ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 51

[FRL-4531-6]

Inspection/Maintenance Program Requirements

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: This action establishes performance standards and other requirements for basic and enhanced vehicle inspection and maintenance (I/M) programs. Section 182 of the Clean Air Act Amendments of 1990 requires EPA to review, revise, and republish such guidance, taking into consideration investigations and audits of I/M programs, as well as the requirements set out in the Act for such programs. This action will provide more effective control of in-use mobile source emissions in ozone and CO nonattainment areas.

EFFECTIVE DATES: This rule will take effect on November 5, 1992. (See section XIII in the **SUPPLEMENTARY INFORMATION** for a discussion of the effective date.)

The information collection requirements in §§ 51.353, 51.365, 51.366 and 51.371 have not been approved by the Office of Management and Budget (OMB) and are not effective until OMB approves them and a technical amendment to this effect is published in the **Federal Register.**

ADDRESSES: Materials relevant to this rulemaking are contained in Docket No. A-91-75. The docket is located on the first floor at the following address and may be inspected from 8:30 a.m. until noon and from 1:30 p.m. until 3:30 p.m. Monday through Friday. A reasonable fee may be charged for copying docket material. Environmental Protection Agency, The Air Docket, room M-1500 (LE-131), Waterside Mall, Attention: Docket No. A-91-75, 401 M Street SW., Washington, DC 20460.

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II. Summary of the Final Rule

Motor vehicle inspection and maintenance (I/M) programs are an integral part of the effort to reduce mobile source air pollution. Despite being subject to the most rigorous vehicle pollution control program in the world, cars and trucks still create about half of the ozone air pollution and nearly all of the carbon monoxide air pollution in United States cities, as well as toxic contaminants. Of all highway vehicles, passenger cars and light trucks emit most of the vehicle-related carbon monoxide and ozone-forming hydrocarbons. They also emit substantial amounts of nitrogen oxides and air toxics. Although we have made tremendous progress in reducing emissions of these pollutants, total fleet emissions remain high. This is because the number of vehicle miles travelled on U.S. roads has doubled in the last 20 years to 2 trillion miles per year, offsetting much of the remarkable technological progress in vehicle emission control over the same two decades. Projections indicate that the steady growth in vehicle travel is continuing. Ongoing efforts to reduce emissions from individual vehicles will be necessary to achieve our air quality goals.

Under the Clean Air Act as amended in 1990 (the Act), the U.S. Environmental Protection Agency is pursuing a three-point strategy for achieving major emission reductions from transportation sources. The development and commercialization of cleaner vehicles and cleaner fuels represent the first two points. It will be many years however before these cleaner cars dominate our vehicle fleet and none of these efforts will be successful unless we ensure that cars in use are properly maintained. The focus of today's action is the third point, in-use control, specifically I/M programs. The concept behind I/M is to ensure that cars are properly maintained in customer use. I/M produces emission reduction results soon after the program is put in place. I/M will also be critical if we are to fully realize the benefits of the new clean vehicles and clean fuels programs scheduled for phase-in over the next ten years.

To put I/M in perspective, it is important to understand that today's cars are absolutely dependent on properly functioning emission controls to keep pollution levels low. Minor malfunctions in the emission control system can increase emissions significantly, and the average car on the road emits three to four times the new car standard. Major malfunctions in the emission control system can cause emissions to skyrocket. As a result, 10 to 30 percent of cars are causing the majority of the vehicle-related pollution problem.

Unfortunately, it is rarely obvious which cars fall into this category, as the emissions themselves may not be noticeable and emission control malfunctions do not necessarily affect vehicle driveability.

Effective I/M programs, however, can identify these problem cars and assure their repair. We project that sophisticated I/M programs in the most polluted cities around the country would cut vehicle emissions by 28 percent, at a cost of about $12.50 per vehicle per year.

This represents a major step toward the Act's requirement that the most seriously polluted cities achieve a 24 percent overall emissions reduction by 2000.

The Act requires that most polluted cities adopt either "basic" or "enhanced" I/M programs, depending on the severity of the problem and the population of the area. In total, I/M programs will be required in 181 areas, 56 of which do not now have I/M. The moderate ozone nonattainment areas, plus marginal ozone areas with existing I/M programs, fall under the "basic" I/M requirements. Enhanced programs will be required in serious, severe, and extreme ozone nonattainment areas with urbanized populations of 200,000 or more; CO areas that exceed a 12.7 ppm design value with urbanized populations of 200,000 or more; and all metropolitan statistical areas with a population of 100,000 or more in the Northeast Ozone Transport Region.

Basic and enhanced I/M programs both achieve their objective by identifying vehicles that have high emissions as a result of one or more malfunctions, and requiring them to be repaired. An "enhanced" program covers more of the vehicles in operation, employs inspection methods which are better at finding high emitting vehicles, and has additional features to better assure that all vehicles are tested properly and effectively repaired.

The Act directs EPA to establish a minimum performance standard for enhanced I/M programs. The standard must be based on the performance achievable by annual inspections in a centralized testing operation. However, neither the Act's language nor EPA's performance standard requires states to implement annual, centralized testing. States have flexibility to design their own programs if they can show that their program is as effective as the "model" program used in the performance standard.

Of course, the more effective the program, the more credit a state will get towards the 24 percent emission reduction requirement discussed above. Furthermore, effective programs help to offset growth in vehicle use and allow for new industrial growth.

EPA and the states have learned a great deal about what makes an I/M program effective since the Clean Air Act, as amended in 1977, first required I/M programs for polluted cities. There are three major keys to an effective program:

- The ability to accurately fail problem cars and pass clean cars requires improved test equipment and procedures, given the advanced state of current vehicle design.
- Comprehensive quality control and aggressive enforcement are essential to assure that testing is done properly.
- Skillful diagnostics and capable mechanics are important to assure that failed cars are fixed properly.

These three factors are lacking in most of today's I/M programs. Specifically, the idle and 2500 rpm/idle short tests used in current I/M programs are not highly effective at identifying and reducing in-use emissions from the types of vehicles which now and in the future will comprise the vehicle fleet. Second, covert audits by EPA and state agencies typically discover improper testing 50 percent of the time in test-and-repair stations, indicating that quality control is very poor and enforcement is lacking. Experience has shown that quality control at test-only stations is usually much better. Finally, diagnostics and mechanics education are often poor or nonexistent.

EPA and state audits as well as research at EPA's Motor Vehicle Emission Laboratory have shown that the simple idle test used in today's I/M programs has serious shortcomings. This type of test worked well for pre-1981 carbureted, non-computerized cars because typical emission control problems involved "rich" air/fuel mixtures that affected idle as well as cruising emissions. Today's high-tech cars with sensors and computers that continuously adjust engine operations are more effectively tested with procedures that include cycles of acceleration and deceleration under loaded conditions. Sensor and computer operation and emissions must be tested during the high-emission acceleration and deceleration driving modes to most reliably identify high polluting cars. At the same time, the visual inspection of emission control devices is becoming less relevant. This is because tampering and misfueling rates have declined significantly with the phase-out of leaded gasoline and the difficulty of tampering with today's high-tech cars.

Another shortcoming of current I/M tests is the inability to detect excessive evaporative emissions. Over the last several years, EPA has learned that vapors which escape from various points in the vehicle fuel system present a huge source of hydrocarbon emissions, generally greater than tailpipe exhaust. No existing I/M program is testing for these evaporative emissions.

EPA has developed two new functional tests which can determine whether vehicle evaporative emission control systems are operating properly:

- A simple pressure check to find leaks in the fuel system (e.g., bad gas cap or cracked evaporative system hose). This test is simple and cheap.
- A check of the "purge" system that removes gasoline vapors stored in the charcoal canister and routes them to the engine where they can be burned as fuel. This test is done during transient testing, that is, while the vehicle is in a driving mode. The purge system does not operate during idle.

With these issues in mind, EPA proposed on July 13, 1992 (57 FR 31058) and is taking final action today to establish, as part of the enhanced I/M program, a high-tech emissions test for today's high-tech cars. The test simulates actual driving and allows accurate measurement of tailpipe emissions and evaporative system purge. It can also accurately measure NO_x emissions. This is especially useful in states where NO_x control is important to address the ozone problem. The test reliably identifies vehicles needing repair.

The high-tech test is so effective that biennial test programs yield almost the same emission reduction benefits as annual programs. In EPA's research, doing the test right has proved much more important than doing it often.

The equipment required for high-tech testing costs about $140,000 per lane (although that estimate may be high), versus $15,000 to $40,000 for today's idle test equipment. The total test time (i.e., the time it takes from when you enter the lane until you leave) is also longer, 10 to 15 minutes versus about five minutes for today's test. But this does not have to translate to higher costs for drivers.

EPA estimates that a high-tech test in a high-volume system will cost about $17 per car, including oversight and administration costs. On a biennial basis though, the cost drops to about $9 per year. That is in line with the average cost of today's programs and is cheaper than many (today's average costs are about $18 for decentralized programs and about $8 for centralized programs). As with today's programs, there is also a cost to repair failed vehicles. But good diagnostics will make repairs efficient, and fuel economy savings of 7 to 13 percent that result from the repairs will largely offset these costs. In addition, manufacturer-provided warranties will cover the cost of repair for some vehicle owners.

Centralized tests are run by states or by a single contractor in an area, while decentralized tests are run by small businesses in the city. High tech I/M testing can be done by independent,

small businesses. Of course, since the testing equipment is more expensive, we would expect fewer, higher volume, test-only stations. Some such independent, high volume, test-only stations are now operating in several states (e.g., Texas and California). Regardless of whether the testing is decentralized or centralized, good quality control and enforcement are critical for a fair, effective program.

High-tech I/M is at least three times more effective than even the better-designed and well-run of today's I/M programs and remains much better even if evaporative system pressure checks are added to these existing, better programs. This high-tech program is so effective that it can be performed biennially, cutting testing costs and consumer time in half, while losing only about 3 percentage points of emission reductions.

As mentioned earlier, states with the most polluted cities are facing a Clean Air Act mandate to reduce overall emissions 24 percent by 2000. Effective high-tech I/M programs can make an enormous contribution toward this goal.

Not only is high-tech I/M one of the most effective air pollution control programs we know of, it's also the most cost effective. At $500 per ton on a biennial basis (excluding convenience costs), high-tech I/M is seven times more cost effective than more stringent new car tailpipe standards and at least 10 times more cost effective than additional controls beyond reasonably available control technology (RACT) on small and large industrial sources. It is cost effective even if no value is given to the CO and NO_x reductions obtained. Biennial testing will effectively cut inconvenience costs in half from what they are in I/M programs today. If one assumes an inconvenience cost of $15 per motorist (based on 45 minutes of total time to drive to the station, get a test and drive back, and a value of $20 per hour) high-tech I/M is still very cost effective, at $1,600 per ton.

To summarize, high-tech I/M provides many benefits:

- 28 percent reduction in vehicle VOC emissions plus 30 percent reduction in vehicle CO emissions, and 9 percent reduction in vehicle NO_x emissions.
- Cost of $500 per ton, ten times less than most other options (excluding convenience costs).
- Biennial testing with less hassle and lower testing costs for car owners (resulting in an annual cost similar to or lower than today's norm).
- Fuel savings to help offset repair costs.
- A big step toward the minimum 24% overall VOC reduction required for the most polluted cities by 2000 and more room for industrial and vehicle miles travelled growth.

EPA's conclusions about the effectiveness and cost effectiveness of various I/M options are based on nearly 15 years of experience with I/M, along with ongoing research on a wide variety of mobile source emission control programs and technologies.

EPA is taking final action today to establish performance standards (benchmark or model programs) for basic and enhanced I/M programs and to establish other requirements related to the design and implementation of I/M programs. The performance standard for basic I/M programs remains the same as it has been since initial I/M policy was established in 1978, pursuant to the 1977 amendments to the Clean Air Act. The performance standard for enhanced I/M programs is based on high-tech tests for new technology vehicles (i.e., those with closed-loop control and, especially, fuel-injected engines), including a transient loaded exhaust short test incorporating hydrocarbon (HC), carbon monoxide (CO), and oxides of nitrogen (NO_x) cutpoints, an evaporative system integrity (pressure) test and an evaporative system performance (purge) test. Today's action also details various requirements for design and implementation of all I/M programs. These include improved enforcement, quality assurance, quality control, test procedures, on-road testing, and other aspects of the program. Some of these requirements apply to both basic and enhanced programs, and some to only enhanced programs. Today's action repeals Appendix N, Part 51, Chapter I, Title 40 of the Code of Federal Regulations, which contained obsolete provisions that have not been applied by EPA since the 1970s.

The final rule has a variety of minor changes from the proposal based on comments received regarding specific details of the regulatory text. Several major changes have also been made in response to public comment. First, EPA decided to drop from the rule "provisional equivalency" for test-and-repair programs in enhanced I/M areas. Public comment was strongly against this option and state governments made it clear that they saw no way to achieve the performance standard with a test-and-repair system. Second, the final rule allows six additional months for initial implementation of basic and enhanced I/M programs, since the proposed deadlines would have left insufficient time after final action for states to develop and implement complying programs. The reader is referred to the section on Public Participation for a further discussion of these issues and other major issues raised during the public comment period.

III. Authority

Authority for the actions taken in this notice is granted to EPA by sections 182(a), 182(b), 182(c), 184(b), 187(a) and 118 of the Clean Air Act as amended (42 U.S.C. 7401 et seq).

IV. Background of Final Rule

A. Clean Air Act Amendments of 1990

The Environmental Protection Agency (EPA) has had oversight and policy development responsibility for I/M programs since the passage of the Clean Air Act in 1970, which included I/M as an option for improving air quality. With the passage of the Clean Air Act Amendments of 1977, I/M was mandated for areas with long term air quality problems. EPA first established policy for I/M programs in 1978; this policy addressed the elements to be included in State Implementation Plan (SIP) revisions, minimum emission reduction requirements, administrative requirements, and schedules for implementation. Existing policy falls short of today's I/M program needs, however, due to the increasing sophistication of the vehicle fleet, advances in vehicle testing technology, and failure of established policy to keep pace with growing knowledge about actual program design and implementation.

Congress recognized this gap when developing the Clean Air Act Amendments of 1990, which gives EPA and the States some specific directives with regard to I/M programs. EPA must develop different performance standards for "basic" and "enhanced" I/M programs; enhanced I/M is required by the Act in areas with the worst air quality problems and in the Northeast Ozone Transport Region. The performance standard is the minimum amount of emission reductions, based on a model or benchmark program design, which a program must achieve. In addition to the performance standard, the Act directs EPA to address requirements for specific design elements and program implementation in both basic and enhanced programs.

Section 182(a)(2)(B) states that, within one year of enactment, the Administrator shall review, revise, update, and republish in the **Federal Register** the guidance for the States for motor vehicle inspection and maintenance programs required by this Act, taking into consideration the Administrator's investigations and

audits of such programs. The guidance shall, at a minimum, cover the frequency of inspections, the types of vehicles to be inspected (which shall include leased vehicles that are registered in the nonattainment area), vehicle maintenance by owners and operators, audits by the State, the test method and measures, including whether centralized or decentralized, inspection methods and procedures, quality of inspection, components covered, assurance that vehicles subject to a recall notice from a manufacturer have complied with that notice, and effective implementation and enforcement, including ensuring that any retesting of a vehicle after a failure shall include proof of corrective action and providing for denial of vehicle registration in the case of tampering or misfueling. The guidance which shall be incorporated in the applicable State implementation plans by the States shall provide the States with continued reasonable flexibility to fashion effective, reasonable, and fair programs for the affected consumer.

Section 182(c)(3) requires guidance for enhanced I/M which includes a performance standard achievable by a [model or benchmark] program combining emission testing, including on-road emission testing, with inspection to detect tampering with emission control devices and misfueling for all light-duty vehicles and all light-duty trucks subject to standards under section 202; and program administration features necessary to reasonably assure that adequate management resources, tools, and practices are in place to attain and maintain the performance standard.

The concept of a performance standard provides state flexibility, as long as the numerical goal for emission reductions is attained. A State may choose to vary any of the design elements (except those required by the Act) of the model program provided the overall effectiveness is at least as great as the performance standard.

The Act further specifies that each enhanced I/M program shall include, at minimum, computerized emission analyzers, on-road testing devices, denial of waivers for warranted vehicles or repairs related to tampering, a $450 expenditure to qualify for waivers for emissions-related repairs not covered by warranty, enforcement through registration denial unless an existing program with a different mechanism can be demonstrated to have greater effectiveness, annual inspection unless a State can demonstrate that less frequent testing is equally effective, centralized testing unless the State can demonstrate that decentralized testing is equally effective, and inspection of the emission control diagnostic system. These are required design elements of each enhanced I/M program, not merely of the model or benchmark program. In addition, each enhanced I/M State must biennially submit to EPA a comprehensive evaluation of program effectiveness including an assessment of emission reductions achieved by the program. Enhanced I/M must achieve minimum reductions in HC (or volatile organic compound (VOC)) emissions and in NO_x emissions from vehicles in the affected ozone nonattainment areas, and reduction in CO emissions in the affected CO nonattainment areas; the programs must be "in effect" two years from enactment and must comply in all respects with this rule.

B. Guidance Versus Regulation

In its relations with States under Title I of the Act, EPA conventionally uses the term "guidance" to mean informational or interpretive policy adopted apart from notice and comment rulemaking, and lacking a fully binding legal effect. Section 182(a)(2)(B)(ii) requires EPA to issue "guidance" for I/M programs. Section 182(c)(3)(B) requires, however, that state enhanced I/M programs "comply in all respects" with EPA's guidance. Further, "such guidance shall include—(i) a performance standard." EPA interprets this language as requiring EPA, under section 182(c) and the Administrative Procedures Act, to establish a binding performance standard with which States must comply when designing and implementing I/M programs. This type of binding standard can only be imposed through notice and comment rulemaking. See *PPG Industries* v. *Costle*, 659 F.2d 1239 (D.C. Cir. 1981), holding that EPA violated the Administrative Procedures Act by requiring continuous sulphur dioxide compliance monitoring through guidance without first providing public notice and opportunity for comment. Consequently, EPA is promulgating regulations defining the performance standard for enhanced I/M programs, and all of the characteristics of an approvable state enhanced I/M program to meet that performance standard.

As discussed earlier, section 182(a)(2)(B) similarly requires EPA to publish "guidance" addressing numerous aspects of basic I/M programs, and also requires states to incorporate the guidance into their SIPs. One interpretation of this requirement would be that EPA could merely publish nonbinding guidance on basic I/M programs. States could then incorporate the guidance into I/M programs by simply addressing the various aspects of the program described in EPA's guidance. Under this approach, states would not be bound to address such aspects in any specific manner. Alternatively, EPA could adopt binding regulations for basic I/M programs as well. Although this is not required by section 182, EPA has the authority under that section and section 301 of the Act to promulgate regulations as necessary to implement the statute. The experience over the last 15 years has shown that the lack of federal minimum requirements has led to less than fully effective I/M programs. This problem is discussed in great detail later in this preamble. EPA's Inspector General and the General Accounting Office have both cited the lack of regulations as a primary cause for the operating problems in existing I/M programs. These problems include ineffective testing, poor quality control, inadequate quality assurance, and weak enforcement. While EPA has been diligent about alerting the states to these problems when they are found during audits of operating I/M programs, the response on the part of these agencies has been constrained by resources and legal authority, and has been inadequate to solve the problems, especially in test-and-repair networks. EPA believes the only way to insure that states will implement effective and cost-effective programs is to promulgate binding regulations.

V. Discussion of Major Issues

A. Development of New I/M Tests

Studies conducted by EPA's Office of Mobile Sources, at the National Vehicle and Fuels Emission Laboratory and elsewhere, have shown that the idle and 2500 rpm/idle short tests used in current I/M programs are not highly effective at identifying and reducing in-use emissions from the types of vehicles which now do and in the future will comprise the vehicle fleet. For pre-1981 model year passenger cars, for which the I/M tests currently in use were developed and proven, idle testing worked well; typical problems involved rich air-fuel mixtures that affected idle as well as on-the-road emissions. Today's high-tech cars with sensors and computers that continuously adjust engine operations are most effectively tested with procedures that include cycles of acceleration and deceleration under loaded conditions.

EPA has developed a transient short test, also called the IM240 exhaust test, which more closely reflects how vehicles perform under actual driving conditions than do current idle, 2500

rpm/idle, or loaded steady-state emission tests. The transient test more accurately identifies high emitting vehicles, and provides greater assurance of effective repair. The transient test involves a brief driving cycle which is based upon the Federal Test Procedure (FTP), the driving cycle by which new vehicles are certified. This test is similar to the loaded, steady-state tests used in some I/M programs today, but differs in that emissions are measured during acceleration and deceleration of the vehicle. While no I/M program is currently running this test on a production basis, EPA believes there is no significant practical or technical impediment to wide-scale application of the test. The transient test also allows accurate emission testing for NO_x (see detailed discussion in the next section). By its nature, the transient test precludes test-defeating strategies that have been observed in I/M programs (e.g., holding down the accelerator pedal slightly during an idle test or disconnecting or crimping vacuum hoses to effect a passing result at idle or other steady-state condition). Such strategies may work with a steady-state test but would generally increase emissions of at least one pollutant on the transient test. As described in detail below, the enhanced I/M performance standard being established today assumes use of the transient test.

The performance standard being established today also includes tests of the vehicle's evaporative emission control system, an important source of pollutants which is not currently being effectively tested, though some current programs include a visual inspection for canister and gas cap presence. In fact, evaporative emissions rates today are often higher than excess tailpipe emissions. This is not a problem that has arisen on only newer vehicles, but rather its magnitude has only recently been realized through EPA testing. Two new functional tests are included in the enhanced I/M performance standard to address this problem. The Evaporative System Integrity Test (hereafter referred to as the pressure test) checks whether the system has any leaks, and the Evaporative Performance Test (hereafter referred to as the purge test) checks whether captured fuel vapor is correctly removed from the canister and delivered to the engine during vehicle operation.

Significantly greater emission reductions can be gained through the transient, purge and pressure tests, due to higher identification rates of polluting vehicles and greater assurance of effective repair. Transient, purge and pressure testing may be performed in either centralized or decentralized inspection networks, although the cost per test will vary according to the throughput of vehicles in a station.

The transient test and the evaporative system checks being established in today's action represent EPA's best technical judgment on obtaining emission reductions from in-use vehicles. Nevertheless, some have suggested that alternative test procedures could conceivably achieve similar emission reductions, possibly at a lower cost. EPA is open to such alternatives and states may seek approval of alternative tests, contingent upon the state demonstrating to EPA that such alternatives are as effective as EPA's recommended tests and thus will achieve the performance standards. In addition to being effective at identifying vehicles for repair and assuring their repair, alternative tests cannot be accepted unless they maintain a low false failure rate similar to EPA's recommended tests and are similarly resistant to test-defeating strategies. It is of critical importance to consumers, motor vehicle manufacturers, EPA, and the States, that any tests employed in an I/M program be accurate, reliable, fair and effective.

One alternative test procedure, a loaded, steady-state purge test, has been of particular interest to several states. EPA staff developed a transient purge test instead of a steady-state test because our best engineering judgment suggests that steady-state purge testing would result in lower emission reduction benefits as well as higher false failure rate and unnecessary consumer costs. This stems from the fact that purge strategies on high-tech vehicles vary considerably.

A loaded steady-state test has also been suggested as an alternative to the transient exhaust emission test. EPA's mobile source emission factor model includes emission reduction credits for this test for VOC and CO emission reductions. As mentioned above and discussed in detail in the next section, the Clean Air Act requires that enhanced I/M programs in ozone nonattainment areas achieve reductions in NO_x emissions as well. EPA has found that NO_x emission testing (as opposed to visual inspection of emission control devices) is essential for significant NO_x emission reductions. Steady-state loaded testing may identify some high NO_x emitters, and EPA will approve alternative test procedures submitted by states if well supported by data that show they accomplish the objectives stated above and meet the requirements for I/M tests in section 207(b) of the Clean Air Act.

B. Basic I/M Performance Standard

In today's action, EPA is taking final action to establish a model program for basic I/M areas that is generally unchanged from that required pursuant to the Clean Air Act as amended in 1977, and the policy that was in effect prior to enactment of the 1990 Amendments. This performance standard is based on the original I/M program that was operating in New Jersey in the earlier 1970s (see Section C. for an explanation of the performance standard concept). The New Jersey program tested only light-duty passenger cars using a simple idle test. Since that time, light-duty trucks have become a significant part of the fleet and are included in nearly all I/M programs, and more sophisticated steady-state tests have been developed and used in I/M programs to improve the emission reduction performance. The basic I/M performance standard requires about a 5% reduction in highway mobile source VOC emissions. The most stringent I/M program can achieve an emission reduction of over 30%. In response to comments discussed in detail below, today's action also requires that basic I/M programs in ozone nonattainment areas not result in NO_x increases unless a demonstration can be made that such a NO_x increase would not prevent or delay attainment of the air quality standards. Emission reductions from basic I/M programs that exceed those required can be used as offsets for other pollution control efforts.

C. Enhanced I/M Performance Standard

1. Discussion of Standard

In today's action, EPA is establishing a "model" program for enhanced I/M areas, defined below as a specific set of program elements. It is estimated that a typical urban area adopting the model program described below will experience a 28% reduction in emissions of VOCs, a 31% reduction in CO emissions, and a 9% reduction in NO_x emissions from highway mobile sources by 2000 when compared to what the area would experience without an I/M program. This estimate is based on EPA's mobile source emission factor model (MOBILE4.1) and is for illustrative purposes only. As described below, a state will have to use the most current version of EPA's mobile source emission factor model available at the time of SIP submission to demonstrate its program will achieve VOC, NO_x, and/or CO emissions levels that are equal to or lower than those that would be achieved by the "model" program. In

other words, the performance standard relates to emissions remaining in the fleet in a given year after application of the I/M program (and other strategies) not to reductions from a hypothetical non-I/M baseline. The pollutants for which a performance standard will apply depends upon the air quality classifications of the area, i.e., whether it is nonattainment for ozone, CO, or both. Since the Act requires a NO_x performance standard, inspection standards for NO_x emissions must be established in enhanced I/M ozone nonattainment areas and in ozone transport regions. If the Administrator finds, under section 182(b)(1)(A)(i) of the Act pertaining to reasonable further progress demonstrations or section 182(f)(1) of the Act pertaining to provisions for major stationary sources, that NO_x emission reductions are not beneficial in a given ozone nonattainment area, then EPA will allow a waiver of the NO_x performance standard requirement for enhanced I/M; however, programs in such ozone areas shall be designed such that NO_x increases (relative to having no inspection program at all) do not occur. EPA believes that a waiver would be appropriate in such areas because it would be unreasonable to require NO_x reductions where they would not be beneficial. Although section 182(c)(3) does not explicitly provide for such a waiver, EPA believes that Congress would not have intended to require NO_x reductions where it would serve no purpose or be counterproductive.

