heat sources, e.g., exhaust system components.

ENGINE MOUNTS AND STEERING
COLUMN RUBBER COUPLINGS—
Inspect surfaces for heat hardening. Inspect the rubber-to-metal bond by applying slight load to component. (Load may be applied to steering coupling by turning steering wheel. Load may be applied to engine mounts by prying engine slightly upward.) Separation or deep localized cracks warrant replacement.

ACCESSORY DRIVE BELTS—
Inspect all belts for any cuts, cracks, and "stripping;" replace as necessary. Check routing to prevent interference with other engine components. Adjust tension to specifications outlined in service manual.

TIRES FOR POLICE PATROL VEHICLES

Tires are one of the major subsystems of an automobile. They serve as the interface between the road surface and the vehicle's brake, suspension, and steering systems. Tires provide the traction necessary to start, stop, and steer the vehicle. They contribute to the characteristics of the vehicle ride by absorbing a portion of the initial impact with road defects, and tires significantly affect the performance generated by the vehicle's engine/power train combination.

Replacement tire purchases represent a sizeable portion of a police agency's transportation budget. If tires are not properly selected and well maintained, they wear faster, reduce fuel efficiency, and adversely affect the vehicle's handling characteristics.

SELECTION

Tires for police patrol cars should be selected on the basis of how they will be used. It would not be cost effective, for example, to put high speed pursuit tires on patrol units that seldom exceed 60 mph and never exceed 75 mph.

IT IS IMPORTANT TO REMEMBER THAT REGULAR PASSENGER CAR TIRES SHOULD NEVER BE PURCHASED FOR USE ON PATROL CARS INVOLVED IN PURSUIT OPERATIONS. Regular passenger car tires, regardless of grade or construction, are not suitable for high speed police use, as the Department of Transportation regulations require that they be certified for speeds up to only 85 mph. Patrol cars which may be used in sustained high-speed operations should be equipped with

tires that are certified by the manufacturer for use at speeds to 125 mph. (Note—Because of liability considerations, all major automobile manufacturers, when producing vehicles ordered as "Police Units," equip the cars with tires certified as Police Pursuit Tires.)

While unit cost is a very important factor to be considered when buying replacement tires, the lowest cost tire may not be the cheapest tire in the long run. Some agencies purchase tires on the basis of low bid only, believing that justification for departing from this process is too difficult. Others use the low-bid method because the total economics of buying tires is not considered. *Tire costing goes beyond the initial purchase price.* A tire, for example, that costs $30.00 and lasts 12,000 miles is just as expensive as one that costs $100.00 and lasts 40,000 miles. In fact, when the cost of removing, replacing, and balancing the tires is considered, the $30.00 tire is far more expensive.

In addition, when evaluating replacement tire expenditures for police applications, factors such as the safety of personnel and equipment, vehicle control under emergency conditions, and the potential economic cost of a disastrous tire failure must be thoroughly considered.

Once the proper replacement tires have been selected, the job is not ended. In addition to identifying and correcting the mechanical causes of abnormal tire wear, a systematic maintenance program to include mounting, balancing, wheel alignment, and tire rotation is essential to maximize tread wear and tire performance.

Properly inflated, well-maintained, and inspected tires will lessen the risk of high speed tire failure and ultimately reduce vehicular related injuries and property damage. Radial tire pressure should be checked daily by the officer(s) using the vehicle.

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