Section 182(b)(1)(A)(i) of the Act requires moderate ozone nonattainment areas to show "reasonable further progress" in achieving emission reductions (later sections of the Act require serious and worse areas to do the same). A 15% reduction in VOC emissions is required by November 15, 1996, the date by which these areas are required to attain the standard. In addition to this requirement, serious or worse ozone nonattainment areas are required under section 182(c)(2) of the Act to provide for an additional 3% reduction each year after 1996 (averaged over each 3 year period after that year). That section also sets milestones of every three years after 1996 for states to demonstrate these reductions are actually occurring. Thus, serious ozone areas must achieve a total of a 24% reduction by November 15, 1999, and severe and extreme areas must continue to obtain a 3% per year reduction after 1999 until the relevant attainment date. Moderate CO areas are required to meet the ambient standards by December 31, 1995 and serious CO areas are required to attain by December 31, 2000. EPA in today's action is setting these attainment and progress requirement dates as milestones for states to meet in designing and implementing the I/M program. In other words, a state's preferred I/M program must match the emission levels of the "model" program on each of these milestone dates, except as provided below.

In designing an I/M program to meet the emission targets for all of the milestones that apply, each affected area must determine the local emission levels predicted for the model program on these milestone dates. This is accomplished by selecting in the emission factor model all non-I/M inputs, (i.e., fleet size, fleet composition, ambient temperature, traffic speeds, fuel volatility, fuel reformulation, etc.) to reflect actual, local conditions and evaluating the resulting emission levels, on each milestone date, assuming that the model I/M program is implemented. This process is then repeated with the local I/M program design and the resulting emission levels are compared to the model program scenario. The emission factor model accounts for other mobile source strategies, such as Tier 1 vehicles, reformulated gasoline, and oxygenated fuels. To the extent that these strategies will reduce emission factors, the model program/performance standard approach automatically accounts for these changes and for updated versions of the model. Once derived, the locally specific emission levels then become the emission targets which the enhanced I/M program areas must achieve or surpass for SIP approval.

Moderate ozone nonattainment areas must meet an emission reduction target for the basic I/M program by November 15, 1996. Serious or worse ozone areas that have to implement enhanced I/M are not required to meet an emission target by November 15, 1996, but they are required to meet various program phase-in schedules (see Implementation Deadlines). These areas must meet the target on November 15, 1999. Severe and extreme ozone areas will also have to demonstrate that emission targets are being met both by November 15, 1999 and every three years after November 15, 1999 until the attainment date. In CO nonattainment areas, moderate enhanced areas must also meet the same phase-in requirements as enhanced ozone areas and serious CO areas must meet the emission reduction target by December 31, 2000.

The benefit of the model enhanced program has been expressed as a certain quantity of total mobile source VOC emissions, because it better reflects the impact that an effective I/M program can have across the full range of vehicle types and emissions sources. It also relates more closely to the emission reduction goals that nonattainment areas will be pursuing to meet attainment and reasonable further progress milestones.

This way of expressing the performance standard deserves some explanation, however, because the minimum benefit from a basic I/M program has often been expressed in the past as a 25% reduction in 1987 exhaust emissions from light-duty vehicles. The similarity between the previous 25% VOC reduction target for existing I/M programs and the new illustrative reduction of 28% for enhanced programs may cause some confusion. The previous 25% reduction figure is relative to a no-I/M baseline that only includes exhaust emissions from light-duty vehicles (passenger cars); the baseline does not include exhaust emissions from light-duty trucks or evaporative emissions from any vehicle category. Expressing the exhaust and evaporative emission reductions from enhanced I/M in terms of reductions in light-duty vehicle exhaust emissions yields a benefit of 140% for VOCs, 62% for CO, and 32% for NO_x (note that the VOC reduction is greater than 100% because exhaust and evaporative emission reductions from light-duty vehicles and light-duty trucks are being compared to light-duty vehicle exhaust-only emission levels).

In establishing the performance standard for enhanced programs, EPA considered a variety of options for specifying the "model" program which in turn establishes the minimum emission reduction requirement. In public meetings, EPA has included low, medium, and high options in the discussion of performance standards. In today's action, a high option program is being established for the enhanced I/M performance standard. The high option includes a transient, mass-based, short test incorporating HC, CO, and NO_x cutpoints, and both purge and pressure testing of the evaporative control system. The high option yields a 28% reduction in VOCs, a 31% reduction in CO, and a 9% reduction in NO_x relative to a non-I/M baseline.

2. Status of Alternative Tests

In 1988, the State of California, Southwest Research Institute, and Sierra Research, Inc. did developmental work on a series of loaded steady-state test modes known as Acceleration Simulation Modes or ASMs. EPA was

involved in reviewing the results of the testing that California had undertaken at that time. The testing, based on 18 vehicles, found that two ASM modes—ASM5015 and ASM2525 (the first two digits refer to the load factor while the second two refer to the speed of steady-state operation)—had some potential for identifying vehicles with NO_x problems related to exhaust gas recirculation valve malfunctions (that were induced in the vehicles tested). A Society of Automotive Engineers (SAE) paper (#891120) was issued and the authors found, however, that the tests did poorly on the identification of hydrocarbon and carbon monoxide failures. The SAE paper concluded that retention of the idle and two-speed tests would be necessary and that the primary benefit of the ASMs was for NO_x testing.

In early 1992, five (5) low mileage 1992 model year vehicles with induced failures were tested by ARCO using the ASM5015 and the ASM2535, and ARCO reported that the ASM5015 test may identify excess NO_x emissions and may effectively test for evaporative system purge. ARCO suggested an equipment package consisting of a single power absorption curve dynamometer with no inertia simulation capability, a raw exhaust, concentration-type emission analyzer, and a mass flow measuring device. ARCO did not specify a specific flow measuring device and suggested that its testing indicates that mass flow measurement may not be essential since an approximation can be made on the basis of engine size and dynamometer power absorption setting. This equipment may be substantially less expensive than the transient test equipment, which could in turn lead to a more cost-effective program, if the emission reduction benefits of the test were found to be comparable. However, ARCO suggested a more complete test program would be necessary to assess the effectiveness of the procedure and the equipment arrangement ARCO suggests.

The California Air Resources Board has also been testing the ASM5015 and the ASM2525 in a laboratory setting and EPA, at the time of the proposal of this rule, expected that this data, along with the federal test procedure (FTP), as well as other steady-state tests California was conducting in its program would provide better insight into the effectiveness of the ASM tests. Unfortunately, the data developed by California turned out to be defective in that it was produced using incorrect dynamometer settings and the State has withdrawn the data from the docket as a result.

Environment Canada conducted lab ASM and FTP testing on 40 Canadian vehicles and forwarded the test results to EPA. Only 20 of the 40 vehicles are representative of the U.S. fleet (since 1981) because Canada has had less stringent standards in effect and recruited vehicles from the older part of the fleet.

Vancouver, British Colombia began pilot testing of the ASM5015 and the ASM2525 along with idle and 2500 rpm modes in its regular I/M lanes early this summer—the first time this has been attempted. Unfortunately, Vancouver's FTP lab was not in operation in time to do tests on any of the vehicles that were run through the trial program but the program has forwarded important information that contributes to the discussion over the ASM procedures. British Columbia officials found serious problems with the ASM5015 and the Province decided to drop the mode from its official test procedure. The report raises serious questions about the application of the ASM5015 for actual I/M lane use.

Nevertheless, EPA plans to pursue the development of emission reduction credits for the ASM tests and has expanded its test contract in the Arizona I/M program to include evaluation of a four-mode steady-state test. This test procedure was discussed and agreed to by representatives of ARCO, the Society of Automotive Vehicle Emission Reductions, Inc. (SAVER—represented by Allen Testproducts, Inc.), Sierra Research, and the California BAR. The procedure includes the ASM5015, the ASM2525, a 50-mph steady-state mode, and an idle test. In light of the experience in Vancouver, EPA believes it is likely that a preconditioning mode or immediate opportunity for a second chance test will be necessary to avoid false failures on this test. EPA's testing program is designed to address this possibility. Thus testing will also help assess whether the ASM5015 is a practical test mode for an I/M program lane. The test program in Arizona is similar to that used for evaluating the IM240, where vehicles coming to the station for a regular I/M test will also be given this new test sequence and an IM240. Vehicles will be recruited for FTP testing at a contractor lab. EPA also plans to evaluate the performance of the test in ensuring adequate repairs. At this point, sufficient data are not available to determine the emission reduction benefits for the four-mode test.

If EPA concludes that the four-mode procedure described above is as effective as the IM240, the final rule allows its use as a substitute. Moreover, if this procedure is nearly as effective in obtaining emission reductions as the IM240, then EPA believes that states will be able to use this test by expanding the coverage of its program in other ways. EPA plans to evaluate the full range of I/M procedures, including the IM240, in a test-only format in actual I/M program settings, and will periodically make changes to the emission factor model to accurately reflect the benefit of I/M on the current fleet. EPA wishes to emphasize that these updates will be based on emission reductions actually achieved by the IM240 and whatever alternative approaches states ultimately implement, in order that all programs are granted appropriate emission reduction credits based on actual performance. For example, EPA is continuing its evaluation of the IM240 to improve estimates of such key elements as repair effectiveness.

3. Other Performance Standard Issues

Section 182(c)(3)(B) requires EPA to establish a performance standard for enhanced I/M programs, but does not specify the level of that performance standard. Both section 182(c)(3)(B) and section 182(c)(3)(C) provide statutory requirements that enhanced I/M programs must meet, thus establishing a minimum baseline for any performance standard EPA may promulgate. However, beyond that minimum, EPA believes that the statute gives EPA the discretion to establish whatever performance standard it concludes is reasonable and appropriate to produce cost-effective emission reductions while providing for state flexibility in program design and implementation.

The model program for enhanced I/M which EPA is establishing today's action includes annual, centralized testing of 1968 and later model year light-duty vehicles and light-duty trucks rated up to 8500 pounds gross vehicle weight. It includes the transient IM240 exhaust emission test and the transient purge test on 1986 and later model year vehicles, pressure testing on 1983 and later model year vehicles, two-speed exhaust testing of 1981–1985 model year vehicles, and idle exhaust testing of pre-1981 model year vehicles.

The inspection cutpoints in the model program have been selected to fail vehicles emitting well above (at least twice) their design standards, without failing vehicles that are properly operating.

The Act requires EPA to establish a performance standard based on an annual test program; it should be noted,

however, that EPA strongly recommends that states implement biennial test programs that meet the required demonstration, described below. Biennial testing dramatically reduces both the test costs and consumer inconvenience of the I/M program. The Act allows for states to perform a biennial program if a demonstration can be made that such a program (alone or in combination with other features) would be equally effective. This demonstration shall be made using EPA's mobile source emission model which includes biennial and annual program credits. For example, using the current version of the emission factor model and assuming the same average characteristics stated earlier for the annual model program, a biennial program can achieve the 28% VOC reduction achieved by the annual model program by doing transient/purge testing on 1984 and later vehicles and pressure testing on 1971 and later vehicles, in addition to the tests in the model program. Given the added convenience and cost effectiveness of a biennial program, EPA recommends that states adopt the biennial high option since it clearly can achieve reductions equal to that of an annual program meeting the Act's requirements at a significantly lower cost to the consumers and state government. In addition, initial testing of new vehicles could be delayed until such vehicles are two or three years old, as the percentage of high emitting vehicles among newer cars is relatively small, thus avoiding the cost of testing such vehicles. It should be noted, however, that such a delay would result in less opportunity to make use of the comprehensive performance warranty coverage provided by the Clean Air Act for 2 years and 24,000 miles, although major specified emission control components would still be covered until 8 years and 80,000 miles.

The annual model program also includes a visual inspection of the catalyst and fuel inlet restrictor on 1984 and later vehicles; it should be noted, however, that the transient short test is capable of identifying vehicles that have important emission control components that are missing, disconnected, or inoperative, making a visual check unnecessary. Thus, a program can be easily designed to meet the performance standard without employing visual checks, provided sufficient model years are covered by the transient test requirement. States may opt to conduct a visual check on vehicles that fail the tailpipe test for diagnosis or waiver purposes.

The waiver rate for the model program is set at 1% of failed vehicles because enhanced I/M programs may issue cost waivers only after a minimum expenditure of $450, adjusted for inflation, and only with careful administration of the waiver issuance process. Only a small percentage of vehicles failing the inspection are expected to be unrepairable within the $450 waiver cost expenditure requirement. The model program also assumes a high compliance rate of 98% because enhanced programs must adopt registration denial enforcement systems (unless a currently operating alternative system can be shown to be equally effective), and because the rule includes quality control and quality assurance requirements to maintain high compliance rates. It is EPA's belief that the states' pre-existing and vested interest in assuring comprehensive and current registration of on-road motor vehicles will support a registration denial enforcement system which can assure a high rate of compliance with inspection requirements.

EPA is requiring in today's action, both in terms of design as well as performance, that enhanced I/M programs include on-road testing of at least 0.5% of the subject vehicle population, in addition to the normal I/M test, to supplement the periodic inspection requirement. EPA believes this is a feasible first effort for I/M programs and may revise the on-road testing requirement as more experience and knowledge are gained regarding the potential of this approach. This effort could be accomplished through the use of remote sensing devices or through a pullover program that includes emission measurement. Remote sensing devices are emission detection instruments that can be used to estimate emissions from vehicles during operation on city streets. EPA and other organizations have performed evaluation studies that indicate that remote sensing technology is capable of accurately measuring instantaneous CO emissions. Recently, studies by the California Air Resources Board and others indicate that the accuracy of remote sensing devices for measuring hydrocarbon emissions, although, at present less accurate than for CO, is within a practical range for use in roadside monitoring. Development work continues, however, on improving the HC analyzer and on the technology and methods for measuring NO_x emissions (as yet unavailable). EPA believes that remote sensing shows promise as a roadside screening and surveillance tool for use in supplementing periodic inspections, but does not intend that it replace these inspections. At this point, EPA believes that more work is needed to actually deploy on-road testing instruments, require high-emitters to be repaired, and assess the emission reduction benefits derived given various levels of effort. Once this study is completed, EPA believes it will have enough information to establish a general credit model for on-road testing. In the interim, EPA would welcome specific on-road testing plans from states that include an analysis of the potential credit to be derived from the proposed program. EPA is ready to work with states to establish credit where appropriate. EPA plans to continue to pursue research on remote sensing and will continue to issue technical reports, guidance to states on the use of such equipment, and other information to support the use of this technology. EPA is currently conducting a multi-unit remote sensing evaluation program in Phoenix, Arizona which captures data on vehicles that participated in the IM240 test lane demonstration. This data will shed light on the advancements made in the remote sensing technology since it has been taken over by private development companies. A more detailed discussion of this technology is included in the technical support document.

Like on-road testing, onboard diagnostic (OBD) checks (which are discussed further in section IX of this preamble) must be made part of the "model" program and I/M programs must include testing of the vehicle's OBD system once vehicles equipped to meet federal OBD standards are old enough to be scheduled for inspection. EPA will promulgate rules specifying when OBD testing must begin and what OBD codes are grounds for failure and how codes are to be obtained from the OBD system.

Emission reduction credits have not yet been established in EPA's emission factor model for either OBD or on-road testing. EPA's emission factor model will be revised when sufficient data are available with which to establish credits and, in particular, when experience is gained in on-road testing. Meanwhile, since on-road testing and OBD inspections are both performance standard elements and specifically required components of the program, they neither can generate nor make use of emission reduction surpluses relative to the performance standard, i.e., they are not substitutes for achieving required emission reductions but rather required supplements.

Today's action also requires that owners of vehicles in enhanced I/M

areas that are subject to EPA ordered or voluntary emissions recalls be required to have recalls completed as part of either the inspection process or the registration process, whichever approach the state chooses. Manufacturers will be required to provide EPA with a list of vehicles that are included in the recalls, as well as updated lists of vehicles that have had the recalls completed. These manufacturer-related requirements will be the subject of a separate rulemaking.

Today's rulemaking establishes for the first time an I/M performance standard for reducing NO_x emissions from in-use motor vehicles in the more serious ozone nonattainment areas. Historically, I/M programs have been designed to reduce only emissions of VOCs and CO (and exhaust opacity in some areas). The Agency has not previously addressed in a formal way the test procedures and standards which would be necessary to identify high NO_x emitting vehicles or the repairs which would be necessary to return them to lower NO_x emission levels. Today's action addresses NO_x reductions because they are required under section 182(c)(3)(A) of the Act for enhanced I/M areas, and because the testing technology has evolved to the point where the Agency feels that a NO_x test on in-use vehicles can effectively be implemented in the field. NO_x testing is also included because it is viewed as increasingly important for ozone attainment. Mobile sources contribute between 30% and 50% of the NO_x emissions in the typical U.S. city.

In-use vehicle emission levels of NO_x have not exceeded new car standards to the degree they have for HC and CO. High NO_x emitters do exist, but not in as great a number nor with as high a magnitude as HC and CO emitters. Of course, this refers to vehicles built to a federal NO_x standard of 1.0 gram per mile for light-duty vehicles. It may be that in-use compliance figures will be worse for cars which are designed to the new NO_x standard of 0.4 grams per mile. In-use data from California would indicate that this is likely.

Measurement of NO_x exhaust emissions requires that a vehicle be driven under load, a procedure which requires a dynamometer. Steady-state loaded testing may identify some of the high emitters, but EPA has found that the transient test for HC and CO measurements is also very effective in identifying vehicles that need NO_x-related repairs.

The California I/M program currently requires a functional inspection of the exhaust gas recirculation (EGR) valve for proper connection. While such inspections should conceivably reduce EGR tampering and identify vehicles with NO_x problems, the EGR inspection in California is performed incorrectly more often than the inspection of other emission control components. Statistics from covert audits show that inspectors miss disconnected EGR valves very frequently, and EPA's tampering surveys currently indicate no difference in the rate of EGR tampering between areas which require EGR inspections and those which do not. In enhanced I/M areas, the tailpipe emission test for NO_x will provide for and exceed the reductions the functional check was intended to achieve.

Due to the practical problems with visual or functional EGR inspections, and the lack of historical data which show a benefit, EPA does not include emission reduction credits for EGR inspections in its mobile source emission factor model. A small amount of NO_x reduction is assumed where a program is successful in deterring tampering with three-way catalysts, or finding and fixing existing three-way catalyst tampering. The emission factor model in the past has not addressed the fact that repairs which are aimed at getting vehicles to pass an idle mode retest for HC and/or CO can often cause an increase in a vehicle's NO_x emissions. This "increase" is really a return to the design NO_x emission level, which typically is depressed somewhat by many malfunctions which cause high HC or CO. Repairs to correct HC or CO failures would not generally cause NO_x emissions to increase beyond certification levels.

EPA has included in its study of transient testing for I/M some analysis of potential NO_x cutpoints and of the costs and effectiveness of identifying and repairing high NO_x emitters (as well as assuring that the vehicles which initially fail for HC or CO do not get only repairs which further sacrifice NO_x levels). The test results are included in the technical support document. The current version of the mobile source emission factor model will be modified to properly account for the effect of HC and CO repairs on NO_x emissions in idle mode programs and the impact of including a NO_x component in the transient exhaust test. As noted earlier, the emission reduction from performing a transient test for NO_x, accounting for the increase associated with HC and CO repairs, is about 9% of total highway mobile source NO_x emissions. The cost of NO_x testing is discussed below in the section on Economic Impact. Thus, the statute's requirement for NO_x emission reductions is feasible and today's action reflects that finding.

Finally, it should be emphasized that today's action sets a minimum performance target for I/M programs which states are free to exceed. States may adopt alternative approaches that meet this performance standard. States may do so through program design changes that affect normal I/M input parameters to the mobile source emission factor model, or through program changes (such as the accelerated retirement of high emitting vehicles) that reduce in-use mobile source emissions. Further, states are free to exceed the performance standard. These additional emission reduction benefits (over those required) may also be used for trading. EPA plans to issue guidance in the near future on trading of emission credits between mobile sources and stationary sources.

D. Inspection Network Types

Two basic types of inspection networks have existed since the inception of I/M programs. A "centralized" network consists of inspection and retest a high-volume, multi-lane, usually highly automated, test-only stations, run by either a government agency or a single contractor within a defined area. A "decentralized" network consists of inspection and retest at privately owned, licensed facilities, such as gas stations and other shops which may also do repair work. I/M program design is usually determined by elected state or local officials who establish the necessary authorizing legislation. Program management is the responsibility of a State or local motor vehicle department or environmental agency. Many program features, including the system to insure that motorists comply with the testing requirement, the system for issuing waivers, quality assurance and quality control measures, vehicle coverage, emission standards, test procedures, and public information, are influenced by network type.

Recently, other network types have been suggested as alternatives to the traditional centralized and decentralized systems. Two examples of this include medium-to-high volume, test-only stations in decentralized, multi-participant systems, and the multiple contractor system with defined territories recently implemented in the State of Florida. In the decentralized multi-participant format, the high-volume, test-only stations are involved in no other automotive-related businesses or services beyond I/M testing, and are operated as privately owned "franchises" (franchised by the

implementing agency) within a decentralized program area. The stations may be individually owned or one owner may own a chain of stations. Individual stations would compete for inspection business based on price, hours, location, and the like. The State of Texas has drafted a concept paper and is now working with a consultant to develop a request for proposal to implement a decentralized, test-only system. In the Florida case, the State established six regions (one or two counties per region) in the three metropolitan areas involved in the program and eventually awarded contracts to three separate contractors (each with a different fixed fee reflecting the differing cost of inspection in each region). These "hybrid" systems provide alternatives that address many of the quality problems historically found in traditional decentralized inspection programs, which will be discussed in the following sections, yet can provide a means for small, local business participation in an effective I/M network.

The Act addresses the choice of network type for enhanced I/M programs. Section 182(c)(3)(C) states that enhanced programs must include, at a minimum, "operation of the program on a centralized basis, unless the State demonstrates to the satisfaction of the Administrator that a decentralized program will be equally effective." EPA must establish the criteria for such a demonstration, though the Act mentions "an electronically connected testing system, [and] a licensing system * * *" as minimal elements of an approvable program. It is clear that States may meet the performance standard with private or government-run centralized systems. EPA believes that the standard can also be met with test-only, high-volume decentralized multi-participant systems or with Florida-style, test-only, multi-contractor systems. The difficult question EPA has had to address in preparing this rule is whether the Agency can approve a traditional, test-and-repair decentralized network, and if so, under what conditions.

EPA's emission factor model for I/M programs contains a set of default assumptions reflecting the fact that decentralized test-and-repair programs have in the past been significantly less effective than centralized programs with similar design features in finding and fixing emission problems. EPA believes it could not accept any of the currently operating decentralized programs as equally effective to centralized. With these effectiveness losses, it is not possible for a decentralized test-and-repair program to meet the performance standard for enhanced I/M, regardless of the test type or vehicle class coverage.

Based on past performance, EPA believes that a decentralized test-and-repair program will not achieve emission reductions equal to that of a similarly designed, enhanced, centralized program. The fundamental problems with the test-and-repair approach, especially those related to conflict of interest, have not been successfully controlled in a test-and-repair program, to date. EPA has looked for strategies that would be sufficient to equalize test-and-repair program performance. Some have suggested that better emission analyzers would solve the problem, but it is clear from the experience in programs that have already adopted such equipment that this is not an adequate solution. Similarly, a few states have also implemented rigorous quality assurance programs, but still suffer from significant levels of improper testing. Clearly, performance can be substantially improved in the extremely poorly run test-and-repair programs. Better surveillance, more rigorous enforcement, and the like will reduce the egregious levels of improper testing found in these programs. Today's action establishes requirements to help bring about these improvements. Nevertheless, EPA is not convinced that they will be sufficient to adequately address the problem. On the other hand, section 182(c) of the Clean Air Act allows a state to make a demonstration that a decentralized (i.e., test-and-repair) program is equally effective for the purposes of meeting the enhanced I/M requirement. Therefore, EPA will consider SIP submissions designed to demonstrate that decentralized, test-and-repair programs are equally effective to a centralized program in meeting the performance standard using the criteria established for case-by-case equivalency.

Basic I/M areas are not required to be test-only, and the performance standard is such that a reasonably comprehensive, conventional test-and-repair system can meet the target. Most basic areas must achieve the ambient air quality standards either by 1993 (marginal areas) or by 1996 (moderate areas). For the purposes of submitting a SIP that meets the performance standard, today's action allows an area to claim additional credit beyond the default level assigned to test-and-repair programs, if past performance can be shown to exceed default performance levels.

E. Convenience Issues

One issue consistently raised in EPA's pre-proposal discussions of I/M policy with interested parties is that of motorist convenience. I/M programs need to be accepted and supported by the public to be successful; therefore, public inconvenience associated with I/M programs needs to be minimized. Several features of an I/M program may affect convenience. As mentioned above, test frequency is the single most significant factor influencing I/M convenience. If motorists only have to get tested every other year instead of annually, inconvenience is cut in half. Apart from test frequency, other influential features include: cost, driving distance, certainty of service, hours of operation, wait times, and necessity for multiple trips. Each of these factors can be influenced to some degree by network type, i.e., whether the program is decentralized or centralized.

Decentralized networks usually have large numbers of gas stations, car dealerships, repair shops, and similar automotive service-related businesses which are licensed by the State to perform emissions testing. Typically, there are hundreds or thousands of stations, depending on the number of vehicles subject to the I/M requirement and the size of the program. The station-to-vehicle ratio in service station based networks is typically on the order of 1 to 1,000, e.g., in the New York City metropolitan area, 4,300 stations test approximately 4,600,000 vehicles annually. Typically, less than half of licensed test stations have the repair technician expertise to repair the vehicle engine and emission controls if the vehicle fails the test. At the stations that do have an engine/emission repair capability, the vehicle may be able to complete the test-repair-retest process in one trip.

In existing centralized networks, performing steady-state emission tests and tampering checks, the ratio of test lanes to annual vehicles tested is about 1 to 35,000. Typically, these test facilities are strategically sited, fully automated, and designed to handle the high volumes of vehicles seeking inspection during peak times of the test cycle without long queues. Vehicle repairs or other business besides testing is not performed or permitted. Centralized systems are operated by government agencies or, more frequently, by a contractor that wins exclusive rights to provide testing services for an entire metropolitan area or state, in a bidding process that factors in convenience, as well as price and technical competence.

Convenient, contractor-run, centralized programs are currently being operated in a wide range of large and small cities and result from good network design, contractual requirements to insure convenience, and competition in the bidding process.

Centralized programs necessarily require owners of failed vehicles to make an extra trip to obtain repairs; the percentage of owners so affected ranges between 10% and 20%. Some States use a hybrid system that allows decentralized retests after the centralized initial test for vehicles that fail and need repair. This eliminates the need to go back to the central test station if a repair shop is chosen that also is licensed to test. This approach increases the administrative burden and cost of the program, as well as the potential for losing emission reductions if repairs are not performed properly.

There are potential problems that arise with convenience in both centralized and decentralized test systems. There are some centralized systems that are not convenient to the motorist. In nearly all cases, this has been in government-run centralized systems. The problem occurs as the result of a combination of factors: inadequate numbers of stations or lanes to handle peak volumes, poor station siting, under staffing so that all lanes cannot be opened when needed, insufficient resources, and inadequate equipment and technical expertise. For the most part, these safety inspection systems, to which emission testing were later added, were put into place decades ago and were not sufficiently upgraded over the years to handle more vehicles. EPA does not recommend the creation of any other government-run systems and has in the past encouraged existing systems to consider privatization. One other case of a centralized system which was reportedly perceived as inconvenient was the centralized change-of-ownership program in the South Coast Air Basin in California. Because the program inspected only about one-sixth of the vehicle population each year, stations were sited far apart to serve wider areas, resulting in longer trip times and long waits for vehicle owners. Extensive experience in designing convenient systems has been gained since that time.

In decentralized systems, convenience problems include having to wait excessive amounts of time for a test (excessive waits also occur in poorly designed centralized programs), having to leave the vehicle behind because testing on demand is not available, being refused testing, and having to return at another time or go to another station. Decentralized stations are rarely originally designed for the purposes of testing and the manual nature of many of the operations that go on in the process can result in a much longer wait time than is generally supposed.

Adequate numbers of licensed test stations have been a problem in some decentralized programs, but this is mainly a function of the limited fee that a station in these programs has been allowed to charge the motorist for doing a test. Often the test includes safety as well as emission-related inspections and, when performed correctly, these tests can take as much as 20–30 minutes. Given the rise in shop labor rates over time, doing inspections in such state programs became a money loser for good repair shops that could better spend their time on higher value services. Thus, insufficient numbers of stations signed up to do testing. In States where there is no test fee cap, such as California, there is a lower vehicle-to-station ratio, indicating that there are more suppliers willing to enter the market.

In both centralized and decentralized systems, it is possible to design and run the systems such that a high level of convenience is maintained. While convenience is often a prospective concern of residents of an area about to implement a centralized program, once operating, most vehicle owners' actual experience is satisfactory to them. A majority of motorists in a recent survey reported that testing centers were conveniently located in both centralized and decentralized networks (Riter Research, "Attitudes and Opinions Regarding Vehicle Emission Testing," conducted for the Coalition for Safer Cleaner Vehicles, September 1991). EPA encourages State and local governments to build into the program design features necessary to insure motorist convenience. EPA has traditionally left it to the States to address these issues. Today's preamble includes specific recommendations to address convenience issues, and because of its importance, the rule requires that states design test systems that insure convenient service for the motorist. For example, in high-volume test systems, EPA that believes contracts could include minimum design features for station siting such that 80% of all motorists are within 5 miles of a test facility, and 95% are within 12 miles of a test facility. Contracts should also include operational features that insure service delivery, including a provision that when there are more than 4 vehicles in a queue waiting to be tested, spare lanes be opened and additional staff employed to reduce wait times. Another feature of high-volume systems should be hot lines that motorists can call and get information on station locations, hours of operation, current wait times and the like. Similar strategies can be employed for decentralized, test-only systems. The rule requires that states make a demonstration in the SIP that the network of stations to be provided for testing is sufficient to insure short wait times and short driving distances, and that regular testing hours are established and motorists are not arbitrarily refused a test.

Another motorist convenience issue is the fact that in test-only networks motorists must go to spare facilities for tests and repairs. The next section discusses a variety of approaches to encourage repair facilities to provide customers with the most convenient service possible, including taking the vehicle for initial testing and, if it fails, back to the test center for the retest after repairs. Included in this discussion are ways to allow repair facilities to obtain free retests for their customers, to provide diagnostic assistance to repair facilities, and to give repair technicians priority access to test facilities, thereby allowing them to obtain a retest as quickly as possible. These ideas are discussed in more detail below, but they are intended to maximize convenience and ensure that motorists get effective repairs on their vehicles with a minimum of inconvenience.

It has been suggested to EPA that siting test facilities in densely populated areas, especially in the northeast United States where most enhanced I/M programs are located and in the Los Angeles area, might be impossible or very expensive. Experience to date has not indicated a problem in this regard. In centralized, contractor-run programs, the contractor purchases or leases the land upon which stations are built. The cost to the I/M program is the carrying cost of that property; the contractor will eventually recoup the value of the land at resale after the contract expires. Thus, the per-vehicle test cost is indicative of carrying the cost of the land, as well as the other costs associated with the program. The average cost of a test in a centralized system in the U.S. is $8.50; and that includes large cities such as Chicago, Miami, and Minneapolis. Probably the most recent example is the program in Vancouver, British Columbia. Vancouver is a densely populated, high land cost city, much like those in the northeast. A centralized, contractor-run program has been implemented there

using a three-mode test (like the four-mode test described in the previous section but shorter) that will result in lower through put than we find in typical I/M programs. The winning bid for the Vancouver program was for under $15 (U.S.) per test, indicating that even though some very expensive real estate is involved the impact on test fees does not result in prohibitively expensive testing.

F. Mitigating the Motorist Impact of I/M Enhancements

The high-tech testing system and administrative requirements in enhanced I/M areas need to be carefully designed and implemented to avoid or mitigate any adverse impacts that conceivably may occur from changing over an existing inspection network or starting a new one. The potential problems fall into two basic categories, one relating to the existing test industry, which will be dealt with in the next section, and the other relating to vehicle owners.

1. Ping-Pong Effect

In a high-tech test system, repair technicians will be faced with a more rigorous exhaust emission test procedure in the transient emission test. The procedure is more rigorous than the idle, two-speed or loaded steady-state tests now used in I/M programs in three respects. First, the transient emissions test more accurately and selectively determines which vehicles need repair. The steady-state tests pass more gross emitters and fail more vehicles that are close to or below the standards for which the vehicles were originally designed, than the transient test. Second, the transient test cannot be "fooled" by strategies aimed merely at passing a test, such as doping the gasoline with additives or disconnecting vacuum hoses. Third, typical repairs in responding to steady-state tests may not always sufficiently reduce emissions to allow a vehicle to pass a transient test. For example, vehicles without a catalyst or with an empty shell of a catalyst can pass a steady-state test if they are operating in a lean condition during the particular test mode. In actuality, however, such vehicles are gross emitters and could not pass the transient test. The real defects in the emission control system will have to be repaired in a transient test program.

Repairs to pass the transient test may require greater diagnostic proficiency on the part of technicians than what is generally needed in response to a steady-state test failure. Furthermore, some repair facilities may return a vehicle to its owner without verifying that it actually passes the transient exhaust test, due to lack of test equipment or unwillingness to get the vehicle retested at the State inspection station prior to owner pick-up. There is a risk that if the repair industry as a whole is unprepared or not able to respond adequately and in a timely manner to the challenge, motorists will be put in the awkward position of failing the retest at higher than necessary rates, requiring yet another trip to the repair facility and then to retest; this is often referred to as ping-ponging.

The other dimension to this problem is the cost to the motorist. The Clean Air Act requires that in enhanced I/M programs a minimum of $450 be spent on repairs which produce emission reductions before the I/M requirement may be waived. This is substantially higher than existing cost waivers in I/M programs, which are typically $50 to $75, although some range as high as $400. The potential exists for some motorists to be vulnerable for repair bills of $450 for repairs that were not actually needed. In rare cases, the repair that is needed to allow a vehicle to pass may be significantly more expensive than $450 and the owner would face the choice of paying for that repair or allowing or encouraging the technician to bill for $450 of repairs that were not helpful. (The cost waiver issue is discussed in more detail at the end of this section.)

A variety of strategies have been suggested as ways of dealing with ping-ponging. First and foremost is improving the capability of the repair industry. Today's rule includes a wide range of requirements and recommendations related to improving repair effectiveness. Most states do not have repair technician certification programs; formation of such programs is a fundamental step that would provide recognition and support for qualified repair technicians. The repair community supports this step and EPA recommends that I/M programs establish a certification program that includes testing and training of repair technicians in the kinds of repairs needed to correct I/M failures.

Another problem has been the lack of adequate training available to independent repair technicians in I/M areas. Some existing I/M programs have worked with community colleges to run classes but others have not, and the technical level of these classes has not always been sufficient to meet the needs of the technician. Today's rule requires I/M programs to insure the availability of adequate training for repair technicians. This does not mean that states have to get into the business of training repair technicians but it may mean taking action to either attract private training programs or to work with local colleges and vocational schools to upgrade existing programs. EPA is not establishing a requirement that repair technicians must get certain training but would encourage states to set up such programs. The public will be best served if an adequate number of technicians have the training and the tools needed to diagnose and repair high-tech cars. Unlike in the past, these skills are not easily acquired by fiddling around under the hood, or learning as you go. The systems are too complex and change too rapidly to allow this approach. EPA received overwhelming comment on this issue from every sector—the response was unanimous that technician training needs to be part of the I/M program.

Some I/M programs have established a technical assistance program to provide repair technicians with help in diagnosing or repairing specific problems. These programs typically have involved hot line services, newsletters, and other outreach programs. Today's action includes a requirement to establish technician outreach programs that provide a rapid source of technical assistance (telephone hot line) as well as routine informational programs (newsletters, workshops, etc.). Today's action also includes a technician performance monitoring program that would track the effectiveness of repairs performed by repair technicians in an I/M area. The purpose of this program is to provide the public, as well as technicians themselves, with objective information on the performance of the various repair facilities. Louisville, Kentucky has used such a system with positive results.

Another effective feature of some existing I/M programs has been the establishment of a monitoring or "report card" system of repair technician performance as measured by the test results of vehicles they have repaired and a feedback mechanism to let them know how well they are doing and to provide the public with objective information on repair performance of technicians in the area. Today's action requires all enhanced I/M programs to operate such a monitoring system.

In some areas, motorists that fail the test are given a variety of information, including a list of certified technicians, warranty information, and other consumer information. Some programs also provide motorists that fail the test a description of the possible causes of the particular failures that occurred based

on an interpretation of the test results. Today's action includes requirements for providing this type of consumer information, especially the basic diagnostic information about what may be wrong with the vehicle. EPA recommends that I/M programs supply more detailed diagnostic information upon request based on additional examination of the vehicle. This might involve down loading and interpreting diagnostic information stored in onboard computers on vehicles not already subject to an onboard diagnostic check (pre-1994 vehicles). It could also include an analysis of various engine functions using a standard engine analysis system. The motorist could use this information in repairing the vehicle or could provide it to a technician chosen to repair the vehicle. These additional services could be provided at inspection stations for free or for a fee, or the state could license or approve independent diagnostic facilities in the private sector.

As discussed earlier, EPA is in the process of developing final regulations requiring vehicles to be equipped with OBD systems. As these systems provide repair technicians with additional valuable diagnostic capability, repair of OBD-equipped vehicles will be easier. Also, as part of these OBD regulations, manufacturers are being required to improve the distribution of repair information necessary to make effective emission-related repairs. Improved information in the hands of repair technicians should greatly enhance their ability to make the most effective repairs and at the least cost to the consumer.

EPA believes the elements discussed above and included in today's action will go a long way towards improving repair effectiveness; but, the full impact of them may take time to be realized. EPA believes I/M programs should consider the following additional strategies to help ensure improved repair effectiveness.

The first approach would be for I/M programs to establish special diagnostic centers which would be available to repair technicians. These centers could be staffed by expert repair technicians that are aware of failure and repair trends in the I/M program and are fully up-to-date on the latest repair and diagnostic techniques and problems being found among vehicles that fail the I/M tests. These technicians could access databases accumulated by the program on the kinds of repairs previously performed on particular vehicles in the program. Such databases could also be made available via modem to any repair facility in the community. The centers would include a full range of diagnostic and I/M test equipment and a library of diagnostic and repair aides, including service manuals, recall information, and technical service bulletins from vehicle manufacturers. In the event that a technician is having difficulty repairing a vehicle and the hot line service is not adequate to solve the problem, the technician could take the car to the diagnostic center and get help from the expert staff. These facilities might be State-run and staffed or might be contractor operated. The focus of the service would be to help repair technicians achieve the most cost-effective repairs possible on vehicles. These facilities could also serve other purposes, including training centers for mechanics, and waiver processing facilities.

Given the expense and spatial requirements for conducting highly accurate, transient emission tests, it is unlikely that many repair facilities would find it cost-effective to establish an in-house capability that would absolutely confirm the effectiveness of repairs. There are many ways for a technician to tell whether the true problem has been found and fixed short of replicating the test, such as reading all electronic trouble codes, observing idle and 2500 rpm emissions, and performing normal engine diagnostic procedures. EPA is working with service equipment vendors to develop simplified transient test equipment which will be adequate for use by repair facilities; EPA estimates that the cost could be as little as $15,000–$20,000 and that facilities' current exhaust analysis equipment could be incorporated into the new system.

The final assurance, of course, comes from passing the transient test itself. Consumers would be better served in the repair process if the repair technician had easy access to the official test equipment to verify that repairs were effective. If free retests were available to repair technicians, then repair shops would be more likely to provide the additional service of taking the vehicle to the station for a retest to verify the repairs were effective and at the same time obtain a certificate of compliance for the vehicle owner. In addition to a free test, if repair technicians had priority access to test facilities this might further encourage the retest service. This would help technicians refine repair strategies by giving them direct feedback on the success of the repairs performed.

Free retesting for technicians might change the way testing cost are distributed in I/M programs, but the impact would likely be very low. The cost of the first retest is already included in the price of inspection in nearly all I/M programs, and the ongoing failure rate of a mature program with effective repairs should be quite low, about 9% per year. Since first attempts to repair the vehicles will be successful in the overwhelming majority of cases, the demand for extra retests should also be low. In decentralized, test-only networks, some mechanism might be needed to reimburse individual test facility owners that got more than a fair share of repair technicians requesting free retests.

Finally, the final rule allows a state to include, if it wishes, a mechanism in the program to address the possibility that some vehicles may still have high tailpipe emissions after being repaired by a certified technician, even after the technician has performed all emission-related repairs identified as needed at the official diagnostic center discussed above and the vehicles pass all physical and functional checks. The mechanism in this case would be simple: if the vehicle had high tailpipe emissions in the retest, passed the physical and function checks, and the official diagnostic center could not identify additional needed repairs, the owner would be given a certificate of compliance. Such vehicles would probably tend to be very close to the standards and even if repair had been possible, would yield little emission reduction benefit. In subsequent cycles, if the vehicle failed the initial test, it could go directly to the diagnostic center to see if updated techniques could identify effective repairs or if other problems had developed that need attention. EPA believes that this approach is consistent with the requirement to spend $450 prior to receiving a waiver for emission-related repairs, without regard to the cost of repairs in this case, because the program could not identify any additional emission related repairs that could be performed. Thus, the vehicle owner would have to have all needed repairs performed and would therefore not need a waiver for emission-related repairs. The legislative history on waivers states clearly, "If repairs are needed, they should be made." (House Rept. 101–490, p. 241) The corollary seems to be that Congress did not intend for vehicle owners to spend money merely to meet a minimum expenditure level, if repairs are not needed. EPA believes that this provision will have no measurable effect

on the emissions performance of the program.

Probably the most important step an enhanced I/M program can take to mitigate the problems associated with ping-ponging during program implementation is to do what most I/M programs did when they first began in the early 1980s: Start out with less stringent cutpoints. The phase-in process that EPA has established for enhanced I/M areas will allow states to start out with cutpoints looser than those established in the model program and then gradually tighten them so that full standards are in effect for at least one test cycle prior to the 1999 milestone (or deadline). Naturally, the earlier standards are tightened the sooner emission reductions are achieved and the greater the credit that can be used for reasonable further progress requirements in the early years. Thus, the repair industry will not be overwhelmed at the start of the program with too many cars to fix. The initial cycles of the program will address the worst polluters while subsequent cycles will capture the less gross polluters.

Since the I/M rule was proposed, EPA has taken steps to begin the process of addressing problems in the repair industry. EPA has launched the Vehicle Maintenance Initiative which is a cooperative effort between the repair industry, the training industry, the testing and certification industry, equipment suppliers, state I/M programs, and EPA to address a whole host of issues related to vehicle repair. Over 200 representatives from these industries met in August and developed specific plans to improve service technician training. Just a few of the ground breaking efforts of this initiative are discussed below. The participants agreed to form an industry steering committee aimed at assuring consumer benefits from improvements in the standards and quality of automotive service.

EPA is working with the National Institute for Automotive Service Excellence to develop a new technician certification test aimed at identifying skills and abilities necessary to diagnose emission-related problems, as well as development of curricula and training materials. The test should be ready next summer, allowing states which wish to use it sufficient lead time to institute the test prior to enhanced I/M implementation.

EPA has awarded a three year, $700,000 grant to the National Automotive Technicians Education Foundation to launch a new program entitled "Training for Repair of Automobiles in the Nineties" (TRAIN). This program will help auto-tech schools upgrade technician training, equipment, and instruction materials and supplies to meet the need for high-tech repair technicians.

EPA believes these efforts and others being undertaken as part of the Initiative will give I/M areas a head-start on addressing the repair issues so critical to a successful I/M program.

2. Repair Costs and Cost Waivers

Based on the testing programs it has conducted over the past few years, EPA estimates that the average cost of repairs for transient test failures will be $120, and the average cost for repairs to the evaporative control system will be $38 to $70 for pressure and purge failures respectively. These costs are not excessive in the context of current vehicle maintenance expenses and are offset significantly by the reduction in fuel consumption that is associated with repairs to malfunctioning high-tech systems. EPA believes, however, that it is important to consider the potential for adverse impact on two smaller segments of the vehicle population: those vehicles which are so old that the repair cost may exceed the blue book value, and those which cannot be repaired effectively within the waiver cost limits.

EPA encourages States to establish programs to purchase and scrap vehicles that may not be cost effective to repair. There has been considerable interest around the country recently in scrappage programs for older vehicles. In 1991, UNOCAL ran a pilot program in Southern California which demonstrated the feasibility of such programs. To understand how such a program would work, consider a vehicle with a low market value that fails the test. If repairing the vehicle to pass or to qualify for the waiver would cost more than the market value of the vehicle, the owner would normally have three options: (1) Scrap the vehicle, (2) purchase repairs (at least to qualify for the waiver), or (3) sell the vehicle outside the I/M area. Owners of such vehicles might see these options as presenting severe economic hardship. Since such vehicles are also likely to be very high-emitting vehicles, the air quality benefit of removing these vehicles from the fleet is great and all participants in the air pollution control program would benefit. To address the difficulty of equitably disposing of such vehicles, the I/M program could have a standing offer to purchase and scrap older, high emitting vehicles, possibly at a set price of $400, for example. This buy-and-scrap program might be financed by a modest increase in the test fee or possibly through a market-based, privately-financed offset purchase program. Offsets especially from older vehicles could be attractive since such vehicles are typically emitting much more pollution than new vehicles. If such vehicles are assumed to otherwise receive waivers and continue to operate at high emission levels, offsets would appear appropriate. To avoid abuse, vehicles could be required to be driveable and to have been registered in the area for some minimum period (e.g., at least a couple of years) to qualify for the program. EPA will be issuing guidance on scrappage programs in the near future.

While most vehicles which initially fail an I/M test can be repaired to meet emission standards with relatively inexpensive repairs, a small portion of the vehicle population might be faced with substantially higher cost repairs as discussed above. This might result from a variety of causes, including: The vehicle may need a variety of repairs that together amount to a substantial expense; the engine may need a major repair that is very costly, such as a valve job; or, the owner might have obtained ineffective repairs from an incompetent or unscrupulous repair provider. In the past, most programs have provided for waivers for these vehicles, which allow vehicles that fail the emission retest to comply with the I/M program requirement. Waivers, however, can be a significant source of emission reduction loss, as well as a potential escape route for any motorist wishing to circumvent the system. Many I/M programs have not controlled waivers sufficiently. The problems include low cost limits which do not allow for meaningful repairs, improperly issuing waivers, cost limits based on estimates for work not yet actually performed which leads to inflated estimates in some cases, and applying repairs unrelated to the emission failure to the cost limit. Repairs attempted by unqualified mechanics or vehicle owners may also qualify a vehicle for a cost waiver without contributing to emissions reductions. The regulations establish requirements for the issuance of waivers in order to address many of the problems identified: any available warranty coverage must be used to obtain repairs before expenditures can be counted towards the waiver; waivers must not be issued to vehicles with missing or disconnected emission control devices; and, repairs must be performed by recognized technicians (e.g., one employed by a going concern or in the yellow pages) and visually confirmed by the administering agency. Requirements are also included in

today's action which are aimed at improving repair technician performance and consumer protection for motor vehicle owners.

The Act requires that in enhanced programs, motorists spend a minimum of $450 on repairs related to the emission test failure before being eligible to receive a waiver. This amount is to be adjusted annually based on the Consumer Price Index; EPA will annually notify states of the adjusted amount. The legislative history of the Act (Report of the Committee on Energy and Commerce on H.R. 3030, Report 101–490, pages 240–241) further supports this when it states "If waivers are otherwise allowed, the program must require a minimum expenditure of $450 for repairs, to be adjusted periodically for inflation." The legislative history indicates that the decision was based at least in part on past experience with cost waiver limits that were "often inadequate to ensure that vehicles received the basic repairs needed to bring the vehicle into compliance." The legislative history further clarifies Congress' position, stating that "poorly maintained vehicles that pollute, no matter how old, should be required, at a minimum, to meet the standards applicable to them when they were manufactured. If repairs are needed, they should be made."

EPA believes that the very large majority of vehicles will be repairable for much less than $450. As the Act states the $450 minimum was set by Congress "in view of the air quality purpose of the program." The challenge for EPA and the States is to determine how to best achieve significant air quality benefits in an equitable and cost-effective manner. The $450 minimum is not as significant an issue for newer vehicles which are more likely to be under warranty, fail less often, and have a high market value. It may, however, pose a greater hardship on owners of older vehicles. Therefore, the regulation allows states to offer a well-controlled, non-renewable, time extension beyond the scheduled compliance deadline, to give motorists additional time to pass the inspection or to sell the vehicle in the case of economic hardship. This time extension is not a waiver—the vehicle owner is not in compliance until the repairs are made—it is just a question of timing. Neither the Act nor the legislative history addresses the question of extensions, even though the Act does specify various details about waiver requirements. Historically, EPA's I/M guidance has provided for time extensions to allow vehicle owners to make repairs or test vehicles. Section 182(a)(2)(B) appears to ratify EPA's past I/M guidance. Nothing in the amended Act leads EPA to conclude that this guidance should be changed. EPA believes that it is appropriate to interpret the Act as following EPA to provide a reasonable amount of time for motorists to comply with the $450 waiver requirement. As a condition for such an extension, a designated State official shall make a thorough diagnosis and inspection of the vehicle, determine that all reasonable cost repairs have been properly performed, and confirm that reasonable additional repairs are not available to correct the inspection failure or further reduce on-road emissions for less than the $450 limit.

States may establish lower minimum expenditure requirements if a vehicle scrappage program is established to buy and scrap vehicles that do not meet standards and the Act's waiver criteria. Thus, a state could set a minimum expenditure requirement at some lower level, say $250, and any vehicle that cannot be repaired for that amount would be scrapped, either with funds provided by the state, the I/M program test fee, or from private sources.

Based on experience with cost limits which are too low to effect meaningful repairs, today's action requires a $75 minimum expenditure for pre-1981 vehicles and a $200 minimum expenditure for 1981 and later vehicles in basic I/M programs. Many operating programs already meet or exceed these minimums and have proven their practicality and public acceptability.

G. Mitigating the Impact of Enhanced I/M on Existing Stations

EPA also recognizes the need to mitigate impacts of implementing a high-tech test program on existing I/M stations in decentralized programs. The test stations have been in the emission test business for as long as 10 years and some derive a substantial portion of their revenue, either directly or indirectly, from emission testing. An investment was made in emission test equipment that may or may not be fully amortized. In any case, EPA is committed to assisting these businesses in making the transition to the high-tech test format and the additional repair business that will result from it.

Three approaches to resolve this transition problem are presented here. The first approach would provide direct financial assistance to stations that might be adversely affected by the transition to a high-tech system, either in the form of cash for recently purchased test equipment or in the form of subsidized software or peripherals to give that equipment new functionality. The second would be to design the enhanced program to include transitional mechanisms to soften the impacts of the new system. The third would be for States to establish programs to assist stations and inspectors through retraining and retooling programs. The previous section discussed various strategies to encourage continuation of one-stop test-and-repair, where repair facilities could take vehicles to test facilities for initial tests and would be given free retests and priority access to retest lanes, as well as diagnostic and repair assistance. These strategies would also help existing I/M stations make the transition to a new program design.

The typical decentralized I/M test program is composed of a variety of facilities, including car dealerships, gasoline stations, and repair shops of different kinds. Dealerships are usually heavily involved in the general repair business and the inspection business represents a relatively small portion of total revenue. Gas stations and repair shops tend to vary widely in terms of the mix of revenue derived from inspection and repair. Some stations are not involved in engine repair and simply provide testing for the test revenue itself and have other business that provides significant income. Some repair shops, like dealerships, are heavily involved in sophisticated engine repair and offer testing mostly as a convenience to their customers. Then there are those in between that do some repairs but are generally not capable of performing the more sophisticated repairs. In some cases, stations exist whose only service is the inspection itself.

The transition to a high-tech, high-volume, test-only system would mean that many stations would have to give up testing. This would result in the loss of direct testing revenue, perhaps the loss of ancillary business, and perhaps investment in test equipment not yet fully depreciated.

In some States that are currently decentralized and will have to implement enhanced I/M, analyzers have been in use for 8 years or more and generally have little or no residual value. In States that upgraded to BAR90 equipment (California and New York), the equipment was purchased since 1990, and has years of useful life left. One mechanism to address the impact of switching to the high-tech tests would be to set up some type of State-supported analyzer buy-back program for stations that were no longer going to participate in either the test or repair business, possibly using funds obtained

from inspection fees. BAR90 analyzers would be needed in the repair business both for diagnostic and repair work as well as to check whether repairs on old technology vehicles were effective. BAR90 analyzers could also be used to test older technology vehicles in test-only stations. Where such equipment were applicable to the enhanced I/M role of the business, buy-backs would not be needed. However, this concept would allow stations that were planning to leave the I/M business to recover all or part of their capital investment for equipment that could not be used for diagnostics and repair. Such a buy-back program might allow a smoother transition to test-only status.

A related strategy would be for EPA, the states, and industry to support the development of new and improved uses for BAR90 analyzers so that current as well as future analyzer owners can use this technology more effectively in the repair process. In particular, it was California's intent in developing the BAR90 specification for the computer in the analyzer, which is an IBM-compatible 386 DOS-based system, to become a platform for vehicle diagnosis and repair databases and other technical assistance software. EPA, the states, and industry could potentially provide technical and financial support to speed the development of such software. They also could potentially subsidize the purchase of required peripherals, such as CD–ROM players and disks of service manuals and the like. This would not only make better use of the equipment in the field but would serve as an excellent mechanism for providing critical technical assistance and training to the repair community. Another expanded function for a BAR90 analyzer would be to serve as controller and analytical bench in a repair-shop level transient test system consisting of a simple dynamometer and exhaust collection device, adequate to judge the success of repairs in most cases. Such a system would not have to be as accurate as the actual test equipment required for the official test, only accurate and repeatable enough to be a good indicator of the effectiveness of repairs. EPA has undertaken developmental work in this area.

The second way to mitigate the impacts is to design transitional features into the program. Today's action would allow test-and-repair shops to continue to do testing on vehicles not subject to the transient/purge test for a specific transitional period (note that EPA's recommended enhanced program would require biennial, transient/purge tests on 1984 and later model year vehicles, and biennial steady-state tests on older vehicles). Today's action would permit a phase-out of the decentralized test-and-repair portion of the program such that all vehicles would be inspected in test-only stations starting with the next inspection after January 1, 1996. This would allow these decentralized, test-and-repair stations three years from today to continue to obtain revenue to recover the investment made in testing equipment and to plan other strategies to replace the income to be lost from testing.

A third strategy would be to provide targeted assistance to stations to assure they were able to provide high-tech repair services. This would require pre-program start-up training to bring repair technicians in these stations up to speed on the high-tech tests, vehicle diagnosis, and engine repair. It might mean tuition grants or other financial assistance to make training feasible. This approach might also include financial assistance to stations for the purchase of equipment to perform sophisticated diagnosis and repair on new technology vehicles or to upgrade tools and equipment for more sophisticated diagnosis and repair.

EPA encourages all affected areas to consider these approaches.

H. Areas of Applicability

I/M programs, either basic or enhanced, are required in both ozone and CO nonattainment areas, depending upon population and nonattainment classification and design value.

States or areas within an ozone transport region must implement enhanced I/M programs in any metropolitan statistical area (MSA), or portion of an MSA, with a population of 100,000 or more as defined by the Office of Management and Budget, regardless of the area's attainment classification. Any area in the nation designated as serious or worse ozone nonattainment, or as moderate or serious CO nonattainment with a design value greater than 12.7 ppm, and having a 1980 Census-defined urbanized area population of 200,000 or more, must implement enhanced I/M in the urbanized area. Serious or worse ozone nonattainment areas which have urbanized areas which were smaller than 200,000 population in 1980 must implement the basic I/M program required in moderate areas. EPA recommends that states expand geographic coverage of the program beyond urbanized area boundaries, to include areas that contribute in a significant way to the mobile source emission inventory in the nonattainment area.

All areas designated as marginal ozone nonattainment or moderate CO nonattainment with a design value less than 12.7 ppm must continue operating existing I/M programs (that is, those operating or part of an approved State Implementation Plan as of November 15, 1990) and must update those programs as necessary to meet the basic I/M program requirements of this regulation. In addition, such areas required by the Act as amended in 1977 to have an I/M program must implement a basic program. Finally, any moderate ozone nonattainment area outside of an ozone transport region must implement a basic I/M program meeting the requirements of this regulation.

The statutory requirements for I/M programs are comprehensive but not without the need for interpretation when determining the applicability to specific types of areas. The discussions which follow detail the reasons that EPA has chosen the interpretations in today's action.

1. Moderate Ozone Areas

Section 182(b)(4) calls for basic I/M in "all" moderate ozone areas, and the legislative history of the House Bill (Report of the Committee on Energy and Commerce on H.R. 3030, Report 101–490, page 237) uses the term "without exception" to indicate that even moderate ozone areas presently without programs must implement I/M. This differs from EPA's 1978 policy of requiring I/M as a condition of an attainment date extension to 1987 [old section 172(B)(11)(b)] and only in urbanized areas as defined by the Census Bureau with a population of 200,000 or more. It also differs from EPA's post-1982 policy of accepting SIPs lacking I/M from some non-extension areas that did not attain by 1982. Despite the use of the phrase "all Moderate Areas," however, EPA believes that Congress did not intend to include rural moderate ozone nonattainment counties which contain no urbanized areas of any size. Section 182(b)(4) requires all moderate ozone nonattainment areas to adopt an I/M program "as described in subsection [182](a)(2)(B)." That section requires certain marginal ozone nonattainment areas to adopt an I/M program of at least the stringency of the program required by the 1977 amendments to the Clean Air Act, "as interpreted in guidance issued by the Administrator" prior to the 1990 amendments to the Act. EPA's pre-1990 I/M guidance had required I/M programs only in urbanized areas. Thus, EPA believes that by referring to EPA's pre-1990

guidance, Congress ratified EPA's approach of requiring I/M programs only in urbanized areas. Further, enhanced I/M programs, which are based solely on statutory language rather than ratified agency guidance, are explicitly permitted to exclude surrounding rural portions of their nonattainment areas. EPA believes that it is consistent with Congressional intent to allow exclusion of rural moderate ozone nonattainment counties, and is, therefore, requiring that basic I/M programs be implemented in any 1990 Census-defined urbanized area in all moderate ozone nonattainment areas. This requirement is broader than previous basic I/M policy because it does not contain a population threshold. At the same time, EPA believes that the Act does not envision I/M programs in completely rural counties.

2. Census-Defined Urbanized Area Boundaries

In today's action, EPA requires that basic I/M programs be established in all Census-defined urbanized areas in the affected nonattainment areas, based on the 1990 Census. The Act is clear in requiring that outside an ozone transport region, enhanced programs are required in areas that were defined by the Bureau of Census as urbanized areas with a population of 200,000 or more in 1980. EPA believes this criterion must be used to determine which urbanize areas are affected, but not the actual program boundaries themselves within those areas. To determine program boundaries, the more current 1990 Census data, which better represent current urban land-use boundaries as affected by growth since 1980 and consequently the area making the greatest contribution to mobile source pollution, shall be used.

3. Ozone Transport Regions

Section 184(b)(1)(A) contains somewhat different language on I/M program coverage in ozone transport regions. It states that "each area" in a region "that is a metropolitan statistical area or part thereof with a population of 100,000 or more [must] comply with the provisions of section 182(c)(2)(A) [sic] (pertaining to enhanced vehicle inspection and maintenance programs.)* * *" [The incorrect reference should refer to section 182(c)(3)]. The legislative history uses slightly different wording in saying enhanced I/M is required "*in* metropolitan statistical areas" (emphasis added) and goes on to say "whether or not the areas are in nonattainment." In establishing the ozone transport region provisions, it seems that Congress intended to address emissions that could contribute to a violation of the standard anywhere in a region. Thus, it included attainment MSAs as well as nonattainment areas. Broad, sparsely settled rural areas with no MSAs or only MSAs under 100,000 population were not included, however, indicating an intent to balance the small emission reductions possible from these areas and the greater difficulty of implementing I/M programs in such areas.

Today's rule requires that in an ozone transport region, enhanced I/M programs are required in areas that were designated as MSAs with a population of 100,000 or more in 1990. In the case of MSAs that cross an ozone transport region boundary (and are not otherwise required to implement enhanced I/M by virtue of air quality classification and population), enhanced I/M is required if the population of the MSA within the ozone transport region was at least 100,000 in 1990. The statutory language does not explicitly state that the MSA boundary must be the I/M coverage boundaries for MSAs over 100,000 in population. Consequently, EPA has considered various interpretations to see how well they fit with the intent of the ozone transport region provisions. EPA considered the urbanized area boundary approach, established for areas outside an ozone transport region. It does not seem consistent with an ozone transport region concept to limit the I/M program to this degree. For example, in the Northeast Ozone Transport Region (the only one established by the Act), there are MSAs with populations well above 100,000 that contain no urbanized areas or contain only a small portion of an adjacent MSAs urbanized area. EPA also considered requiring enhanced I/M throughout the entire MSA if it had a 1990 population of 100,000 or more. This would, however, result in the inclusion of some large, sparsely-settled rural counties in some MSAs. EPA believes it would not be cost effective to require I/M in such rural territory and their inclusion would contribute very little emission reduction benefit. Past EPA policy on I/M has provided for the exclusion of such rural areas even within a nonattainment area, and by establishing the criterion of 100,000 people or more in an MSA, the Act excludes many large rural areas in an ozone transport region. Further, section 184(b)(1)(A) requires transport areas to have the I/M program described in section 182(c)(3), which is a program that applies only in urbanized areas. Therefore, EPA believes it is consistent with Congressional intent to require that the enhanced I/M program be implemented in all counties within the entire MSA, except largely rural counties with fewer than 200 persons per square mile. In the public comment process, however, EPA learned that this provision would allow the exclusion of a few entire MSAs. In that this is contrary to the letter of the law, the final rule requires that at least 50% of any given MSA be included in the enhanced I/M program. On the other hand, the requirement to implement enhanced I/M in the entire county would cause at least one and maybe other islands off the Northeast coast that are not connected by bridge, road or tunnel to the mainland to be included in the I/M program. Since such a requirement could create a significant hardship for vehicle owners residing on such isolated islands, the final rule allows for the exclusion of such islands from the enhanced I/M program.

4. Multi-State Areas

The Act does not address multi-state urbanized areas. Past de facto practice by EPA exempted portions of urbanized areas in bordering states if the urban population in that State were under 200,000. Multi-state moderate ozone nonattainment areas have portions that vary from under 50,000 to as much as 100,000 or more. In multi-state urbanized areas, the rule requires that the appropriate level I/M program (as determined by the classification and population of the urbanized area as a whole) be implemented in the urbanized area within each of the affected states provided that the urbanized area population within the state is 50,000 or more, as defined by the Bureau of Census in 1990. According to the Census' definition, 50,000 persons is the minimum to constitute an urbanized area. EPA believes this threshold is consistent with the criteria established for single-state areas and with the exclusion provisions for basic areas discussed below.

I. Geographic Coverage

EPA's I/M policy prior to enactment of the amended Act included a "geographic bubble" that allowed programs to claim emission reduction credits for expanding the testing requirement to include non-urban portions of the nonattainment area surrounding the urbanized area. The extra emission reduction credits could be applied toward the minimum performance standard the program had to meet. The bubble was calculated using human population data instead of

motor vehicle population because a reliable source of disaggregate data for the latter was not generally available. Thus, the bubble was defined as the number of people included in the actual I/M area divided by the number of people in the urbanized area. This calculation yielded a bubble factor that was multiplied by the emission reduction benefit of the program to account for the added benefit from testing non-urban vehicles. Due to the way urbanized areas and nonattainment areas are defined, the geographic bubble factors that are available are quite varied and frequently quite large, i.e., factors of 2 to 4. With such large bubbles, some I/M programs were designed to meet emission reduction requirements through broad geographic coverage, but had a very weak program design. Other areas had a strong design intent but were able to meet the minimum performance standard in operation despite serious operating problems. In essence, the geographic bubble effectively lowers the performance standard for areas which have large MSAs in relation to the urbanized area. EPA does not believe that such weakening of the performance standard is consistent with the Act's intent of establishing more effective I/M programs. Therefore, today's action requires that credit from expanding program coverage beyond the minimum required area boundaries can only be applied toward the "reasonable further progress" requirement or can be used as an offset, provided that the covered vehicles are operated in the nonattainment area.

Similarly, EPA's policy prior to enactment of the Act included a "geographic debubble" policy that allowed parts of an urban area to be excluded from the program as long as the emission reduction loss was made up in some other way. The purpose of this policy was to allow States to confine the program to county boundaries. Urbanized area boundaries do not correspond to county boundaries, making it difficult to establish a coherent administrative area based on the urban area. Also, in some cases, a very small fraction of a county might be included in the definition of an urbanized area. General practice has been to exclude these portions of the urbanized area to avoid having to include the entire county. In most cases, programs made up for these exclusions by including the non-urban portions of the counties central to the area, thereby effecting a one-to-one trade in population covered. In today's action, exclusion of some urban population from I/M requirements is allowed, as long as an equivalent number of contiguous non-urban residents who live within the same MSA are included in the program to compensate for the exclusion. EPA believes that it is appropriate to allow this bubble in recognition of administrative needs since such nearby non-urban vehicles can be expected to drive in the urbanized area and thus, emission reductions within the urbanized area will occur. EPA encourages States to rationalize their I/M boundaries by making them broader (especially to county lines) rather than narrower. This will contribute additional emission reductions and help insure expeditious attainment.

J. Administrative Program Requirements

1. Background

EPA has accumulated much information since the 1977 Amendments to the Act regarding effective design and implementation of I/M programs through audits, day-to-day work with I/M program managers and officials, roadside emission and tampering surveys, in-depth analyses of test data, and various studies by individual States and EPA. In 1984, EPA began auditing I/M programs as part of the National Air Audit System, using procedures developed jointly by EPA, the State and Territorial Air Pollution Program Administrators (STAPPA), and the Association of Local Air Pollution Control Officials (ALAPCO). These procedures are detailed in the National Air Audit System Guidance (EPA–450/2–88–002). To date, EPA has conducted over 96 I/M program audits totaling more than 320 person days of on-site visits and several thousand person days of related activities.

This experience has shown that significant problems can exist in I/M programs which adversely impact the magnitude of air quality benefits that programs achieve. These problems include excessive waivers, motorist noncompliance, inadequate quality assurance and quality control measures, outdated test procedures, insufficient enforcement against inspectors that violate regulations, inadequate data collection and analysis, inadequate resources, and improper testing (see I/M Network Type: Effects on Emission Reductions, Cost, and Convenience, EPA–AA–TSS–I/M–89–2 in the docket). These problems reduce the emission reduction effectiveness of these programs, but generally do not reduce test costs. The intent of today's regulation is to address these problems, and insure to the extent possible that vehicles are tested accurately and repaired correctly, thus achieving the best emission reduction at the lowest possible cost.

The General Accounting Office has audited the I/M program several times and has consistently concluded that these problems exist and that tougher requirements are needed to correct the problems. EPA's Inspector General has also audited the I/M program and has come to similar conclusions. Both have strongly recommended the establishment of regulations, as opposed to guidance, as a means to address these problems. Reports by these organizations are included in the docket.

The intent of this regulation is to address these problems, and insure to the extent possible that vehicles are tested accurately and repaired correctly, thus achieving the best emission reduction at the lowest possible cost.

In the past, decentralized programs have not been as effective as centralized programs in achieving emission reductions from inspection of motor vehicles. This inequality became apparent to EPA in a variety of ways. For example, EPA tampering surveys have shown existing decentralized programs to be less effective than centralized at preventing tampering. Of I/M areas, decentralized program areas have had the highest overall tampering rates, and centralized program areas have had the lowest rates. Analysis of the data for 1975–1983 model year vehicles in the 1987, 1988 and 1989 tampering surveys showed decentralized areas with rates 20% to 50% higher than centralized areas on fuel switching, catalyst, inlet, evaporative canister, and air system tampering, even though many centralized programs do not check underhood components. This suggests that centralized programs are more effective than decentralized programs at deterring tampering.

Further, covert audits of decentralized programs, performed by States and by EPA, have shown that improper inspections occur routinely when vehicles are presented for inspection in decentralized programs and that these problems have not been fully resolved despite determined efforts by some states. In covert audits performed between January and April of 1991, in California and New York (programs which have BAR 90 type analyzers) inspectors passed failing vehicles 20% and 38% of the time, respectively. Even with advanced analyzer technology and the most intensive management of any decentralized program in the country, California has not been able to

completely resolve its improper inspection problem. Preliminary data from the second round of self-evaluation required under California law show 30% of the vehicles being passed when they should fail at the first Smog Check station which is visited. Covert audits performed by decentralized programs with BAR84 test equipment typically show even higher numbers of inspectors passing failing vehicles, with rates between 34% and 82%. The limited number of covert visits EPA is able to make during program audits show similar results; between 8% and 75% of inspectors passed vehicles which should have failed in the six audits of decentralized programs performed in 1990. The number of inspectors performing some element of the test incorrectly, whether or not it resulted in a false pass, was much higher, between 25% and 100%.

In the audits and studies summarized here, the false passes most often involved incorrect visual or functional inspections of emission components, since defects in these are the easiest for enforcement agencies to introduce into audit vehicles. However, incorrect tailpipe testing is both technically possible and has been observed in audits as well. EPA believes it would be even more common in many decentralized programs than it is at present, except for the fact that a low cost waiver limit, loose control of compliance documents, and other laxities provide alternate means for owners to avoid repairs of cars that would fail a properly performed test or retest. As discussed previously, the Clean Air prohibits low cost waivers for enhanced I/M programs.

Centralized programs are not completely immune to these problems. Due to the automation in centralized systems, as well as on-site supervision, it is virtually impossible to improperly test a vehicle for tailpipe emissions. However, improper testing has been found on the visual emission control device checks in centralized programs. The important feature which sets centralized programs apart is the demonstrated ability to correct problems once found. When problems have been found in well-run centralized systems, the response by program management has led to virtual elimination of the problem in a relatively short period of time. The limited scope of the quality assurance problem, as compared to a decentralized system, makes this feasible. Of course, the durability of this improved performance must be ensured by continual monitoring. Suffice it to say that an effective on-going quality assurance program is equally essential in a centralized system and this action establishes minimum requirements to that end.

Covert audits with a vehicle set to fail the exhaust emissions test or the emission control device visual inspection show, to some degree, how actual initial testing takes place. They do not, however, provide realistic information on the objectivity and impartiality of retest. Based on overt audit findings and data analysis, EPA believes that improper testing in test-and-repair decentralized programs occurs more often on retest than on initial test. First, the option of an improper retest removes most of the incentive there might be for an improper initial test. Second, stations are aware that States use initial test failure rates to screen stations for additional surveillance; those with low initial failure rates are targeted for covert audits or other investigation. EPA believes that inspectors are often too ready to please a customer or unwilling to admit that the vehicle does not pass, even after repairs. In traditional centralized programs, the opportunity for a motorist to "shop around" for a false passing result or for an inspector to probe a clean vehicle or otherwise falsify the tailpipe emission test essentially does not exist. The tailpipe test is automated, inspectors are well supervised and have no stake in repairs, and the single contractor is assured of the test business regardless of test outcome. A multi-supplier test-only system should significantly reduce this problem as well.

To address these types of problems, the regulations set out specific requirements for both basic and enhanced areas for data collection and analysis, enforcement against stations and inspectors, and quality assurance. Today's action also requires that all test systems in fully implemented enhanced I/M programs be electronically connected to allow real-time data transfer between stations and a host computer. It also requires computerized (BAR–90 quality) analyzers in basic I/M programs.

2. Data Collection and Analysis

EPA audits have indicated that problems exist with oversight, management, and test procedures in some I/M programs. Inspectors often perform inspections incorrectly even when they are aware of being observed by auditors. Auditors have also found missing stickers, lack of certificate security, poor record-keeping, and other administrative problems. Evidence of improper testing often appears in subsequent review of paperwork and records, in the count of stickers or certificates issued but not accounted for, and suspicious information in waiver and repair records.

For example, a station may claim to have charged the same amount for almost all repairs performed, or the same repair may be documented for most vehicles. Records also have shown very short times between tests and the same emission results on a series of tests, indicating that the same vehicle may have been tested repeatedly to provide passing results for a number of vehicles that need repair. Vehicle information (i.e., vehicle type or model year) may be changed between failing and passing tests on the same vehicle, indicating that the inspector changed the standards so the vehicle could pass. Again, the regulations set out requirements for data collection and analysis to better address these types of problems.

Inconsistent data collection has often hampered analysis of program operation; some programs are unable to calculate basic statistics such as the number of vehicles tested and failed because of incomplete data collection. Of those programs that do collect data, some have not used data analysis extensively, despite the fact that it is important in managing program operations. In some cases the quality of the data collected is inferior, as a result of errors on the part of the inspector in entering data into the computer. Typically, data collection problems are more serious in decentralized programs, due to numerous, widely dispersed stations, and varying levels of analyzer sophistication and maintenance. Therefore, the regulation sets out specific data collection requirements; the test data must clearly link specific test results to specific vehicles, vehicle owners, test sites, inspectors, and test parameters. Further, specific data reports on testing, quality assurance, quality control, and enforcement are required to insure adequate monitoring and evaluation of program operation.

3. Quality Assurance Audits

Experience has shown that quality assurance is an essential element of program management, particularly in decentralized systems, which involve numerous stations and inspectors. With a large, dispersed source of inspections, close management is both time consuming and labor intensive, and close attention to detail on the part of the program staff is required. Typically, adequate funding has not been available

to carry out the level of quality assurance necessary to oversee the program, particularly in large decentralized networks. In today's regulation, specific quality assurance objectives and requirements are set out, including regular overt and covert audits to determine whether procedures are being followed correctly, whether records are being maintained adequately, whether equipment is functioning properly, and whether other problems exist which hinder the effectiveness of the program.

4. Funding

Lack of adequate funding for management and oversight has hampered the effectiveness of many programs, and has been especially problematic in decentralized and government-run centralized programs. Underfunding tends to negatively impact all aspects of the program, and is one of the problems that is most difficult to address. Without adequate resources to hire personnel, purchase equipment, monitor stations, follow up on enforcement, conduct data analysis, and perform numerous other necessary functions, the efficiency of many programs has suffered. Therefore, the regulation requires a demonstration that sufficient resources necessary to meet the quality assurance objectives and requirements of the I/M regulation are available. One critical factor in funding is the amount spent on quality assurance activities. Centralized programs currently spend about $1 to $2 per vehicle on all oversight related costs. Decentralized programs spend anywhere from 50¢ to $6 per vehicle, but they all suffer from quality control problems. California recently increased the amount it is spending from $6 per vehicle to $7 in an ongoing effort to address operating problems in the program.

5. Equipment Quality Control

The ability to insure good equipment quality control has also varied with network type, due to oversight capability, available resources, and equipment sophistication. EPA's audits have shown that analyzers frequently fail calibration and leak checks in decentralized networks, while these problems are rarely found in most centralized programs. The goal of the quality control requirements included in the regulation is to insure that test equipment is calibrated and maintained properly, and that inspection and calibration records are created, recorded, and maintained accurately. These requirements include preventive maintenance on equipment; frequent checks of the sampling system; analyzer calibration; dynamometer and constant volume sampler calibration, if applicable; and document security measures.

6. Enforcing Motorist Compliance

Both centralized and decentralized programs have experienced problems, to varying degrees, with all of the approaches traditionally used to insure that motorists participate in the I/M program. The extent of the problem, however, is often difficult to quantify. For many programs, it is difficult to estimate the number of vehicles requiring testing due to problems in obtaining registration data for a defined area from the agency that collects it and with the quality of that data. If can also be difficult to determine how many vehicles have complied. The number of vehicles which programs report were tested may be overstated due to multiple initial tests, in decentralized programs especially. Data loss can also result in reported test rates that are incorrect.

Registration denial enforcement systems have been viewed as effective for the most part, although potentially significant problems do exist. For example, programs that are not state-wide have reported problems with people registering vehicles with an address outside the subject area in order to avoid inspection. Similarly, in programs that do not test all vehicles, motorists may falsely register the vehicle with a weight rating, fuel type or model year that is not required to be tested. Test certificates are sometimes counterfeited, allowing people to escape program requirements. Most I/M programs do not have an effective means of auditing the registration denial process; this makes it difficult to monitor which clerks have been correctly rejecting applications not accompanied by the required test certificate. Registration denial enforcement has been found to be less in States in which a decentralized registration issuance system exists. As with emission testing, it is difficult to insure that registrations are properly denied when issued without unified control.

Sticker enforced programs have historically performed poorly, for a variety of reasons. Enforcement against motorists without stickers requires a substantial amount of effort and commitment from police departments, which have never placed I/M sticker enforcement as a priority. Unless sticker accountability is very tight, motorists can obtain a sticker without having an inspection at all. Also, counterfeiting has been found in most sticker enforced programs. If a program is not state wide, it is often impossible to determine whether a vehicle without a sticker is in fact subject to the I/M test without a police officer calling in the registration. Similarly, vehicle types and model years which are not required to be in the program may be difficult to distinguish from subject vehicles. Finally, the penalty for driving without a valid sticker is often not sufficient to deter non-compliance or is waived after compliance, thereby eliminating deterrence effects.

Computer matching systems have been successfully implemented in several areas, but experience shows that this approach can suffer from problems as well, especially in decentralized systems because of faulty data transfer from inspection stations to the enforcement agency. An effective approach requires sophisticated computer hardware and software and a substantial commitment of resources to operate the system. Program managers must also be willing and able to follow through and take whatever enforcement actions are available to ensure motorist compliance, without political interference.

The sections of the regulation covering motorist compliance address the range of problems that programs may encounter in assuring that vehicles comply with the testing requirements. Section 182(c)(3)(C)(iv) of the Act requires that motorist compliance be ensured through the denial of motor vehicle registration in enhanced I/M programs; enhanced programs may use an existing alternative if it can demonstrate that the alternative is "more effective" than registration denial. For newly implementing enhanced areas, the Act does not provide any alternatives to registration denial enforcement. EPA policy has always required that alternative mechanisms be "as effective" as registration denial and that requirement is retained for basic I/M programs. The regulation specifies the measures necessary to make such determinations. All programs must develop a system which insures that subject vehicles are easily identified, must adopt a test schedule which clearly determines when a vehicle is required to be tested, and must systematically enforce the program. The program also must develop quality assurance and quality control measures to monitor the effectiveness of the enforcement system.

7. Inspector and Station Enforcement

Lack of adequate enforcement authority against stations and inspectors

has historically been a major stumbling block in attempts to implement effective programs, especially in decentralized systems. Even when programs have an effective effort to discover improper testing by stations and inspectors, there is rarely an adequate system in place to prevent the problem from continuing or recurring. Lack of authority, low fines or penalties, and lack of consistent and systematic penalty schedules have appeared as serious impediments to program enforcement in audits of decentralized programs across the country. Therefore, the regulation requires that all inspectors must receive formal training and be licensed or certified to perform inspections, and that such certification be a privilege rather than a right; in effect, programs must insure that inspectors who do not follow program requirements will be penalized fairly and systematically, and will lose their license or certification to perform inspections if problems are not corrected satisfactorily.

In sum, EPA believes that significant changes are needed in the design and oversight of decentralized programs. One factor in improving the performance of decentralized I/M programs can be separation of the test and repair function; evidence suggests that tests were more likely to be performed correctly if the testing agent did not have any interest or involvement in the repair of vehicles. Another important consideration is oversight of the multitude of stations found in low volume decentralized programs. Extensive quality assurance efforts are necessary due to the greater number of stations and inspectors, limited oversight capability, greater incentive for improper testing, and lack of effective enforcement mechanisms in many programs. Even very tightly designed and run quality assurance schemes in decentralized systems have not insured that proper inspections take place, that forms are adequately controlled, or that the program actually achieves estimated emission reductions. While advanced analyzer technology, such as BAR 90 systems, may improve the effectiveness of decentralized testing, the analyzer alone cannot eliminate the incentive for private station owners to perform tests improperly, or solve the quality assurance and oversight problems repeatedly identified in decentralized programs. Therefore, the additional measures listed above are needed to insure that claimed levels of emission reductions are actually achieved. While the rule requires additional efforts in each of these areas, it generally allows States flexibility in the specific design of the I/M program.

8. Program Effectiveness Evaluations

To provide assurance that the in-use vehicle emission levels projected to be achieved by a given program are, in fact, being achieved, today's action requires the implementation of a continuous, State-run effectiveness evaluation program for all enhanced I/M programs. The effectiveness evaluation would need to include, at a minimum, the special testing of a representative, random sample of the fleet, consisting of at least 0.1% of the subject vehicle population. That sample would be required to receive a State-administered or monitored IM240 transient exhaust test, purge test, and pressure test, or another test protocol approved by the Administrator as equivalent for the purposes of evaluation. This testing would take place at the time of these vehicles' scheduled initial inspections, before any repair. EPA believes this could be accomplished in a program which routinely requires IM240 testing by State personnel randomly visiting stations, double checking quality control, performing or closely observing the testing of vehicles which arrive for an initial inspection during the day, and flagging those vehicles tested as "evaluation" cars. Vehicles required to pass only a steady-state test (i.e., older cars) would need to also receive a transient IM240 test, or other approved test protocol, to accurately characterize tailpipe emissions. Test data from these vehicles would document the true state of maintenance and emissions performance of the in-use fleet. In a program in which not all stations are equipped for performing the required battery of evaluation tests a different approach would be needed. In this case, a random sample of vehicle owners would need to be notified in advance of their regularly scheduled inspection and required to report to a station which does have that capability and which will be state operated or monitored as previously described.

The evaluation program described above would also determine the amount of emission reductions the state can credit retrospectively toward the reasonable further progress requirements discussed previously. The I/M performance target is to achieve a specific fleet-wide emission level (in grams per mile) after I/M and other mobile source strategies are implemented.

To isolate the impact of the performance of I/M programs, as opposed to other strategies such as new car standards or reformulated gasoline, EPA will evaluate the performance of centralized, test-only systems (the standard established by the Act) to determine the actual effectiveness of the program. EPA will also do the same for any other approved I/M program. This evaluation will be used to update the emission factor model which states will use to conduct the evaluation of the test-and-repair system. Thus, if any given mobile source strategy is more or less effective than MOBILE5 predicts, EPA's evaluation and model modifications will take that into consideration. For example, if reformulated gasoline is found to be more effective, the emission credits in the model will be adjusted accordingly. So, when an area using reformulated gas evaluates fleetwide emissions, using the revised model will properly account for the actual effect of the program.

K. State Implementation Plan (SIP) Submissions

In today's action, EPA requires that in order to be considered complete and fully approvable, I/M SIP submittals must include an analysis of the program using the most current EPA mobile source emission model demonstrating that the program meets the applicable performance standard; a description of the geographic coverage of the program; a detailed discussion of each required program element; the legal authority related to the implementation and operation of the I/M program; and the text of all implementing regulations, interagency agreements and memoranda of understanding. The following two deadlines are relevant to the SIP submittal process: by November 15, 1992, States must submit a plan which includes a formal commitment by the Governor to the adoption and implementation of an I/M program meeting all the requirements of this action, including a schedule of program implementation milestones addressing the promulgation of draft and final regulations, the issuance of final specifications and procedures, the issuance of final Request for Proposals (where applicable), and all other relevant dates, including mandatory test dates. Note that these submittals do not have to specify program details such as the test procedures or model year coverage. EPA will conditionally approve all such submittals under section 110(k)(4). EPA believes that conditional approvals are appropriate in these circumstances because states cannot be expected to begin developing I/M programs meeting the requirements of these regulations until the regulations are finally adopted. EPA does, however,

believe that states can adopt and implement I/M programs within one year of making the commitment described above. Therefore, as a condition of EPA's approval, the regulations require that by November 15 1993, a complete SIP revision must be submitted which contains all of the elements listed above, including authorizing legislation and implementing regulations. Since EPA is not required to conditionally approve SIP revisions but merely has the discretionary authority to do so, EPA believes that it has the authority to limit the use of conditional approvals to instances in which states commit to submit fully approvable SIPs containing all necessary legislation and regulations by November 15, 1993. EPA believes that in balancing the congressional desire for promptly effective I/M programs with state needs to have EPA's final I/M regulations prior to adopting and implementing programs, November 15, 1993 is a reasonable date to require submission of fully approvable I/M plans.

Various nonattainment areas were required to correct deficiencies in operating I/M programs. These areas must submit commitments to adopt needed changes as soon as possible but no later than the above SIP submittal schedule. The Act also requires basic I/M areas to continue to operate programs at least as stringent as what was in the SIP at the time of passage of the amended Act or the minimum basic requirement, whichever was greater. Today's action requires that areas meet this requirement but allows for changes in program design, as long as those changes result in a program that achieves at least as much or more reduction as the SIP-approved program at the time of passage of the amended Act or the minimum basic program required by these regulations, whichever is greater.

L. Implementation Deadlines

Basic I/M programs must be implemented as expeditiously as practicable, with full implementation by January 1, 1994, for decentralized programs or by July 1, 1994, for centralized programs. Additional phase-in time (not to exceed the enhanced area schedule) may be taken if the area opts to do an enhanced I/M program instead.

Today's action requires that enhanced I/M programs be fully implemented with respect to all administrative details, such as enforcement and waivers, by January 1, 1995. However, today's action allows states to phase in high-tech testing. The rule calls for high-tech testing to start in January 1995, and to cover at least 30% of the vehicle model years present in the fleet at the time which according to the program design will eventually be subject to the high-tech test in order to meet the November 1999 milestone. The rule also calls for all affected vehicles to be inspected using high-tech by January 1, 1996. Another phase-in option in today's action is to allow States to begin high-tech testing with looser cutpoints to allow the test system and repair industry to adjust to the new requirement. This is important to allow the repair industry to build the skills necessary to fix vehicles that will fail the high-tech procedure. Full cutpoint phase-in for these vehicles must be completed by January 1, 1998. EPA is also concerned about the time that may be needed for programs which have established test-and-repair networks to make a transition to a test-only format without causing some portion of the currently licensed inspection stations to lose their investment in new I/M analyzers. Today's action allows enhanced I/M areas to continue testing vehicles, which are not among the 30% phased in to test-only as described above, in a test-and-repair network until January 1, 1996, when the test-only system would be fully phased-in.

Section 182(c)(3)(B) of the Act requires that enhanced I/M programs "take effect" by November 15, 1992, in compliance with EPA's enhanced I/M guidance. Had the Agency been able to promulgate full guidance by even the statutory date of November 15, 1991, states and local jurisdictions would still have been extremely hard pressed to enact legal authority, adopt rules, license or contract for the building of test-only facilities, and complete the myriad of tasks that are required to fully implement an effective program by November 15, 1992. It is clear that this date is now impossible to meet.

On the other hand, the sense of urgency incorporated in the statutory date is well justified, and the Agency has attempted to craft a combination of required SIP submittal dates and testing phase-in schedules which will require enhanced I/M areas to make an immediate commitment to a fully effective program and to proceed expeditiously with its implementation. The subsequent submittal dates represent a significant challenge and will require priority focus on implementation of the enhanced I/M program. As stated above in the section on SIP submittal deadlines, EPA believes that states will need one year from initial SIP commitment submission to adopt all necessary statutory and regulatory authority. Once this is done, EPA concludes that the statutory requirement to have programs "take effect" will be satisfied. The implementation phase-in dates provide states the time needed to construct testing facilities and get the program fully operational.

VI. Public Participation

This section discusses the content of major submissions to the docket received during the comment period and EPA's response to those comments. Submissions were received from approximately 300 commenters, including private citizens, state and local governments, various industries, environmental organizations, and other organizations and individuals. Copies of the comments in their entirety can be obtained from the docket for this rule (see "**ADDRESSES**"). The docket also includes a complete Response to Comments document for this rule, which provides greater detail on the comments received and EPA's response. Given the sheer volume of the comments received, many of the less significant comments or minor details are addressed only in the Response to Comments document even where minor changes to the final rule were made in response to such comments. Seven major issues emerged from the public comments and will be addressed below. These include: Network type, alternatives to the IM240, implementation deadlines, improving repair effectiveness, on-road testing, the enhanced I/M performance standard, and the basic I/M performance standard.

A. Network Type

1. Summary of Proposal

The preamble to the proposed rule stated that EPA knows of no way to make test-and-repair decentralized programs as effective as test-only centralized programs, based on experience over the past 15 years showing problems with improper testing, oversight, and quality control. EPA believes that an inherent conflict of interest exists which increases the likelihood of improper testing in this type of network. However, several commenters in public sessions prior to issuance of the notice of proposed rulemaking (NPRM) had argued strongly that test-and-repair networks are or could be equivalent to centralized programs, and that EPA was unjustified in automatically discounting enhanced test-and-repair program effectiveness.

In the NPRM, EPA proposed that decentralized test-and-repair programs be granted provisional equivalency to

centralized programs for purposes of initial SIP submission and approval, requiring program evaluation to assure that both centralized and decentralized programs were meeting the performance standard. EPA proposed to require any test-and-repair program granted provisional equivalency to submit a back-up plan including all necessary authority to switch to a test-only system if the program evaluation showed that the performance standard was not being met. EPA also proposed that test-only decentralized networks, such as the management contractor/franchise system being proposed in Texas, be granted presumptive equivalency to traditional single contractor, test-only programs. EPA asked for comment on the appropriate definition of "test-only" for purposes of granting presumptive equivalency. For areas that wished to retain decentralized programs but did not meet requirements for provisional or presumptive equivalency, EPA proposed that States could petition the Administrator for higher than the default level credit for their programs, based on past performance, on a case-by-case basis.

2. Summary of Comments

2. Comments on network type focused on several issues: the advantages and disadvantages of decentralized and centralized networks, the ability or inability of decentralized programs to achieve equivalent emission reductions to centralized programs, and the appropriateness and legality of granting presumptive or provisional equivalency to test-and-repair and test-only decentralized networks. Each of these issues is discussed below.

a. *Advantages of Centralized and Decentralized Networks.* The advantage offered for decentralized test-and-repair programs by station owners and The Society of Automotive Vehicle Emission Reductions, Inc. (SAVER) was that decentralized programs are more convenient for the public. The consumer can choose where to have a vehicle inspected and repaired. Because repair and test are not separated, it is easier for the mechanic to verify that repairs were performed effectively and redundant equipment costs are avoided. Centralized programs were disfavored because they allegedly would create long lines and necessitate multiple trips, i.e., failing motorists cannot purchase repairs at the inspection facility. Long driving distances and high prices for a centralized test were also cited as disadvantages of centralized programs in comparison to decentralized programs.

The advantages offered for centralized programs by centralized contractors and state agencies operating centralized programs were that test fees were lower, oversight and enforcement costs are lower, and the consumer gets an objective test. These parties find no overall convenience advantage in decentralized programs. They note that improper testing and improper failures also result in inconvenience.

b. *Legality and Appropriateness of Provisional Equivalency.* NESCAUM, the American Lung Association, the Natural Resource Defense Council, STAPPA/ALAPCO, the New York Department of Environmental Conservation, the New York Department of Motor Vehicles, the California EPA, the California I/M Review Committee, and many others commented that in light of evidence that decentralized test-and-repair programs cannot meet a centralized performance standard, it is inadequate and probably illegal for EPA to allow for provisional equivalency. They suggest no evidence has been provided that decentralized test-and-repair programs can work as well as centralized programs. These commenters argue that to grant provisional equivalency without some confidence in the prospects for success is to irresponsibly allow ineffective and costly programs to continue while air quality improvement suffers. Parties argue that either test-and-repair programs should not be allowed at all, or up-front equivalency demonstrations should be made.

Station owners and other parties commented that decentralized test-and-repair programs can be as effective as centralized programs. They believe that centralized programs have improper testing too, and argue that separating repair and testing will not eliminate cheating. The main argument is that BAR90 technology has solved or can allow I/M programs to solve these problems. It was also argued that more attention to enforcement would solve the problem. Some believe that with the addition of enhanced BAR90 technology and the ASM test, stations would have more of an investment and therefore would be more motivated to perform proper tests.

Parties arguing that decentralized programs could not and will never be able to meet a centralized enhanced performance standard cited past experience, especially with the BAR90 systems in California and New York. They also believe that the inherent conflict of interest, the large number of stations, and the institutional barriers they face make it impossible for a decentralized test-and-repair system to work equally effectively. In that California, with its severe air quality problem and forceful air quality program, has spent $6–7 per car on oversight and still is experiencing high improper testing rates, it is not likely that any other state can do better.

Comments on the program evaluation requirements for equivalency demonstration were closely related to the proposal's intent of granting presumptive and provisional equivalency. Those who felt that decentralized programs should be granted provisional equivalency commented that a back-up program should not be required. Those who were against granting provisional or presumptive equivalency in the first place commented that at the very least a back-up program was necessary, while others argued that an up-front demonstration of equivalency was required by the Clean Air Act. Those parties did not feel that decentralized programs could meet such a requirement for equivalency up-front or in the future, and felt that allowing states to try was irresponsible of EPA. In light of experience showing that decentralized programs did not work, and especially looking at the California example, these parties argued that provisional equivalency would lead to the prolonging of programs doomed to inevitably fail. Meanwhile, time, money, and effort would be wasted on attempting to demonstrate equivalency, while air quality continued to worsen. Parties who were network neutral commented in favor of the most effective, cost-effective, and convenient choices possible, and urged EPA to make network requirements clear, so that station owners could make reasonable decisions as to whether to invest in an enhanced program or not.

The National Automotive Service Association urges EPA to be clear in setting equivalency requirements so that small business owners are not misled. The organization is concerned that "changing the ground rules" will mean that owners do not have time to recover their investments.

c. *Legality and Appropriateness of Presumptive Equivalency.* The majority of comments on this section of the rule relate to the definition of "test-only." Commenters were concerned that any other services, even if they were not repair related, may lead to a conflict of interest, in that the facility may sell easy passes to increase other business, and that the motivation to perform proper testing to avoid loss of license may be diminished by revenue from other

services. Other services may also simply distract from the testing process and result in weaker quality control and quality assurance. In addition, commenters were concerned that a true separation of test-and-repair could not be achieved. The Natural Resources Defense Council, a centralized contractor, a local repair shop owner, an analyzer manufacturer, and the Automotive Service Association supported a definition of test-only that allowed for no other services.

ARCO commented that the definition of test-only should be less restrictive and allow for the sale of gasoline, tune-ups, brake jobs, tire replacement, oil changes, motor vehicle sales and leasing, and emission control repairs up to $30. Jiffy Lube commented that quick lube services do not affect emissions and should be allowed.

The Texas Air Control Board commented that the rule should more explicitly separate test and repair, for example by barring individuals from owning stock in companies providing motor vehicle sales or services. The TACB had been concerned with making more than a paper distinction between test and repair facilities. Mobil Oil supported a definition requiring test-only contractors to not engage in the business of manufacturing or selling motor vehicles in the state, and prohibiting them from offering to the general public for profit motor vehicle maintenance or repair service at the inspection location or any other location in the state.

NRDC commented that presumptive equivalency may be premature since the larger number of stations and participants may make quality control and assurance more difficult than in a single contractor situation. Also, independent test-only stations might sell easy passes simply to encourage repeat and word-of-mouth inspection business.

3. Response to Comments

a. *Advantages of Centralized and Decentralized Networks.* The advantage cited for decentralized programs—superior convenience—is not supported by the data available, and contrary to initial, intuitive thinking about the problem, the data available indicate the opposite is true. EPA specifically requested information on the relative convenience costs of centralized and decentralized programs. EPA has one new major set of data on the convenience issue submitted by ARCO. Also, EPA conducted an audit of the St. Louis, Missouri BAR90 I/M program which also yielded some information on convenience issues. ARCO submitted its latest Customer Study statistics on the use of its SMOGPROS stations in California. The ARCO study showed that 82% of the motorists getting tested at a SMOGPROS station waited for the test. Only 9% dropped the car off and went to work. Of those that failed (18%), one-third left the test station and did not get repairs there. A survey conducted by Riter Research, Inc. (discussed in the proposed rule preamble) found 50% went to another station for repair; the difference probably stems from the fact that SMOGPROS emphasizes and markets its repair capabilities. Neither of these studies looked at the question of whether those who got repairs at the station of initial test were able to do so at the time of initial test. Anecdotal evidence indicates that motorists that fail at a test-and-repair station often need to make an appointment at a later time for the repair work. This is not surprising given that good repair shops are usually booked solid and most people are unaware that they might fail the test. Among the 82% that waited for the test, 62% waited more than 20 minutes. 23% of the SMOGPROS customers that came from home drove more than 5 miles to the station and 40% of the customers that come from work drove over 5 miles. EPA found in its recent audit of the Missouri decentralized test-and-repair I/M program, that it took 48 minutes on average to get a test at a randomly selected sample of stations even when appointments were made beforehand. Also, 40% of the stations in St. Louis at which auditors tried to get an inspection without an appointment told the auditor that a test could not be done anytime soon and that they would have to return at another time.

These data reinforce earlier findings about decentralized, test-and-repair convenience: Motorists wait much longer to get a test than in efficient centralized systems (typically under 5 minutes), and despite the large number of stations, many motorists drive long distances to get inspected in test-and-repair networks—seemingly as far as in centralized programs with well designed networks. The enhanced decentralized, test-only option that states can pursue retains the high-volume efficiency of centralized networks while making more test stations available to further reduce driving distances.

Among the cohort of vehicles that fail the initial test, it is clear from the ARCO data and the Riter Research data that many or most people that fail the test do not opt for one stop test-and-repair and other information indicates that some may have to make more than one trip even if they want to get repaired at the initial test station. Given that the overwhelming majority of motorists will pass the initial test, the time they save in a centralized system more than exceeds the apparently small additional time, compared to a test-and-repair system, motorists that fail will spend going to a repair shop and returning to the test-only facility.

The California I/M Review Committee investigated the question of indirect costs for both centralized and decentralized programs. The Committee looked at the entire time cycle, including driving to the station, getting a test, and the complete repair and retest process. The Committee estimated that the total time, per inspected vehicle for the entire process was 76 minutes in a centralized program and 83.25 minutes in a decentralized program.

EPA concludes there is no factual basis for the thesis that test-only is less convenient than test-and-repair. It is clear that test-only programs are more convenient for the majority of motorists that pass, and may in fact be more convenient overall. This conclusion is supported by the California I/M Review Committee which has undertaken an in-depth analysis of test-only I/M issues, as well as other commenters with experience in centralized systems.

The rule gives states the opportunity to reduce by virtually half the inconvenience associated with I/M, simply by switching to a biennial system. States can further enhance the convenience of test-only systems by issuing registrations in the inspection lane. By doing so, motorists avoid having to visit the Department of Motor Vehicles and wait to get the reregistration processed. States are also considering "bundling" other services such as driver license renewal, tax payments, and the like. EPA would encourage states to continue in these efforts at maximizing public convenience.

b. *Legality and Appropriateness of Provisional Equivalency.* EPA was impressed by the fact that the state agencies that are charged with implementing enhanced I/M programs stated in no uncertain terms that they knew of no solution to the problem of test-and-repair ineffectiveness and virtually all urged EPA to eliminate provisional equivalency from the final rule. EPA was also surprised to hear that many representatives of the decentralized, test-and-repair industry were not in favor of the provisional equivalency approach taken in the rule. They considered it a non-option because of the uncertain situation it left them in and the political difficulty such an approach would face.

The argument by SAVER, and other test-and-repair industry representatives, that the enhanced BAR90 system can address the problems with test-and-repair programs is not supported by the results from BAR90 systems in California and New York, both of which submitted extensive comments and data on effectiveness, and the Missouri BAR90 program which EPA audited in August of 1992. EPA conducted 38 covert audits over three days in St. Louis and 84% of the stations falsely passed vehicles set to fail the test. The catalyst was removed from the covert vehicles, and despite the fact that the Missouri program includes a safety inspection that requires the vehicle to be raised on a lift for a brake check, 75% of the stations passed the covert vehicles for catalyst. The covert vehicles were also set to fail the tailpipe emission test, yet 34% of the stations found ways to pass these vehicles.

California is recognized by most observers as having the most effective and comprehensive decentralized, test-and-repair system in the world. The California I/M Review Committee's Draft Fourth Report to the Legislature, issued on September 8, 1992, reinforces the findings discussed in the proposed rule that test-and-repair I/M programs are achieving only 50% (at best) of the potential emission reductions. The report shows that the enhanced BAR90 system being used in California is achieving only 42% of the potential for hydrocarbons, 32% for carbon monoxide, and 34% for hydrocarbons. The Committee also writes that "Limited evidence available to the Review Committee suggest that improper Smog Checks may occur more frequently under circumstances where the vehicle owner has had a previous business relationship with the Smog Check station. Under these circumstances, there is an inherent conflict of interest between the desire of the Smog Check station to satisfy the customer and the need to perform a proper and thorough inspection that may cause the vehicle to fail." The Review Committee also concluded that given the enormous expenditures on enforcement in California, additional expenditures on enforcement to improve compliance would not be cost-effective.

The New York Department of Motor Vehicles presented extensive testimony on the pitfalls of implementing a test-and-repair program. New York is using the most advanced BAR90 arrangement with modem hook-ups to a centralized data processing system and automatic polling of stations. The Department testified that the 50% credit reduction estimated for test-and-repair programs by EPA is supported by the Department's findings. The DMV set out in designing its BAR90 system to "close every loophole" but they quickly found out that the system simply does not work. The testimony from New York demonstrates that despite having the most sophisticated analyzers, excellent data collection and analysis, and aggressive covert audits, other fundamental problems impeded effective performance. EPA views many of these problems as major stumbling blocks and would encourage the reader to review the docket for the full text of this testimony. Two examples will provide a flavor of this testimony. First, New York testified that data analysis alone is insufficient evidence in court, that in order to successfully prosecute, the state must catch the inspector doing the improper testing. Second, the state found, as has California and others, that catching inspectors actually doing improper testing is extremely difficult. NY DMV testified, "If you [the inspection station] don't do inspections for anybody but regular customers—bad inspections for anybody but regular customers, or [for] good, strong referrals—from either another station or some person you know and trust—then an undercover will *never* get you. (emphasis added)" This is a fundamental limitation in the test-and-repair system. EPA's experience with covert audits is that it is very hard to overcome the natural suspicion of inspectors at stations. They know the state is out doing covert audits and most take the necessary precautions to avoid being detected engaging in improper testing, many times EPA covert auditors are discovered by the station and confronted. Thus, a quality assurance system has two effects: it eliminates egregious improper testing and it makes inspectors cautious about for whom they improperly test. Essentially, improper testing becomes harder to detect because it is driven underground. California showed that with the expenditure of vast amounts of resources it could reduce the covert audit false improper test rate from about 80% to about 20–30%. But the I/M Review Committee's work shows that much of this change was a diminution in detection not wholly a reduction in actual improper testing or an improvement in program performance.

The due process system makes it virtually impossible to detect, stop, and prevent improper testing in test-and-repair systems. New York DMV finds that while the BAR90 system has improved its ability to detect improper testing through data analysis, the legal system essentially doesn't allow data to be introduced as evidence. Even when an inspector is caught doing an improper inspection during a covert audit, the plea before the judge is that an isolated mistake was made inadvertently—even when data indicates a larger problem. The inspector gets off with a reprimand, or a short suspension. Even when a revocation is obtained, the inspector can get a stay within 30 days and is back in business selling tests, or the business simply reincorporates with different principals (often in-laws) and business-as-usual resumes. Under these circumstances, the type of analyzer, the type of test, the amount of oversight, and the expenditures made are essentially irrelevant.

The House Committee Report on the Clean Air Act gives some insight into the Committee's thinking on this question when it states, "The intent of the Committee is that enhanced inspection and maintenance programs as required under this subsection are to either be centralized, or to include other program elements which taken together allow a decentralized system to be as effective as a centralized system in identifying noncomplying motor vehicles, and causing such vehicles to be repaired." (House Rept. 101–490, part 1, p. 240) The basic problem with the provisional equivalency approach is that neither EPA nor the states or other commenters know of any "other program elements taken together" that will achieve equal effectiveness, except the separation of test and repair. While some comments indicated concern over particular aspects of the definition of a decentralized test-only system, most concurred with EPA that such a system will be equally effective. However, the docket is conspicuously lacking in ways to make decentralized, test-and-repair equally effective that haven't already been tried and failed.

In light of the absence of known elements to make test-and-repair equally effective, EPA shares the concern that provisional equivalency for test-and-repair systems will simply delay the implementation of effective enhanced I/M programs, that it will create more confusion and hardship than a transition to a test-only network, and will be inordinately expensive to attempt. Therefore, EPA has dropped the provisional equivalency option for test-and-repair systems from the final rule. Nevertheless, besides implementing a decentralized, test-only system, states still have the option under the provisions of case-by-case equivalency to demonstrate that a decentralized,

test-and-repair program will be as effective as a centralized system. States will have to make this demonstration at the time of SIP submittal as contemplated by the statute.

C. *Legality and Appropriateness of Presumptive Equivalency.* EPA agrees with the majority of commenters on this issue that presumptive equivalency should be further limited with respect to the definition of test-only. It was EPA's intent in deriving the test-only concept, that it would be very much like centralized programs today, where only testing is performed at the station and there is no other business involved to compete with the testing business for management attention. EPA believes that test-only stations could be authorized to perform other state services, such as registration renewal, without creating a conflict of interest. Thus, EPA has modified the definition of "test-only" for the purposes of presumptive equivalency, to clarify that the sole purpose of stations in such program shall be testing, with the exceptions discussed above.

Jiffy Lube and ARCO would have EPA further blur the line distinguishing testing and repair. EPA finds no rational basis for granting presumptive equivalency to a test-only system in which shops perform all sorts of motor vehicle services (such as lube jobs) and/or repairs. In the recent Missouri audit, lube shops, tire shops and other stations that would fall into a broadened definition of test-only performed improper testing more often than the overall average. There is no evidence to suggest that the conflicts of interest and the program management impediments inherent in the test-and-repair approach are alleviated by eliminating engine repairs alone from the test station.

The NRDC commented that presumptive equivalency may be premature for a decentralized, test-only system. While EPA is concerned that states could poorly design and implement test-only programs, EPA believes the risks are no greater than that presented by a centralized system. The reality is that any kind of program can be badly implemented. EPA believes the comprehensive requirements contained in today's rule will lead to high levels of quality control and quality assurance in both types of systems.

B. Alternative Tests

1. Summary of Proposal

It was proposed that alternative test procedures be approved if they were shown to meet the criteria established by § 207 of the Clean Air Act and by the I/M rule. EPA requested comments on an enhanced performance standard that would incorporate steady-state tests and comments and any available test data regarding the feasibly and potential effectiveness of an inspection comprised of steady-state exhaust and steady-state purge tests in a tests in a test-only network. Specifically, EPA requested comments on the ability of a steady-state test to identify high emitting vehicles and enforce effective repairs.

2. Summary of Comments

Most commenters recommended that EPA continue to evaluate alternative tests such as the acceleration simulation mode test publicized by ARCO. The main reason offered for why EPA should evaluate and possibly adopt the test for the performance standard was that it was cheaper and faster than the IM240 test. It also was suggested that it may have fewer errors of commission, or false failures. Some automobile dealer associations suggested the test should be adopted in the regulation as equivalent or if not equivalent, better from a cost standpoint. These organizations offered no further data except what ARCO had presented to support their position. Environment Canada submitted data collected in a lab study it undertook in Ottawa. The California Environmental Protection Agency also submitted test data. Unfortunately, these data have turned out to be defective because incorrect dynamometer settings were used in the testing.

Motor vehicle manufacturers and centralized contractors urged EPA not to approve tests that did not meet the criteria for approval proposed in the NPRM and that were not based on a significant amount of data. On the other hand, ARCO urged EPA to drop the requirement for Federal Test Procedure correlation, arguing that the test should be approved based on its ability to identify high emitters.

3. Response to Comments

The status of investigating alternative tests has been addressed previously in the discussion of major issues. The final rule leaves the alternative test section unchanged from the proposal. ARCO's suggestion for dropping the correlation requirement would be contrary to the requirements of section 207 of the Clean Air Act. EPA agrees with the Motor Vehicle Manufacturers that a significant data base is necessary to assess the effectiveness of a test procedure—both laboratory data and data from I/M lane application of the test. Test procedures must be evaluated under the full range of circumstances under which they will be used and on the full range of vehicles. EPA is committed to fully evaluating the four-mode test procedure discussed earlier and developing I/M credits for such tests. If these tests prove effective, EPA will establish official test procedures pursuant to the criteria in section 207 of the Clean Air Act, provide emission reduction credits for them, and make them available to I/M programs. At this point in time, however, EPA believes that there is no technical basis for approving any steady-state loaded mode test as an alternative to the IM240.

C. Implementation Deadlines

1. Summary of Proposal

The proposal set out implementation deadlines with the goal of requiring the most expeditious implementation of programs practicable. For basic I/M areas implementing decentralized programs, July of 1993 was the proposed deadline. For basic areas implementing centralized programs, the proposed deadline was six months later, January of 1994. For enhanced areas, it was proposed that all program requirements go into effect by July of 1994, with phase-in of test-only coverage and high-tech testing allowed for areas switching from test-and-repair to test-only. Phase-in of transient testing and evaporative system checks was also proposed for test-only areas. Phase-in was structured such that 30% of the vehicles that were to eventually be subject to transient IM240 testing were to participate in the test-only system beginning in July of 1994. By January of 1996, all applicable model years and types were to be included in the test-only system. For existing test-only areas with contract expiration dates up to December 31, 1994, alternative phase-in schedules could be approved. EPA requested comment on alternative implementation schedules.

2. Summary of Comments

Most environmental groups that commented favored an accelerated implementation schedule. A chapter of the Sierra Club approved of the schedule, but felt that cutpoints should be tightened before 1998. These groups understand the need for States to have time to implement, but still feel EPA should accelerate the implementation schedule from what is in the regulation. The Natural Resources Defense Council argues that legally, EPA is required to begin the sanction process for states failure to implement programs by November 15, 1992, and for basic areas failure to meet the immediate SIP submission requirements of the Clean Air Act. They comment that EPA does

not have legal authority to offer deadline extensions to states through conditional SIP approvals.

ARCO argued that the different deadlines for decentralized programs versus centralized programs is an unfair advantage for centralized programs. This advantage may mean that decentralized programs will fail to meet the equivalency demonstration because of the lack of time to implement a good program.

States required to implement basic and enhanced programs commented that more implementation time is needed. The Alaska Department of Environmental Conservation and the Michigan Department of State commented that a July 1993 deadline for decentralized basic programs was too early, because analyzer manufacturers would not be able to complete the needed steps of designing, manufacturing, and shipping analyzers by then. The American Association of Motor Vehicle Administrators (AAMVA) agreed and suggested, as did Alaska, a deadline of January 1994 for basic decentralized programs. For basic areas implementing enhanced designs, AAMVA suggested a deadline of January 1995, with phase-in allowed as for enhanced areas. Ohio EPA was also concerned that basic areas not be discouraged from implementing enhanced programs because of the January 1994 deadline.

The California Environmental Protection Agency (CALEPA), the California I/M Review Committee, the South Coast Air Quality Management District (SCAQMD), and the Wisconsin Department of Transportation (WIDOT) all formally commented that more time was needed for implementation in enhanced areas. CALEPA is concerned because it believes it cannot obtain legislation until late in 1993. CALEPA suggests the implementation date for states switching to test-only be January 1996. Similarly, the California I/M Review Committee comments that the state legislature cannot be expected to grant broad authority for sweeping program changes on such a short schedule; they suggest that July of 1995 is the earliest practical date for implementation of a different program. These California agencies contend that the 30% phase-in between 1994 and 1996 does nothing to alleviate the time constraints of the implementation schedule. The SCAQMD commented that the phase-out period for decentralized test-and-repair programs should be longer than provided for, given that substantial inertia already exists against program changes. WIDOT favors a deadline for full enhanced program implementation by November 15, 1996, noting that States who are considering different I/M vendors instead of having current contractors upgrade the program will need more time.

The New Jersey, Utah, and New Hampshire I/M agencies also requested more time. The Texas Vehicle Inspectors Association contended that EPA originally promised phase-out of test-and-repair through the year 2000.

3. Response to Comments

EPA agrees in general that the original deadlines written into the proposed rule do not, at this late date, give states adequate time to accomplish the many tasks involved in implementing new or revised I/M programs. It should be noted that the Clean Air Act did not specify implementation dates for basic I/M programs. Sections 182(a)(2)(B)(i) and (b)(4) merely require states to submit plans "immediately after the date of enactment." Nevertheless, the Clean Air Act contains ambitious deadlines for attainment and reasonable further progress that press for faster implementation than might normally be pursued. There are three states that are faced with a new I/M requirement; all of the other states have operating I/M programs and policy makers are generally familiar with many of the issues and requirements involved in upgrading and expanding I/M programs. This should help expedite the legislative and regulatory process to some extent.

On the other hand, EPA recognizes that the legislative and regulatory processes have inherent time constraints. The legislative process generally takes 3–4 months, at best, and the administrative procedures requirements in states typically require notice-and-comment proposal of regulations prior to being finally adopted. Then additional time is needed to implement the program. Thus, getting legislative changes, regulatory changes, and program modifications implemented in 7 months in basic, decentralized programs (as proposed) is not feasible in most cases and clearly not in the new basic areas. Similarly, the implementation time in centralized, basic programs is even longer because states must develop and issue RFPs, negotiate and award contracts, site and construct stations, and get them up and running smoothly prior to the start date. Thus, WPA believes a thirteen month schedule (i.e., after promulgation of this rule) is feasible for decentralized basic programs, and 19 months for centralized basic system. In the past, centralized systems have taken 24 to 36 months to implement, but EPA believes that states must compress the normal schedule. Enhanced areas face even greater challenges than basic centralized programs, given the complexity and magnitude of changes that are required. These programs will be putting in more sophisticated and complicated equipment to conduct the new, high-tech tests. This equipment will require more time to install and to acceptance test; it is essential that complete acceptance and "shake-down" testing be conducted before starting official testing. The states will also have to acquire the capability and expertise to conduct on-road testing and program evaluation. Quality assurance systems need to be put into place to control waivers, compliance, and equipment quality control. These additional burdens require more time than that involved in a basic program. Again, EPA believes the Act pushes states to move as quickly as possible and the rule requires start-up in only 25 months from publication—about the same amount of time states have needed in the past to implement simpler basic programs.

It is also EPA's intention to approve extended time schedules for basic I/M programs that want to employ high-tech testing and achieve comparable emission performance to that of an enhanced I/M area. Implementation dates beyond those required for enhanced I/M areas, however, could not be justified.

Therefore, the dates for start up for both basic and enhanced programs have been moved back six months. Basic areas that opt for decentralized programs have until January 1, 1994 to begin testing under new or revised requirements, and basic areas that opt for centralized systems have until July 1, 1994. Enhanced I/M programs must begin enhanced operation starting January 1, 1995 with 50% of the fleet subject to test-only operations. Phase-out of test-and-repair operations still applies and full enhanced, test-only operation must begin by January 1, 1996.

EPA believes that section 110(k)(4) gives the agency the authority to conditionally approve I/M SIP submittals based on a commitment by the state to adopt and submit enforceable I/M regulations by November 15, 1993. Where EPA can conditionally approve an I/M SIP submittal, EPA does not believe it is required to find either that a state has failed to submit an I/M program as required by section 182, or that such a submittal is incomplete within the meaning of 110(k)(1). EPA believes that conditional approval under 110(k)(4) is a

complete substitute for full or partial approval under 110(k)(3). Nothing in section 110 concerning EPA approvals or section 179 concerning sanctions indicates that Congress would have wanted the sanctions for failure to submit or submission of an incomplete SIP to apply where EPA has made a conditional approval. The only apparent reason to include conditional approval authority in the statute is to provide states with additional time to adopt fully approvable programs where they cannot do so by the otherwise required date. It would be absurd to provide such flexibility while at the same time imposing sanctions for failure to submit a fully approvable plan. EPA recognizes that as currently drafted the completeness criteria at 40 CFR part 51, appendix V, do not explicitly account for committal SIPs. EPA intends to propose to amend the completeness criteria to clarify that committal SIPs can satisfy the completeness criteria.

EPA acknowledges that section 182(c)(3) requires that enhanced I/M programs should take effect by November 15, 1992. In light of the delay in promulgation of these final regulations, however, it is simply not possible at this late date for states to adopt and put in place enhanced I/M programs that comply in every respect with EPA's I/M guidance, as required by section 182(c)(3)(B), by November 15, 1992. Given this impossibility, EPA believes that states should be required to adopt enhanced I/M programs that take effect as soon as possible after the statutory date. EPA believes that it will take states one year after submission of committal SIPs to adopt such programs. Consequently, EPA is requiring that states submit I/M programs that are in effect by November 15, 1993. Further, EPA believes that such programs will meet the statutory requirement to "take effect," within the meaning of section 182(c)(3), as soon as regulations imposing I/M requirements are effective. The fact that certain aspects of the testing requirements provide for a phase-in of testing stringency does not diminish the effectiveness of the regulations themselves.

D. Improving Repair Effectiveness

1. Summary of Proposal

EPA recognizes that effective repairs are the key to achieving the goals of an I/M program. The NPRM required states to take steps towards ensuring the repair industry has the capability to perform effective repairs. Specifically, states are required to provide technical assistance to repair facilities and to monitor the performance of individual repair facilities. Technical assistance is to include regularly informing repair facilities of program changes and training course schedules, providing information on commonly found problems, and providing a "hot line" service to assist repair technicians with specific repair problems and to answer technical and legal questions. Performance monitoring requires states to provide information on the retest pass/fail rate of individual service providers to the provider and the public. The proposal did not require mechanic training or mechanic certification.

2. Summary of Comments

Commenters were virtually unanimous in stating that advanced repair technician training is needed, that adequate training is often not available, and that without a systematic effort to insure the availability of training, I/M will continue to fall short of its goals. Commenters from every point view on other issues agreed that a national effort was needed and that EPA should do more, and the common thread was that the I/M rule should require mechanic training. Commenters argued that intervention is needed so that consumers subject to mandatory I/M testing can get effective repairs. In addition, improved cost-effectiveness and better program acceptance were cited. A state automotive service association commented that mechanics in their area have a hard enough time fixing cars in the BAR90 program. IM240 and the increased waiver requirements in enhanced areas are expected to result in more pressure on the repair industry to perform. Without training, there is general agreement that many repair technicians will not have the skills needed to effectively repair vehicles.

On-board diagnostics and information from the IM240 are expected to help, but commenters noted this would not be enough in the absence of strong training programs. The American Lung Association, STAPPA/ALAPCO, the Coalition for Safer Cleaner Vehicles, the Natural Resources Defense Council, and several state agencies and local environmental groups support mandated training. These groups also support mandated or voluntary repair technician and/or facility certification programs. The Motor Vehicle Manufacturer Association, Texas Air Control Board, Mobil Oil, and the National Automobile Dealers Association support training and certification programs. The Automotive Service Association and the National Automobile Dealers Association suggest credit incentive programs to encourage early training and certification programs.

3. Response to Comments

EPA has launched a Vehicle Maintenance Initiative, discussed previously, to meet the challenge of the 1990s for high-tech service. EPA cannot by itself solve all of the problems associated with the repair industry. That is the basis for the cooperative effort the agency has undertaken. However, it is clear that the success of the I/M program depends upon the availability of capable repair technicians. The past 15 years of I/M experience have demonstrated that market mechanisms alone will not serve to deliver either good training or adequate numbers of capable technicians (in terms of reducing actual on-road emissions as opposed to merely getting cars to pass the I/M short test or merely qualifying cars for a waiver). EPA is taking the lead to insure that national standards, tests specific to emission diagnosis and repair, and curricula are available for states to use. It is up to states to ensure the administration of these products. Therefore, today's action requires states, as part of the SIP process, to assure the availability of repair technician training in the local community. This is not a requirement for the state to conduct training, per se, but it is a requirement to take action to get adequate training programs started at local community colleges or vocational schools, or to attract private training providers to offer the kinds of training needed.

EPA believes this is only a first step and that much more is needed. Even the most expert technicians in a community are going to be unfamiliar with the new test procedures, the standards, and other program related issues. It is essential that state programs take the initiative to set up a process that get this information to technicians, so that when motorists that fail start showing up for repairs, they won't be in the dark. This is the kind of activity that the outreach program required by the rule is intended to encourage. Beyond this, EPA would encourage states to establish repair technician and repair facility certification programs. Most commenters called for the establishment of a national technician certification program. At this point, EPA believes it can best contribute by establishing national examples and guidelines but it is up to the states to actually implement and enforce certification requirements.

E. On-Road Testing

1. Summary of Proposal

Enhanced areas are required to use on-road testing, i.e., using remote sensing devices or roadside pullovers, to

evaluate the in-use performance of at least 0.5% of the subject fleet each year. Owners of vehicles found to be high emitters are to be required to pass an out-of-cycle follow-up inspection. Emission credit for on-road testing is not specified but will be granted for a program designed to obtain significant reductions over and above those already achieved by other aspects of the program.

2. Summary of Comments

Comments on the on-road testing provisions were fairly balanced between those who believe EPA should strengthen on-road requirements and those who believe EPA should relax on-road requirements. In general, states opposed the 0.5% requirement as burdensome and statistically unjustified and the requirement for out-of-cycle inspections, given the limits of the technology and the high risk of false failures. California suggested a cap on the number of vehicles that would need to be tested in states with large vehicle populations. On the other hand, New York State Senator Owen Johnson commented that EPA is bypassing Congressional intent by requiring only 0.5% of the fleet to be on-road tested. Remote Sensing Technologies suggests EPA should increase the minimum requirement to between 10 and 15%. Resources for the Future, Donald Stedman, and the New Jersey Chapter of the National Motorists Association suggest changes to the NPRM to increase the role of remote sensing. Mr. Stedman suggests that remote sensing can do a better job of testing than an idle or two-speed idle test in a traditional network.

Many organizations did not offer an opinion on the technical merits of the technology but demonstrated considerable interest in remote sensing as a way to possibly reduce costs and inconvenience of I/M, for example by serving as a screening mechanism, and as a way of possibly increasing an I/M program's effectiveness, for example by reducing between cycle tampering and encouraging better maintenance. These organizations urged EPA to continue to evaluate and improve remote sensing technology, and to use remote sensing as a supplement to traditional I/M programs.

The Motor Vehicle Manufacturers Association commented that the 0.5% requirement was arbitrary and that the requirement should be based on cost/benefit analysis. Ohio EPA and Remote Sensing Technologies commented that EPA should establish credits for on-road testing.

3. Response to Comments

EPA has considered the conflicting comments received and has chosen to leave the on-road testing requirement as it was proposed, except for a cap on the minimum number of vehicles that must be tested and minor clarification of terms. The Clean Air Act clearly requires on-road testing to be part of enhanced I/M programs, not simply as window-dressing but as an active part of the overall system. Thus, taking measurements alone is not enough—enforcement of emission limits mut be pursued. EPA plans to issue guidance to states on how to employ remote sensing technology, addressing its current limitations and possibilities. EPA believes that the carbon monoxide channel is accurate enough to use in an I/M program setting as long as certain standards and criteria are employed. It should be reemphasized that remote sensing is not an adequate replacement for enhanced I/M testing. At this point, there is no NO_x capability, it cannot detect evaporative emission system problems, and the hydrocarbon channel is still very coarse. The bottom line is that remote sensing is a useful supplement to enhanced I/M. What is not clear at this point is the amount of emission reduction that could be derived from on-road testing in the context of a stringent, comprehensive, and well-enforced enhanced I/M program, which the Clean Air Act also expects. Therefore, EPA believes that more work is needed to actually deploy on-road testing instruments, require high-emitters to be repaired, and assess the emission reduction benefits derived given various levels of effort. Once this study is completed, EPA believes it will have enough information to establish a general credit model for on-road testing. In the interim, EPA would welcome specific on-road testing plans from states that include an analysis of the potential credit to be derived from the proposed program. EPA is ready to work with states to establish credit where appropriate.

The House Committee Report states that "On-road emission testing is to be a part of the emission testing system, but is to be a complement to testing otherwise required since on-road testing is not intended to replace such testing. On-road emission may not be practical in every season or for every vehicle, and is not required. However, it should play some role in the State program." (House Rept 101–490, part 1, page 239) It seems that Congress recognized practical difficulties and limitations of on-road testing but still wanted "some" role for it in enhanced programs. It clearly did not intend for all vehicles to receive on-road testing. In selecting the 0.5% test level for on-road testing, EPA felt it was important to establish minimum requirements but not to preclude different options. EPA chose the 0.5% minimum based on an analysis of the feasibility of employing either remote sensing devices or roadside pullover programs. EPA agrees with California that a cap on the number of vehicles required to be tested is appropriate and the rule has been modified to limit the minimum to 20,000 vehicles per year or 0.5% of the subject fleet, whichever is less. Setting the minimum testing requirement higher would make roadside pullover programs impractical for I/M programs, especially large ones. For example, in a 4,000,000 car fleet, to obtain a 0.5% test sample requires about 20 weeks of roadside pullovers. A 1% test sample would require on-road testing just about year round for a single team. EPA agrees with the House Committee report that on-road emission testing is not practical all year round. Weather conditions, especially, will limit when on-road testing can be performed—for both road-side pullovers and remote sensing. States are free, of course, to test more than the minimum.

F. Enhanced I/M Performance Standard

1. Summary of Proposal

EPA proposed an enhanced performance standard based on annual testing of all 1968 and later light duty vehicles and light duty trucks, with transient mass-emission testing of 1986 and later model year vehicles using the IM240 driving cycle, transient evaporative system purge test for 1986 and later model year vehicles, and evaporative system integrity test of 1983 and later model year vehicles. The performance standard includes a visual inspection of the catalyst and fuel inlet restrictor on all 1984 and later model year vehicles. The standard is based on a pre-1981 stringency rate (failure rate) of 20%, a waiver rate of 1%, and a compliance rate of 98%. States will have to use the most current version of EPA's mobile source emission factor model at the time of SIP submission (or an alternative approved by the Administrator) to demonstrate its program will achieve VOC, NO_x, and/or CO emissions levels that are equal to or less than those that would be achieved by the model program.

It was proposed that NO_x emission reductions not be required in any ozone nonattainment area where it was determined by the Administrator under section 182(b)(1)(A)(i) of the Act

pertaining to reasonable further progress demonstrations or section 182(f)(1) of the Act pertaining to provisions for major stationary sources that such reductions would not be beneficial in lowering ozone concentrations.

EPA requested comment on the above issues including specifically: the legality of providing for NO_x exemptions; the assumptions used for waiver rate, compliance rate, and model year coverage; comment on the low and medium performance standard options described in the preamble; and, comments on an enhanced performance standard that would incorporate steady-state tests.

2. Summary of Comments

The vast majority of commenters supported the high-option performance standard proposed by EPA, citing its cost-effectiveness and potential to significantly reduce the contribution of motor vehicles to the air quality problem. STAPPA/ALAPCO commented on the need for a strong performance standard in light of political pressure to preserve the status quo. They argue adopting a weaker standard will result in weak programs, necessitating more costly but more politically acceptable controls for stationary or new vehicle regulations. Motor vehicle manufacturers, oil companies, and chamber of commerce groups agreed. Comment and opposition focused on evaluating and/or allowing alternative test procedures to the IM240, not on lowering the performance standard to the level of the medium or low options.

Most commenters recommended that EPA continue to evaluate tests such as the Acceleration Simulation Mode tests advocated by ARCO so that they might be used in place of the IM240 but virtually no one suggested that the ASM be the basis for the enhanced I/M performance standard.

There was mixed comment on whether NO_x waivers should be allowed. Two parties, an oil company and a motor vehicle manufacturer supported the proposed waiver, while two parties, both state agencies, opposed the exemptions. Those opposed argued that NO_x emission reductions are beneficial in any ozone nonattainment area, and that the Clean Air Act does not allow for such a waiver. They suggest that authority for NO_x exemptions under the Act applies only to stationary sources.

On the issue of waivers and compliance, the American Lung Association commented that the standard should be based on 100% compliance and 0% waivers, arguing that the standard should be at least as strict as it was in the past for the basic standard. They argue states should have to make up the difference, if they fail to meet these goals, in some other way. A state agency and three oil companies commented that these rates were unrealistic, even with an increase in the waiver rate of $450. The state agency suggested compliance should be about 95%, and an oil company suggested 90–95%, based on California data from roadside checks showing above 5% of vehicles without valid registrations.

The Natural Resources Defense Council urged EPA to strengthen the proposed standard to include high-tech testing for more model year vehicles, and to require inclusion of heavy duty trucks. The Arizona Department of Environmental Quality suggests that idle and two speed tests should be limited to areas not doing enhanced I/M, as these tests offer little or no advantage over a high-tech test.

3. Response to Comments

The final rule makes minor changes to the "model program" that forms the basis of the enhanced I/M performance standard. EPA believes that this is a cost-effective and reasonably achievable standard for enhanced I/M areas. The question of alternative tests has been addressed at length in a previous section. States will have the option of implementing other test regimes if ongoing evaluations show them to be effective. Strengthening the standard would diminish state flexibility in designing the enhanced I/M program. Section 182(c)(3)(B)(i) of the Act specified the model year coverage for the enhanced performance standard to include only light-duty cars and trucks. There is no requirement for heavy-duty trucks to be included in the performance standard. EPA believes it should be up to the states to weigh the costs and benefits of including heavy-duty trucks against making other program decisions—such as the cost and benefits of improving motorist compliance enforcement.

While the idle and two-speed tests are less effective at both identifying vehicles that need repair and ensuring effective repairs, the marginal benefit to be derived from instituting an IM240 on old technology vehicles, as suggested by Arizona, is not clear at this time. It should be reemphasized that EPA is establishing a performance standard—not a program design requirement per se. States have the flexibility to institute any combination of tests that will achieve the standard. EPA has focused its testing program on newer technology vehicles because the idle and two-speed tests perform very poorly on these vehicles and because they will dominate the fleet in the next few years and beyond. These tests do fairly well on old technology vehicles, although problems with reliability and consistency still exist—especially when it comes to test defeating adjustments to make the vehicle pass. Nevertheless, it may be that states can mix idle, two-speed, and transient testing in the I/M program and get effective results at a lower cost than doing transient testing on all vehicles covered. On the other hand, the cost associated with deploying three different test regimes in one test network may outweigh the savings in time offered by the idle and two-speed tests. EPA believes states should weigh these options and the advantages and disadvantages for each very carefully before selecting a network design. In general, broader coverage of the transient test may well be the most cost-effective strategy. The failure rates for particular model years, and the emission benefits derived from testing them, are easily controlled by adjusting the emission standards to desired levels—as is the case with pre-1981 vehicles in I/M programs today. (Note, however, that tighter standards for 1981 and later vehicles than the 1.2% CO and 220 ppm HC levels in use today on the steady-state tests would result in major increases in false failures and would not be acceptable.)

EPA sees no legal impediment to the NO_x waiver provision and until ongoing air quality analyses are completed it won't be clear in some areas as to whether NO_x reductions are useful. The issue may be moot, however, if the current trend continues which indicates that NO_x emission reductions are essential for attainment of the ozone standard. EPA acknowledges that the statute does not contain an explicit provision for waivers of NO_x requirements with respect to the I/M program, as it does for certain stationary source requirements in section 182(f). EPA believes, however, that requiring NO_x reductions where they would be useless or even counterproductive in reducing ozone concentrations would be absurd, and that Congress could not have meant for the Act to be implemented in a manner that would lead to absurd results. Therefore, EPA believes that where the Administrator has made the finding, necessary to support the section 182(f) exemptions, the NO_x reductions would not be beneficial in reducing ozone concentrations, then NO_x reductions would not be required by the I/M program. As stated previously, EPA does not now consider it likely that the

Administrator would make such findings, in light of new scientific evidence that NO_x reductions are significantly more important in achieving ozone reductions than previously believed.

The mobile source emission factor model has compliance and waiver rates as inputs. Lower compliance and higher waivers simply means less emission reduction benefit. EPA does not believe that a compliance rate of 100%, as suggested by the American Lung Association, is realistic. EPA has reviewed the compliance issue and agrees with comments that 98% may not be achievable. On the other hand, some programs have clearly demonstrated that 96% compliance is achievable. Thus, the final "model program" has been modified to include a 96% compliance rate. It will be up to the states to assess the effectiveness of current and upgraded enforcement and waiver systems and commit to a performance level for these two criteria in the SIP. The state will be held accountable for these commitments and must run the program such that they meet those standards. If a state chooses not to or structural limitations are such that they cannot achieve these levels of performance, then program expansion is necessary to account for the emission reduction losses that occur. For example, if a state could only achieve a 95% compliance rate instead of 96%, then one option would be to expand model year coverage of the high-tech tests to make up for the lost reductions. The state will need to make trade-off decisions between more resources dedicated to the enforcement process versus more testing.

EPA believes that achieving the waiver rates in the short run will be relatively easy since looser cutpoints will be used in the early stages of the program. How well the state implements repair technician awareness program, however, will influence initial waiver experience. In the long run, as the program tightens the cutpoints to achieve the standards it will be more difficult for some vehicles to comply. This could cause waiver rates to increase. Again, repair technician training will be a key factor in ensuring effective repairs at this point. Thus, EPA has decided to increase the model program waiver rate to 3% of failed vehicles.

Compliance and waivers are important equity issues. EPA believes it unfair to the majority of motorists that comply with program requirements if the program is poorly enforced and a small portion of the vehicle population is allowed to slip through the cracks without complying. A similar situation exists with waivers. The data EPA has seen shows that most motorists that fail do go out and get the vehicle fixed, regardless of cost, because they are dedicated to the goal of the program. So, again, it is unfair to these motorists to set up a waiver system that allows economically able motorists to drive non-complying vehicles.

This rule establishes comprehensive quality control and quality assurance on both waivers and compliance. EPA believes these measures will go a long way towards eliminating the abuses of the program that are found in many programs. For all of these reasons, EPA sees no justification for weakening the compliance target or the waiver rate target in the enhanced I/M performance standard.

G. Basic I/M Performance Standard

1. Summary of Proposal

The NPRM proposed to keep the basic I/M performance the same as it was prior to enactment of the Clean Air Act Amendments of 1990. EPA requested public comment on whether the basic I/M performance standard should be strengthened to require additional emission reductions, including whether high-tech tests should be required in basic I/M programs. EPA also requested comment on whether the basic performance standard should be revised to better reflect typical program operation in terms of waivers, compliance and the inclusion of light-duty trucks.

2. Summary of Comments

There was support for strengthening the basic standard to include light-duty trucks, pressure tests, visual checks, and tests such as the 2-speed loaded mode or ASM-type tests that include NO_x testing from environmental groups, oil companies, I/M contractors, and four state agencies. STAPPA/ALAPCO supported upgrading the standard. It was commented that the idle test has been discredited and should not be used, even in basic areas. There was little support for including IM240 type testing in basic areas from these groups. Three parties including the Motor Vehicle Manufacturers Association suggested it would not be worthwhile to require high-tech testing in areas where only basic testing is needed. Two I/M contractors and an association for emission control manufacturers were in favor of the best test available for all areas.

3. Response to Comments

EPA agrees with the general thrust of the comments that indicate that current science and technology with regard to I/M should be considered in establishing the performance standard for basic I/M areas. EPA believes states should seriously consider pursuing high-tech testing because it is a highly cost-effective approach to emission control, but does not believe, however, that requiring a performance level on the order of that required for enhanced I/M areas is appropriate at this time. In that NO_x is viewed as increasingly important for ozone attainment, EPA believes that basic I/M areas that are nonattainment for ozone need to take this factor into consideration. Historically, I/M programs have been designed to reduce only emissions of VOCs and CO (and exhaust opacity in some areas). Such programs, however, can lead to small increases in NO_x levels. EPA is concerned that such NO_x increases could make ozone attainment more difficult. Thus, today's action leaves the basic I/M performance standard as proposed except it requires that basic I/M programs in ozone nonattainment areas be designed and implemented in such a way as to prevent increases in NO_x emissions, unless a demonstration can be made that such NO_x increases would not delay or prevent attainment of the ozone standard. The deadline for meeting the NO_x requirement shall be within 12 months of initial implementation of the I/M requirement pursuant to this rule to allow areas time to implement NO_x reduction techniques, except that newly implemented basic programs shall include NO_x controls from the start. Tropospheric ozone formation is a function of many site-specific variables, most importantly the local VOC to NO_x ratio. In areas where the VOC/NO_x ratio is relatively large, NO_x reductions are needed to reduce ozone. EPA would encourage areas that are NO_x limited to implement NO_x emission testing to achieve appropriate NO_x emission reductions.

Apart from demonstrating that NO_x increases would not be harmful, states have a variety of program design options that would avoid NO_x increases or actually decrease NO_x. The most important way states could pursue NO_x control is through three-way catalyst inspections. Replacement of missing or misfueled catalysts may get enough NO_x benefit to overcome the increases in NO_x from HC and CO repairs. EPA is also investigating the effect of relaxing CO cutpoints in ozone nonattainment areas that are CO attainment areas. This

approach alone might be enough to overcome any NO_x increases associated with HC repairs. Many states could add steady-state NO_x testing fairly simply and require repair of vehicles with high NO_x emissions. EPA anticipates that steady-state NO_x testing will be effective enough to overcome the NO_x increases associated with HC and CO repairs (see later discussions of steady-state tests for enhanced I/M programs). States could also design programs that emphasize evaporative emission repairs and other HC related strategies that would not increase NO_x emissions. The technical support document contains further discussion and specific examples of program designs that would meet this requirement.

VII. Environmental and Health Benefits

This rule will provide environmental and health benefits by decreasing in-use motor vehicle emissions of VOCs, CO, and NO_x. In 1985, motor vehicles were responsible for 70 percent of the nation's CO, 45 percent of the NO_x, and 34 percent of the VOCs. Ozone, the major component of smog, is produced by the photochemical reaction of VOC and NO_x emissions. Motor vehicles are also a significant source of toxic air pollutants. Their contribution to toxics is decreased as hydrocarbon levels are lowered. All of these pollutants have significant adverse effects on human health and the environment.

Carbon monoxide interferes with the oxygen-carrying capacity of the blood. Exposure aggravates angina and other aspects of coronary heart disease and decreases exercise tolerance in persons with cardiovascular problems. Infants, fetuses, elderly persons, and individuals with respiratory diseases are also particularly susceptible to CO poisoning.

Nitrogen oxides, a family of gases including nitrogen dioxide (NO_2) and nitric oxide (NO), irritate the lungs, lower resistance to respiratory infections, and contribute to the development of emphysema, bronchitis, and pneumonia. NO_x contributes to ozone formation and can also react chemically in the air to form nitric acid.

HC emissions include VOC, which react with NO_x to form ozone and other photochemical oxidants. Some VOCs, including benzene, formaldehyde, and 1,3-butadiene, are air toxics. They cause cancer and other adverse health effects, as well as toxic depositions in lakes and coastal waters.

As shown in the following table, when compared to the no-I/M case, current I/M programs obtain estimated total annual emission reductions of 116,000 tons of VOC and 1,566,000 tons of CO. Implementation of the recommended biennial high option would yield estimated annual emission reductions of 384,000 tons of VOC and 2,345,000 tons of CO from enhanced I/M programs, and 36,000 tons of VOC and 500,000 tons of CO from basic programs, as compared to the no-I/M case. Enhanced I/M programs would also reduce NO_x emissions. The transient test with NO_x cutpoints designed to fail 10% to 20% of the vehicles would yield estimated NO_x reductions of 9% relative to emission levels with no program in place.

NATIONAL BENEFITS OF I/M

[Annual tons of emission reductions in 2000 compared to the no-I/M case]

	VOC	CO
Reductions From Continuing I/M Unchanged:		
Centralized	55,540	775,228
Decentralized	60,476	791,167
Current Total	116,016	1,566,395
Expected Reductions:		
Enhanced Areas	384,130	2,345,278
Basic Areas:		
Centralized	23,289	326,290
Decentralized	12,996	174,186
Basic Total	36,285	500,476
Total Future Benefits	420,415	2,845,754

Thus, enhanced I/M and improvements to existing and new I/M programs will result in national emission reductions substantially greater than current I/M programs.

VIII. Economic Costs and Benefits

A. Impacts on Motorists

EPA has developed estimates of inspection and repair costs in a "high-tech" I/M program. The derivation of these estimates is detailed in the Regulatory Impact Analysis, included in the technical support documents for this rulemaking. A conventional steady-state I/M test including emission control device checks currently costs about $8.50 per vehicle on average in a centralized program, and $17.70 on average in decentralized programs. The test for 1986 and later vehicles in today's action, including transient, purge, and pressure testing, is expected to cost approximately $17 per vehicle in an effectively run, high-volume program. If the inspection were performed biennially (and extended to 1984 and 1985 vehicles) the estimated annual per vehicle cost would be about $9.

The cost to fix a transient test failure that would also fail the 2500/idle test is estimated at $75. The average cost to repair vehicles failing the transient test that would not fail the 2500/idle test is estimated to be $150. The overall average repair cost for transient failures is estimated to be $120. Average repair costs for pressure and purge test failures are estimated to be $38 and $70, respectively. Repairs for NO_x failures are estimated to cost approximately $100 per vehicle. Data from a pilot program in Indiana indicate that it would be very rare for one vehicle to need all three of these repair costs. Also, some vehicles will be repaired at no charge to the owner, due to warranty coverage provided by the manufacturer.

These repairs have been found to produce fuel economy benefits that will at least partially offset the cost of repairs. Fuel economy improvements of 6.1% for repair of pressure test failures and 5.7% for repair of purge test failures were observed. Vehicles that failed the transient short test at the established cutpoints were found to enjoy a fuel economy improvement of 12.6% as a result of repairs. Fuel economy improvements persist beyond the year of the test.

Currently, there are an estimated 64 million vehicles subject to I/M nationwide. Of these, 24 million are in centralized programs and 40 million are in decentralized programs; some of these are annual programs and a few are biennial. EPA estimated the economic impact of continuing these programs as they exist today and evaluated this in the year 2000. Inspection fees would total an estimated $747 million annually, $182 million in centralized programs, and $565 million in decentralized programs. Repair costs would total an estimated $392 million, $140 million in centralized programs, and $252 million in decentralized programs. Fuel economy benefits from repairs would total an estimated $245 million, $92 million in centralized programs, and $153 million in decentralized programs. These costs are expressed in 1990 dollars but are not discounted since the costs and benefits of I/M accrue during each year the program is in operation.

As shown in the table below, estimates using EPA's cost effectiveness model show that total inspection costs in the year 2000 in enhanced I/M programs accounting for growth in the size of the inspected vehicle fleet due to expanded and additional program areas are expected to be $451 million, with repairs totaling $710 million assuming that programs are biennial. Fuel economy benefits are expected to total $825 million, with $617 million attributable to the tailpipe emissions

test and $208 million due to the functional evaporative tests.

In basic I/M programs, total annual inspection costs in the year 2000 are estimated at $162 million, and repair costs are expected to be approximately $113 million.

Thus, despite significant increases in repair expenditures as a result of the program, the switch to biennial testing and the improved fuel economy benefits will result in a lower national annual cost of the inspection program.

If EPA were to establish the low option as the performance standard, states could continue the kinds of programs we see being run today. EPA believes that this would result in significantly higher direct and indirect costs to the nation. There would be the direct cost, discussed above, of about $350 million that would be avoided by the changes called for in today's action. The indirect cost has to do with the cost of achieving the emission reductions forgone by establishing the low option standard. EPA believes that alternative VOC emission reduction strategies will, on the margin, cost about $5000 per ton. Given this, the cost of getting the additional tons of benefit that the high option offers from these more expensive sources amounts to about $1.25 billion. Thus, the total cost of implementing a low option I/M program may be as much as $1.6 billion more than the approach taken in today's action.

PROGRAM COSTS AND ECONOMIC BENEFITS

[Millions of annual dollars in 2000]

	Test cost	Emission test repair cost	Evap repair cost	Emission test fuel economy savings	Evap fuel economy savings	Net cost [1]
Costs and Economic Benefits of Continuing I/M Unchanged						
Central	182	140	na	(92)	na	230
Decentral	565	252	na	(153)	na	664
Total	747	392		(245)		894
Expected Costs and Economic Benefits						
Enhanced Areas	451	489	221	(617)	(208)	336
Basic Areas.						
Central	67	60	na	(39)	na	88
Decentral	95	53	na	(31)	na	117
Total	162	113		(70)		205
Grand Total	613	602	221	(687)	(208)	541

[1] Net cost is derived by adding inspection and repair costs and subtracting fuel economy benefits.

B. Impacts on the Inspection and Repair Industry

EPA has determined that the regulations promulgated today may have a significant impact on a substantial number of the small businesses that own and operate emission test facilities in states that currently have decentralized test networks and are required to implement enhanced I/M. Testing revenues in such states are currently about $300 million. In states which choose a multiple-independent supplier, test-only format for inspections, this impact will involve the small businesses having to choose between providing inspection-only services and repair-only services, and the associated costs of making such a transition. In some cases, the businesses may not be able to make the investment to become a test-only station, but may also be unable or unwilling to compete successfully in the high-tech repair market. The impact of this rule could potentially mean closure for some of these businesses that are otherwise marginal. This is discussed in more detail later in this section. EPA has outlined a set of mitigating measures, discussed in detail previously, as well as later in this section, intended to ease the transition to an enhanced I/M program that separates test and repair functions. Given the phase-in of I/M requirements that discussed above and established by today's rule, EPA anticipates any negative impacts will be ameliorated, if not eliminated. By contrast, many small businesses will be positively affected by the major increase in repair activity expected as a result of today's action. The volume of repair expenditures is expected to increase from current levels of about $392 million to approximately $823 million. This includes an increase of $211 million in areas that currently have decentralized programs, $100 million in areas that currently have centralized programs, and $120 million in areas that are not currently operating I/M programs but are required to by the Act.

The types of small businesses that currently do inspections in decentralized I/M programs include car dealerships, service stations, general and specialized repair shops, and similar businesses. Equipment manufacturers were not examined here because such firms do not constitute small entities. In general, inspections are just one of many services these businesses provide, although some inspection stations are set up for the sole purpose of performing inspections and provide no other services. The average inspection station in decentralized programs tests about 1,025 vehicle per year. An average station has gross receipts of between $5,000 and $30,000 per year from providing emission testing services, depending on the allowable test fee in the state. After accounting for costs associated with purchasing and maintaining the analyzer, the test stations are left with a net gain of between $2,000 and $8,000 per year. Thus, it is clear that inspection services do not, by themselves, yield significantly high profit to the average inspection station. Even if the inspection labor is that of the owner of the station, which is often the case, average test volume alone would not generally sustain the business by itself.

While the average profit is low, the distribution of inspection volume varies considerably, with some stations, typically performing virtually no inspections at all ranging to some that perform over twice the average number of inspections. The best data available to EPA on this comes from California where equipment costs are high due to the transition to BAR90 analyzers in 1990 and inspection fees are high, as well. Obviously, the stations in

California that report no inspection activity in a quarter (about 22% of the total) are losing money on the equipment and related costs of maintaining it (estimated loss of about $5,000 per year), and may be ready to abandon the test program in any case. Based on available information from California, net profit in stations that do over twice the average inspection volume (18% of the stations) in California is estimated to average about $29,000 per year.

As mentioned above, the adoption of test-only stations in enhanced I/M programs would force existing test-and-repair stations in decentralized programs to choose between the test business and the repair business. To opt for the test business, an investment of about $140,000 will be needed for the equipment to perform the tests (EPA based this estimate on conversations with equipment manufacturers over the past year; however, more recent data indicate that a lower figure is more likely). This is a much larger investment than the $6,000–$8,000 cost of equipment in most current decentralized programs, and very large even compared to the cost of BAR90 analyzers which are about $10,000–$15,000. The stations that are most likely to opt for the test business are those that currently derive substantial profit from the test business and little or none from repairs. For the purposes of this analysis, it is assumed that the 23% of stations performing over 150% of the average test volume might opt into the test-only business, or, to the same effect, that there is a new entrant to the test-only business for each of these 23% that chooses to pursue the repair-only business instead. After withdrawals by other stations, as explained below, these stations would each do about 4,100 tests annually on average.

Car dealerships and repair shops, especially those that specialize in engine repair, will probably opt out of the test business but will compete for the additional repair business that enhanced I/M will create. Data available indicate that roughly 50% of test stations in current I/M programs fall into the dealership and engine-repair category. These stations also tend to do fewer tests than average because of their focus on repair, and some of them likely fall into the 22% of stations that report no test activity. For the purposes of this analysis, it is assumed that half of the licensed stations that do virtually no testing are repair-oriented shops. Much of the emission repair business for dealerships and repair shops is referrals from stations that do little or no emissions-related repair (data indicate that about half of the motorists that fail a test in a decentralized program go to another facility for repair). These businesses will be faced with the need to upgrade repair technician skills and to obtain equipment necessary to perform effective repairs on new technology vehicles. The emission analyzers owned by these stations will be useful in testing vehicles that will still be subject to steady-state testing and may also provide an indicator of repair success on vehicles receiving a transient emission test. In the case of BAR90 analyzers, this equipment was designed to down load OBD fault codes and to act as a platform for diagnosis of vehicle problems. The degree to which these businesses need to upgrade their skills and equipment will affect the number that can afford to perform emissions repairs and depends much upon the current resources employed.

The remaining 27% of the licensed station population (i.e., 100%–50% dealer/repair shops—23% high-volume test shops) are a mix of: service stations some of which do some engine repairs including I/M repairs on some of the cars they test, in addition to gasoline sales; non-engine service or repair shops, such as brake and muffler shops; and retailers. Assuming that the other half of the 22% of stations that show virtually no test activity fall into this group, then 16% of the licensed stations (27%–11%) in decentralized programs are now active and may opt not to engage in the test business (which would preclude their repair business) and also opt not to make up for the lost test revenue by seriously competing for some of the increased I/M-generated engine repair business. The 11% in this group that did no test business during the survey period are assumed to be unlikely to be adversely affected by this regulation since they are deriving no income from the inspection business at this time. The 16% that are doing test business all currently have other sources of income other than the inspection business, including non-emission related engine repairs, non-engine repairs, gasoline sales, and merchandising. Data are not available on the contribution of test business and associated repairs to total revenue in these businesses. Since these stations by definition perform less than 150% of the annual inspection volume, the lost profit should be less than $12,000 for inspections, plus about $5,000 from at most 200 I/M repairs each year. If 10% of the 16% of the stations comprising this category were so marginally profitable that the loss of inspection and associated repair revenue forced closure of the business it would amount to a total of 400 stations in enhanced inspection programs nationwide that would close as a result of this action. The discussion in Section V.F., above on mitigating impacts on inspection stations is especially intended to address the impact on this group of station owners.

If a single contractor, centralized program were instituted in an area where a decentralized program is currently operating, the option to become a test-only station would not be available to the 23% of the station population that would be likely to pursue it. Members of this group without profitable alternatives would also face the risk of closure.

The likelihood of closure would depend upon the fraction of incomes derived from inspections. Data on this is not available. Since many of these stations have other lines of business, such as gasoline sales, auto parts sales, or various types of vehicle repair and servicing, the loss of inspection business will not necessarily mean closure. As before, if 10% of these stations might close as a result of a switch to a single-contractor, centralized system, as well as 10% of the 16% of stations identified previously as being at risk, then 977 stations might close nationwide if all decentralized programs in enhanced I/M areas switched to centralized, single-contractor systems. If the areas containing half of the current inspection stations were to switch to a single-contractor, centralized system, then potential closures would number about 489.

The most severely impacted would be the test-only stations, which in California comprise 2% of the test stations (about 160 stations in California). EPA believes California probably has many more test-only stations than other decentralized I/M states due to the fact that average test fees are higher making it feasible to have testing as a sole source of income (there is no cap on test fees in California, as there is in most other states). Given that they have no other lines of business to compensate for the loss of inspection revenue, these test-only stations would almost certainly close if the area were to switch to a centralized single contractor system, unless these stations were able to win the contract (some of these businesses have made it clear to EPA that they intend to do this).

Section V.F., above, regarding mitigating impacts on existing test stations, details ways states could minimize or eliminate the loss of jobs or

closure of small businesses. The regulation includes a phase-in of the test-only requirement, by January 1996, to allow adequate time for small businesses to make the transition.

These losses to the small business community and to labor would be offset by the increase in jobs resulting from a test-only program. Repair shop business is likely to increase and would require the services of additional mechanics, and test-only inspection stations would need additional inspectors. The $431 million in extra expenditures estimated in the section on Economic Costs is comprised of about 40% parts cost and the remainder for labor, profit and overhead. The additional parts demand has potential economic benefits for the parts manufacturers as well as retailers in the local community. The 60% remainder is estimated to be about 50% profit and overhead at the repair shop and 50% labor (for about $130 million total). EPA estimates that in a high volume enhanced I/M lane, 3–4 inspectors would be needed per lane instead of the 1–2 typically employed in current high volume systems. The table below shows that current jobs in I/M areas are about 11,400, with approximately 9,100 in the inspection sector and 2,300 in the repair sector. As a result of today's action EPA expects the total number of jobs in the repair sector to increase to 6,200 jobs for a gain of 3,900 repair technician jobs. The change in inspector jobs depends upon the type of systems states choose to implement. If states choose the decentralized, test-only approach with multiple, independent suppliers, it is expected that more jobs would result, a total of 10,500 inspectors would be required in addition to the 2,700 inspector jobs in basic I/M programs. If states chose a single-supplier contractor approach, then about 2,700 inspector jobs would be needed in enhanced I/M areas. Thus, total future inspector jobs would range from 5,400 to 13,200. In addition to inspector and repair technician jobs, the increased expenditure for auto parts and for setting up and servicing test-only stations, will result in construction industry jobs, parts manufacturing jobs, and service industry jobs. EPA estimates a total of 3,600 additional jobs in these sectors. Overall, EPA estimates that today's action will result in between 3,800 and 11,600 additional jobs, directly or indirectly related to testing and repair of motor vehicles as a result of the program. It is important to note that these may not represent a net increase in nationwide employment overall. The resources allocated to test and repair services may otherwise have been spent on other goods and services in the economy. Thus, it may be that other sectors of the economy would incur an employment loss.

In conclusion, today's action may cause significant shifts in business opportunities. Small businesses that currently do both inspections and repairs in decentralized I/M programs may have to choose between the two. Significant new opportunities will exist in these areas for small businesses to continue to participate in the inspection and repair industry. This will mean shifts in jobs but an overall increase in jobs in the repair sector and a small to potentially large increase in the inspection sector, depending on state choices. Up to four years is provided by today's rule for this transition. EPA believes this will provide ample time for these businesses and individuals to take advantage of the new program. In addition, EPA believes there are several other ways states can help test stations, inspectors, and repair technicians make the transition to an enhanced I/M program, as described above.

CHANGES IN JOBS AS A RESULT OF THE RULE

	FTE
Current Test and Repair Jobs:	
Inspector Jobs:	
Decentralized Programs	6,600
Centralized Programs	2,500
Repair Jobs:	
Decentralized Programs	800
Centralized Programs	1,500
Total Current Jobs	11,400
Future Test and Repair Jobs:	
Enhanced I/M Programs:	
Inspector Jobs:	
Multiple Independent Supplier	10,500
Single Contractor Program	2,700
Inspector Job Subtotal	2700–10,500
Repair Jobs	5,500
Basic I/M Programs:	
Inspector Jobs	2,700
Repair Jobs	700
Total Future Inspection and Repair Jobs	11,600–19,400
Other Job Gains:	
Equipment Manufacturing	na
Parts Manufacturing	1,000
Construction	1,800
Small Business Services	800
Total Net Gain in Jobs	3,800–11,600

IX. Cost-Effectiveness

Based upon the inspection and repair costs and fuel economy benefits described above, a biennial high-tech I/M program satisfying the requirements of this rule has an estimated net annual cost of $5,400,000 per year per million vehicles. If all program costs are allocated to VOC reductions the biennial high-tech program has an annual cost effectiveness of $880 per ton of VOC (without inconvenience assumptions); if performed annually the cost effectiveness of the high-tech program is $1,700 per ton of VOC. This compares with a cost effectiveness of $5,400 per ton for basic I/M, $4,400 per ton for the Low Option, and $2,600 for the Medium Option. If all of the program costs were allocated to CO, the biennial high option program would have a cost-effectiveness of $143 per ton, while the basic program would be $334 per ton. If all of the costs were allocated to NO_x reductions (which only occur in the high option program), then the cost per ton for the annual high-tech program would be $6,298 per ton and for the biennial high-tech program $3,267 per ton of NO_x benefit.

If program costs are allocated among all three pollutants as described in "Enhanced I/M Costs and Benefits," costs per ton of VOC reduction are estimated at $4,500 for Basic I/M, $3,700 for the Low Option, $2,200 for the Medium Option and $500 for the biennial high-tech program. If the high-tech program were performed on an annual basis, the cost effectiveness would be $1,300 per ton.

The cost-effectiveness estimates discussed above do not include the cost associated with the time it takes for a motorist to get through the inspection process (to allow for straightforward comparisons among I/M options). In a well-designed, high-volume system (the type being required here), the time to drive to the station, get tested, and drive home is estimated to be about 45 minutes. Assuming a time value of $20 per hour, that would add $15 to the cost. Assuming this, the biennial high-tech program would have a cost-effectiveness of $1,600 per ton, rather than $500 per ton (with cost split among the three pollutants). If all costs were allocated to VOC, then the cost effectiveness including the inconvenience assumption is $2,000 per ton of VOC (as opposed to $880 per ton of VOC without the inconvenience assumption). This is still significantly lower than costs per ton of other available control strategies.

X. Relationship to Other In-Use Control Strategies

Considerable emission control development effort has been expended in the last two decades by both the vehicle manufacturers and the federal government, and each new vehicle produced represents a monetary investment in terms of emission control components. These efforts and

investment have caused the passenger cars and light-duty trucks produced in recent years to be much lower emitting than their predecessors, provided that they are properly operating and that the conditions of temperature, traffic speeds, etc. they encounter are the same as the conditions of the EPA compliance test. However, a large body of evidence has been accumulated showing that current generation vehicles are not all operating properly in actual service. Moreover, they are often used under other temperature and driving conditions, and significant excess emissions are released as a result. These facts have been true of every generation of vehicles to some extent and have always been recognized by policy makers and professionals in the field of motor vehicle emission control. However, as nearly total control over the emissions of properly functioning vehicles under standard test conditions has been achieved, the lack of equivalent control over malfunctions and during non-standard conditions has become more evident to all. The Clean Air Act Amendments of 1990 reflect a renewed realization of these two problems. The Amendments contain several provisions aimed at reducing them. This section explains these provisions and their interrelationships.

The Amendments address emissions performance under non-standard conditions by directing EPA to revise the procedures under which compliance is determined, for both exhaust and evaporative emissions. EPA is in the process of doing so, and has underway a number of studies and rulemakings in this area, some begun prior to the 1990 Amendments. When completed, these actions will ensure that properly functioning vehicles maintain excellent control of emissions at colder and hotter temperatures than now used in compliance testing, when left parked for several days, and in driving patterns that play a significant role in everyday traffic. For vehicles produced before these new requirements take effect, it is generally true that in-use strategies aimed at prevention or correction of malfunctions (discussed below) will achieve emission reductions even under conditions not well represented by the pre-amendment test procedures.

The problem of excess emissions due to in-use malfunctions is addressed by several provisions of the 1990 Amendments. First, the Amendments extend the useful life of light-duty vehicles to ten years or 100,000 miles. Manufacturers are responsible for recalling their vehicles of a given model when emissions testing performed within the first 7 years or 75,000 miles reveals that a substantial number of properly maintained vehicles fail to comply with standards. Previously, the useful life has been only 5 years or 50,000 miles. EPA believes that the extension of the recall period will lead to emission control systems that are more durable, with less frequent malfunctions. An extension of the emissions warranty period for catalysts and on-board emission control computers to 8 years or 80,000 miles will also lead to more durable designs for these components and to more frequent action by owners to have them replaced when needed. (The 1990 Amendments reduce the warranty coverage period for other components, striking a balance between the emissions control advantages of long warranty coverage and the disadvantages of the same in terms of competition in the vehicle service and repair markets.)

Second, section 182(c)(3) of the Act directs EPA to revise its I/M policy to achieve an enhanced level of effectiveness in certain metropolitan areas. EPA is also directed to enforce the requirement for a "basic" I/M program in more areas, and to reconsider its previous policy for the design and operation of such programs. Basic and enhanced I/M programs both achieve their objective by identifying vehicles that have high emissions as a result of one or more malfunctions, and requiring them to be repaired. An "enhanced" program is enhanced in the sense that it must cover more of the vehicles in operation than has been the case to date in many metropolitan areas, must employ inspection methods which are better at finding all high emitting vehicles, and must have additional features to better ensure that all vehicles are tested properly and properly repaired if failed by the tests.

Third, section 202(m) of the amended Act directs EPA to promulgate regulations requiring new vehicles to be equipped with on-board diagnostic (OBD) systems. On-board diagnostic systems have been incorporated into some vehicles at the manufacturers' initiative since 1980. The new regulations will require all manufacturers to install equipment that will monitor the performance of emission control equipment, the vehicle's fuel metering system and ignition system, and other equipment and operating parameters for the purpose of detecting malfunction or deterioration in performance that would be expected to cause a vehicle to fail emission standards. When such problems are detected, a malfunction indicator lamp located in the dashboard of the vehicle will be illuminated, instructing the vehicle driver to "Service Engine Soon." Codes indicating the likely problem will also be stored in the vehicle's onboard computer for ready access by the servicing technician to aid in proper diagnosis and repair of the vehicle. The Agency has proposed onboard diagnostics regulations (September 24, 1991; 56 FR 48272) that would be phased in beginning with the 1994 model year. In accordance with section 202(m), today's action allows the opportunity for case-by-case waivers until the 1996 model year.

OBD systems will have their greatest benefit when the vehicle owner observes the warning signal and on his or her initiative obtains appropriate emission system repair promptly. Prompt action minimizes the time the vehicle is operated in a higher polluting condition, and the possibility of a prolonged malfunction in one component or subsystem causing secondary damage to another. EPA is hopeful that many owners will take such prompt voluntary action. There is, of course, no way to ensure that they do. Another way that OBD systems will have an emissions benefit is that vehicle repair technicians may access the OBD codes when vehicles are presented to them with symptoms of poor driveability or even just for routine servicing, and thereby discover emission malfunctions of which the owner was unaware. EPA hopes that in many such cases the owner will consent to an appropriate repair of the vehicle.

An appropriately designed OBD system also presents an opportunity to include a scan of the stored malfunction codes at the time of the periodic I/M test, to identify vehicles whose owners did not seek repairs when the warning signal first occurred. The presence of one or more codes in a vehicle indicates the current or recent existence of a malfunction with the potential to cause high emissions. Such a car should be failed and required to return after repair. Code inspections can be viewed as a supplement to the inspection regime which improves its effectiveness in finding high emitting vehicles, but also as a possible long-term replacement to the other tests for identifying high emitting vehicles. With the rapid connection and data transfer capabilities which have been developed by industry and are required by EPA's proposed OBD regulation, code inspections would not add significantly if at all to the time or cost for an inspection. The Act requires EPA to promulgate a rule which will require all

I/M programs to include code inspections. Today's notice makes note here of this requirement, but does not actually establish that rule currently. EPA believes it would be inappropriate to do so prior to final adoption of OBD rules. EPA expects to make a proposal on OBD inspection simultaneously with or soon after finalizing the regulation which requires OBD systems to be installed on new vehicles.

OBD systems, in addition to improving the identification of high emitting vehicles in an I/M program will also be of great utility in the repair of vehicles which fail the inspection, including the exhaust emission test. OBD will speed identification of the responsible component, and help avoid trial and error replacement of components which the repair technician cannot evaluate otherwise. The Clean Air Act requires that OBD inspections be performed in I/M programs once vehicles with mandated OBD systems become part of the fleet. At this point, EPA believes it is too early to be absolutely certain about the potential for OBD to replace existing or newly established test procedures or how long it will take to refine the technology to the point where it could substitute.

Fourth, the Act requires the sale of reformulated gasoline in many of the worst ozone nonattainment areas, with the option for others to elect to be subject to the program also. The Act also requires the sale of oxygenated gasoline in all carbon monoxide nonattainment areas. These special fuels will reduce the emissions of vehicles that are not operating properly due to a malfunction, as well as emissions from properly functioning vehicles. Reformulated fuels will only partially soften the effect of a malfunction in the emission control system. Similarly, changes in certification test procedures and new vehicle standards will not eliminate the need to inspect and repair in-use vehicles.

Finally, EPA is undertaking an initiative in response to the Act which may reduce the need for certain enhanced I/M emission checks. On October 3, 1991 (56 FR 50196), EPA proposed a program in which EPA would, at the manufacturer's option, certify specific vehicle models as "inherently low emitting vehicles" (ILEVs). The inherently low emitting character of these vehicles would arise mostly in regard to their evaporative emissions, which are required to remain very low even under malfunction conditions.

XI. Other Issues

Since the publication of EPA's draft I/M guidance in April 1991, the Agency has been made aware of a unique situation which concerns air quality planning for the City and County of El Paso, Texas. El Paso lies across the Rio Grande from Ciudad Juarez, Mexico. The 1990 populations of the two cities are about 592,000 and 798,000 respectively. Efforts are underway to develop an emissions inventory for Ciudad Juarez and to execute an Integrated Border Environmental Plan (IBEP) involving both the United States and Mexico over the next few years. Although the emission inventories are not yet complete, it is believed that the mobile source contribution from Ciudad Juarez is greater than that from El Paso County.

El Paso is a serious ozone nonattainment area, which makes it subject to the enhanced I/M provisions of the Act. Its required attainment date for ozone is November 15, 1999, by which time it must also achieve a 24 percent reduction in adjusted 1990 baseline emissions in order to comply with the reasonable further progress requirements of section 182(c)(2). Because of the influence of emissions from Ciudad Juarez, ozone attainment in El Paso is believed to be impossible without very significant new controls in that city, which despite progress on the IBEP are uncertain in the 1999 time frame. In recognition of this, Congress provided in section 179B for approval of plans from an area like El Paso that would otherwise be satisfactory to achieve attainment but for emissions emanating from outside the United States.

Nevertheless, the goal for El Paso should be to make as much progress as possible in reducing ambient ozone concentrations by 1999 and thereafter. In doing so, El Paso will also face additional obstacles due to the difficult economic situation in the area, the relatively long period for which vehicles are used before being retired, and the importance of vehicle emissions to the total inventory on the El Paso side of the border. Because of its special circumstances, EPA believes that El Paso should be allowed to use its limited resources with as much flexibility as possible in how they are applied to the ambient ozone problem, subject to the Act's reasonable further progress requirements. EPA therefore has explored whether and how it might establish a unique requirement for enhanced I/M in El Paso, within the range of discretion it has under the Act in defining enhanced I/M in general. Specifically, EPA has determined that provided the area can demonstrate that the 24% reasonable further progress requirement is being met, then the enhanced I/M program in El Paso shall meet a performance standard which is achievable by a model program that is identical to that for other areas except in the following ways: the transient emission test and transient purge test are conducted on 1990 and later model year vehicles, two speed testing on 1981–89 model year vehicles, idle testing on 1968–81 model year vehicles, and pressure testing on 1971 and later model year vehicles. El Paso must match the emission reductions from this program in November 1999, and every three years thereafter until its attainment year. El Paso must meet the same SIP submittal deadlines discussed above as established for all other areas.

EPA received no comment challenging its ability to establish this unique performance standard for El Paso. Small businesses in El Paso urged a more relaxed standard, but EPA does not believe that would be consistent with the statutory requirement for an enhanced I/M program.

XII. Administrative Requirements

A. Administrative Designation

Under Executive Order 12291, EPA has determined that this regulation is major. A Regulatory Impact Analysis has been prepared and is available from the address provided under "For More Information Contact."

This regulation was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291. Any written comments from OMB and any EPA response to those comments are in the public docket for this rulemaking.

B. Reporting and Record Keeping Requirement

The information collection requirements in this rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501, et seq. An Information Collection Request document has been prepared by EPA (ICR No. 783) and a copy may be obtained from Sandy Farmer, Information Policy Branch, EPA, 401 M Street SW. (PM–223Y), Washington, DC 20460, or by calling Sandy Farmer (202) 260–2740.

Public reporting burden for this collection of information is estimated to vary from 43 to 127 hours per response with an average of 85 hours per response, including time for reviewing

instructions, searching existing data sources, gathering and maintaining the data needed, and completing the collection of information.

These requirements are not effective until OMB approves them and a technical amendment to this effect is published in the **Federal Register.**

C. Regulatory Flexibility Act

The Regulatory Flexibility Act of 1980 requires federal agencies to identify potentially adverse impacts of federal regulations upon small entities. In instances where significant impacts are possible on a substantial number of these entities, agencies are required to perform a Regulatory Flexibility Analysis. This analysis has been completed and is included in the docket. Issues related to this analysis have been addressed previously in various sections of this preamble.

XIII. Rationale for Effective Date

The Clean Air Act requires certain areas to submit SIP revisions containing I/M programs by November 15, 1992. This rule clarifies the content of those required SIP revisions. EPA believes that it is appropriate to make the rule effective on the date of publication so that states will know what the rule requires before the date for SIP submission. EPA has previously announced its intentions with respect to these required SIP submittals in the General Preamble for Implementation of Title I of the Act, 57 FR 13498 (April 16, 1992), and the Notice of Proposed Rulemaking for this rule, 57 FR 31058 (July 13, 1992). Consequently, states have been on notice for some time of how EPA would be interpreting the statutory requirements for I/M SIP submittals. States have repeatedly urged EPA to take final action on these rules before the statutory deadline for SIP submittal. For all of these reasons EPA concludes that it has good cause for making this rule effective on the date of publication. EPA is making this rule effective without thirty days advance notice for good cause shown and published with this rule.

List of Subjects in 40 CFR Part 51

Administrative practice and procedure, Air pollution control, Carbon monoxide, Intergovernmental relations, Lead, Motor vehicle pollution, Nitrogen oxide, Ozone, Particulate matter, Reporting and recordkeeping requirements, Sulfur oxides, Volatile organic compounds.

Dated: November 1, 1992.

William K. Reilly,

Administrator.

For the reasons set out in the preamble, part 51 of chapter 1, title 40 of the Code of Federal Regulations is revised as follows:

PART 51—REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS

1. The authority citation for part 51 is revised to read as follows:

Authority: 42 U.S.C. 7401–7671q.

Appendix N to Part 51 [Removed and Reserved]

2. Appendix N of part 51 is removed and reserved.

3. A new subpart S is added to part 51 to read as follows:

Subpart S—Inspection/Maintenance Program Requirements

Sec.

51.350 Applicability.
51.351 Enhanced I/M performance standard.
51.352 Basic I/M performance standard.
51.353 Network type and program evaluation.
51.354 Adequate tools and resources.
51.355 Test frequency and convenience.
51.356 Vehicle coverage.
51.357 Test procedures and standards.
51.358 Test equipment.
51.359 Quality control.
51.360 Waivers and compliance via diagnostic inspection.
51.361 Motorist compliance enforcement.
51.362 Motorist compliance enforcement program oversight.
51.363 Quality assurance.
51.364 Enforcement against contractors, stations and inspectors.
51.365 Data collection.
51.366 Data analysis and reporting.
51.367 Inspector training and licensing or certification.
51.368 Public information and consumer protection.
51.369 Improving repair effectiveness.
51.370 Compliance with recall notices.
51.371 On-road testing.
51.372 State implementation plan submissions.
51.373 Implementation deadlines.

Appendices to Subpart S of Part 51

Appendix A to Subpart S—Calibrations, Adjustments and Quality Control
Appendix B to Subpart S—Test Procedures
Appendix C to Subpart S—Steady-State Short Test Standards
Appendix D to Subpart S—Steady-State Short Test Equipment
Appendix E to Subpart S—Transient Test Driving Cycle

Subpart S—Inspection/Maintenance Program Requirements

§ 51.350 Applicability.

Inspection/maintenance (I/M) programs are required in both ozone and carbon monoxide (CO) nonattainment areas, depending upon population and nonattainment classification or design value.

(a) *Nonattainment area classification and population criteria.* (1) States or areas within an ozone transport region shall implement enhanced I/M programs in any metropolitan statistical area (MSA), or portion of an MSA, within the state or area with a 1990 population of 100,000 or more as defined by the Office of Management and Budget (OMB) regardless of the area's attainment classification. In the case of a multi-state MSA, enhanced I/M shall be implemented in all ozone transport region portions if the sum of these portions has a population of 100,000 or more, irrespective of the population of the portion in the individual ozone transport region state or area.

(2) Apart from those areas described in paragraph (a)(1) of this section, any area classified as serious or worse ozone nonattainment, or as moderate or serious CO nonattainment with a design value greater than 12.7 ppm, and having a 1980 Bureau of Census-defined (Census-defined) urbanized area population of 200,000 or more, shall implement enhanced I/M in the 1990 Census-defined urbanized area.

(3) Any area classified, as of November 5, 1992, as marginal ozone nonattainment or moderate CO nonattainment with a design value of 12.7 ppm or less shall continue operating I/M programs that were part of an approved State Implementation Plan (SIP) as of November 15, 1990, and shall update those programs as necessary to meet the basic I/M program requirements of this subpart. Any such area required by the Clean Air Act, as in effect prior to November 15, 1990, as interpreted in EPA guidance, to have an I/M program shall also implement a basic I/M program. Serious, severe and extreme ozone areas and CO areas over 12.7 ppm shall also continue operating existing I/M programs and shall upgrade such programs, as appropriate, pursuant to this subpart.

(4) Any area classified as moderate ozone nonattainment, and not required to implement enhanced I/M under paragraph (a)(1) of this section, shall implement basic I/M in any 1990 Census-defined urbanized area in the nonattainment area.

(5) Any area outside an ozone transport region classified as serious or worse ozone nonattainment, or moderate or serious CO nonattainment with a design value greater than 12.7 ppm, and having a 1990 Census-defined urbanized area population of less than 200,000 shall implement basic I/M in the 1990 Census-defined urbanized area.

(6) If the boundaries of a moderate ozone nonattainment area are changed pursuant to section 107(d)(4)(A)(i)–(ii) of the Clean Air Act, such that the area includes additional urbanized areas, then a basic I/M program shall be implemented in the newly included 1990 Census-defined urbanized areas.

(7) If the boundaries of a serious or worse ozone nonattainment area or of a moderate or serious CO nonattainment area with a design value greater than 12.7 ppm are changed any time after enactment pursuant to section 107(d)(4)(A) such that the area includes additional urbanized areas, then an enhanced I/M program shall be implemented in the newly included 1990 Census-defined urbanized areas, if the 1980 Census-defined urban area population is 200,000 or more. If such a newly included area has a 1980 Census-defined population of less than 200,000, then a basic I/M program shall be implemented in the 1990 Census-defined urbanized area.

(8) If a marginal ozone nonattainment area, not required to implement enhanced I/M under paragraph (a)(1) of this section, is reclassified to moderate, a basic I/M program shall be implemented in the 1990 Census-defined urbanized area(s) in the nonattainment area. If the area is reclassified to serious or worse, an enhanced I/M program shall be implemented in the 1990 Census-defined urbanized area, if the 1980 Census-defined urban area population is 200,000 or more. If less than 200,000, a basic I/M program shall be implemented in the 1990 Census-defined urbanized area(s) in the nonattainment area.

(9) If a moderate ozone or CO nonattainment area is reclassified to serious or worse, an enhanced I/M program shall be implemented in the 1990 Census-defined urbanized area, if the 1980 Census-defined urban area population is 200,000 or more. In the case of ozone areas reclassified as serious or worse, if the 1980 Census-defined population of the urbanized area is less than 200,000, a basic I/M program shall be implemented in the 1990 Census-defined urbanized area(s) in the nonattainment area.

(b) *Extent of area coverage.* (1) In an ozone transport region, the program shall entirely cover all counties within subject MSAs or subject portions of MSAs, as defined by OMB in 1990, except largely rural counties having a population density of less than 200 persons per square mile based on the 1990 Census can be excluded provided that at least 50% of the MSA population is included in the program. This provision does not preclude the voluntary inclusion of portions of an excluded rural county. Non-urbanized islands not connected to the mainland by roads, bridges, or tunnels may be excluded without regard to population.

(2) Outside of ozone transport regions, programs shall nominally cover at least the entire urbanized area, based on the 1990 census. Exclusion of some urban population is allowed as long as an equal number of non-urban residents of the MSA containing the subject urbanized area are included to compensate for the exclusion.

(3) Emission reduction benefits from expanding coverage beyond the minimum required urban area boundaries can be applied toward the reasonable further progress requirements or can be used for offsets, provided the covered vehicles are operated in the nonattainment area, but not toward the enhanced I/M performance standard requirement.

(4) In multi-state urbanized areas outside of ozone transport regions, I/M is required in those states in the subject multi-state area that have an urban area population of 50,000 or more, as defined by the Bureau of Census in 1990. In a multi-state urbanized area with a population of 200,000 or more that is required under paragraph (a) of this section to implement enhanced I/M, any state with a portion of the urbanized area having a 1990 Census-defined population of 50,000 or more shall implement an enhanced program. The other coverage requirements in paragraph (b) of this section shall apply in multi-state areas as well.

(c) *Requirements after attainment.* All I/M programs shall provide that the program will remain effective, even if the area is redesignated to attainment status, until the state submits and EPA approves a maintenance plan, under section 175A, which convincingly demonstrates that the area can maintain the relevant standard for the maintenance period without benefit of the emission reductions attributable to the I/M program. The state shall commit to fully implement and enforce the program throughout such period, and, at a minimum, for the purposes of SIP approval, legislation authorizing the program shall not sunset prior to the attainment deadline.

(d) *SIP requirements.* The SIP shall describe the applicable areas in detail and, consistent with § 51.372 of this subpart, shall include the legal authority or rules necessary to establish program boundaries.

§ 51.351 Enhanced I/M performance standard.

(a) Enhanced I/M programs shall be designed and implemented to meet or exceed a minimum performance standard, which is expressed as emission levels in area-wide average grams per mile (gpm), achieved from highway mobile sources as a result of the program. The performance standard shall be established using the following model I/M program inputs and local characteristics, such as vehicle mix and local fuel controls, except as provided in paragraph (e) of this section. The emission levels achieved by the state's program design shall be calculated using the most current version, at the time of submittal, of the EPA mobile source emission factor model or an alternative model approved by the Administrator, and shall meet the minimum performance standard both in operation and for SIP approval. Areas shall meet the performance standard for the pollutants which cause them to be subject to enhanced I/M requirements. In the case of ozone nonattainment areas subject to enhanced I/M, the performance standard must be met for both oxides of nitrogen (NO_x) and volatile organic compounds (VOCs), except as provided in paragraph (d) of this section.

(1) *Network type.* Centralized testing.

(2) *Start date.* For areas with existing I/M programs, 1983. For areas newly subject, 1995.

(3) *Test frequency.* Annual testing.

(4) *Model year coverage.* Testing of 1968 and later vehicles.

(5) *Vehicle type coverage.* Light duty vehicles, and light duty trucks, rated up to 8,500 pounds Gross Vehicle Weight Rating (GVWR).

(6) *Exhaust emission test type.* Transient mass-emission testing on 1986 and later model year vehicles using the IM240 driving cycle, two-speed testing (as described in appendix B of this subpart S) of 1981–1985 vehicles, and idle testing (as described in appendix B of this subpart S) of pre-1981 vehicles is assumed.

(7) *Emission standards.* (i) Emission standards for 1986 through 1993 model year light duty vehicles, and 1994 and 1995 light-duty vehicles not meeting Tier 1 emission standards, of 0.80 gpm hydrocarbons (HC), 20 gpm CO, and 2.0 gpm NO_x;

(ii) Emission standards for 1986 through 1993 light duty trucks less than 6000 pounds gross vehicle weight rating (GVWR), and 1994 and 1995 trucks not meeting Tier 1 emission standards, of 1.2 gpm HC, 20 gpm CO, and 3.5 gpm NO_x;

(iii) Emission standards for 1986 through 1993 light duty trucks greater than 6000 pounds GVWR, and 1994 and 1995 trucks not meeting Tier 1 emission standards, of 1.2 gpm HC, 20 gpm CO, and 3.5 gpm NO_x;

(iv) Emission standards for 1994 and later light duty vehicles meeting Tier 1 emission standards of 0.70 gpm non-methane hydrocarbons (NMHC), 15 gpm CO, and 1.4 gpm NO_x;

(v) Emission standards for 1994 and later light duty trucks under 6000 pounds GVWR and meeting Tier 1 emission standards of 0.70 gpm NMHC, 15 gpm CO, and 2.0 gpm NO_x;

(vi) Emission standards for 1994 and later light duty trucks greater than 6000 pounds GVWR and meeting Tier 1 emission standards of 0.80 gpm NMHC, 15 gpm CO and 2.5 gpm NO_x;

(vii) Emission standards for 1981–1985 model year vehicles of 1.2% CO, and 220 ppm HC for the idle, two-speed tests and loaded steady-state tests (as described in appendix B of this subpart S); and

(viii) Maximum exhaust dilution measured as no less than 6% CO plus carbon dioxide (CO_2) on vehicles subject to a steady-state test (as described in appendix B of this subpart S).

(8) *Emission control device inspections.* Visual inspection of the catalyst and fuel inlet restrictor on all 1984 and later model year vehicles.

(9) *Evaporative system function checks.* Evaporative system integrity (pressure) test on 1983 and later model year vehicles and an evaporative system transient purge test on 1986 and later model year vehicles.

(10) *Stringency.* A 20% emission test failure rate among pre-1981 model year vehicles.

(11) *Waiver rate.* A 3% waiver rate, as a percentage of failed vehicles.

(12) *Compliance rate.* A 96% compliance rate.

(13) *Evaluation date.* Enhanced I/M programs shall be shown to obtain the same or lower emission levels as the model program by 2000 for ozone nonattainment areas and 2001 for CO nonattainment areas, and for severe and extreme ozone nonattainment areas, on each applicable milestone and attainment deadline, thereafter. Milestones for NO_x shall be the same as for ozone.

(b) *On-road testing.* The performance standard shall include on-road testing of at least 0.5% of the subject vehicle population, or 20,000 vehicles whichever is less, as a supplement to the periodic inspection required in paragraph (a) of this section. Specific requirements are listed in § 51.371 of this subpart.

(c) *On-board diagnostics (OBD).* [Reserved]

(d) *Modeling requirements.* Equivalency of the emission levels which will be achieved by the I/M program design in the SIP to those of the model program described in this section shall be demonstrated using the most current version of EPA's mobile source emission model, or an alternative approved by the Administrator, using EPA guidance to aid in the estimation of input parameters. States may adopt alternative approaches that meet this performance standard. States may do so through program design changes that affect normal I/M input parameters to the mobile source emission factor model, or through program changes (such as the accelerated retirement of high emitting vehicles) that reduce in-use mobile source emissions. If the Administrator finds, under section 182(b)(1)(A)(i) of the Act pertaining to reasonable further progress demonstrations or section 182(f)(1) of the Act pertaining to provisions for major stationary sources, that NO_x emission reductions are not beneficial in a given ozone nonattainment area, then NO_x emission reductions are not required of the enhanced I/M program, but the program shall be designed to offset NO_x increases resulting from the repair of HC and CO failures.

(e) *El Paso, Texas.* In the case of El Paso, Texas, providing that its SIP has been approved as meeting the reasonable further progress requirements of the Act and that the Administrator has not determined that a milestone has been missed, the model program inputs shall be as in paragraph (a) of this section, except that the transient and purge tests shall be assumed for 1990 and later model year vehicles, two-speed testing on 1981–1989 model year vehicles, idle testing on 1968–1980 model year vehicles and pressure testing on 1971 and later vehicles.

§ 51.352 Basic I/M performance standard.

(a) Basic I/M programs shall be designed and implemented to meet or exceed a minimum performance standard, which is expressed as emission levels achieved from highway mobile sources as a result of the program. The performance standard shall be established using the following model I/M program inputs and local characteristics, such as vehicle mix and local fuel controls. Similarly, the emission reduction benefits of the state's program design shall be estimated using the most current version of the EPA mobile source emission model, and shall meet the minimum performance standard both in operation and for SIP approval.

(1) *Network type.* Centralized testing.

(2) *Start date.* For areas with existing I/M programs, 1983. For areas newly subject, 1994.

(3) *Test frequency.* Annual testing.

(4) *Model year coverage.* Testing of 1968 and later model year vehicles.

(5) *Vehicle type coverage.* Light duty vehicles.

(6) *Exhaust emission test type.* Idle test.

(7) *Emission standards.* No weaker than specified in 40 CFR Part 85, Subpar W.

(8) *Emission control device inspections.* None.

(9) *Stringency.* A 20% emission test failure rate among pre-1981 model year vehicles.

(10) *Waiver rate.* A 0% waiver rate.

(11) *Compliance rate.* A 100% compliance rate.

(12) *Evaluation date.* Basic I/M programs shall be shown to obtain the same or lower emission levels as the model inputs by 1997 for ozone nonattainment areas and 1996 for CO nonattainment areas; and, for serious or worse ozone nonattainment areas, on each applicable milestone and attainment deadline, thereafter.

(b) *Oxides of nitrogen.* Basic I/M testing in ozone nonattainment areas shall be designed such that no increase in NO_x emissions occurs as a result of the program. If the Administrator finds, under section 182(b)(1)(A)(i) of the Act pertaining to reasonable further progress demonstrations or section 182(f)(1) of the Act pertaining to provisions for major stationary sources, that NO_x emission reductions are not beneficial in a given ozone nonattainment area, then the basic I/M NO_x requirement may be omitted. States shall implement any required NO_x controls within 12 months of implementation of the program deadlines required in § 51.373 of this subpart, except that newly implemented I/M programs shall include NO_x controls from the start.

(c) *On-board diagnostics.* [Reserved]

(d) *Modeling requirements.* Equivalency of emission levels which will be achieved by the I/M program design in the SIP to those of the model program described in this section shall be demonstrated using the most current version of EPA's mobile source emission model and EPA guidance on the

estimation of input parameters. Areas required to implement basic I/M programs shall meet the performance standard for the pollutants which cause them to be subject to basic requirements. Areas subject as a result of ozone nonattainment shall meet the standard for VOCs and shall demonstrate no NO_x increase, as required in paragraph (b) of this section.

§ 51.353 Network type and program evaluation.

Enhanced I/M programs shall be operated in a centralized test-only format, unless the state can demonstrate that a decentralized program is equally effective in achieving the enhanced I/M performance standard. Basic I/M programs can be centralized, decentralized, or a hybrid at the state's discretion, but shall be demonstrated to achieve the same emission reduction as the program described in § 51.352 of this subpart.

(a) *Presumptive equivalency.* A decentralized network consisting of stations that only perform official I/M testing (which may include safety-related inspections) and in which owners and employees of those stations, or companies owning those stations, are contractually or legally barrel from engaging in motor vehicle repair or service, motor vehicle parts sales, and motor vehicle sale and leasing, either directly or indirectly, and are barred from referring vehicle owners to particular providers of motor vehicle repair services (except as provided in § 51.369(b)(1) of this subpart) shall be considered equivalent to a centralized, test-only system. States may allow such stations to engage in the sale of refreshments for the use of employees and customers waiting at the station and may fulfill other functions typically carried out by the state such as renewal of vehicle registration and driver's licenses, or tax and fee collections.

(b) *Case-by-case equivalency.* (1) Credits for test-and-repair networks, i.e., those not meeting the requirements of paragraph (a) of this section, are assumed to be 50% less than those for a test-only network for the tailpipe emission test, purge test, evaporative system integrity test, catalyst check, and gas cap check; and 75% less for the evaporative canister checks, PCV check, and air system checks. Smaller reductions in credits for the various test protocols may be claimed if a state can demonstrate to the satisfaction of the Administrator that based on past performance with the specific test-type and inspection standards employed, its test-and-repair system will exceed these levels. At a minimum, such a demonstration shall include:

(i) Surveys that assess the effectiveness of repairs performed on vehicles that failed the tailpipe emission test and evaporative system tests;

(ii) In programs including tampering checks, measurement of actual tampering rates, their change over time, and the change attributable to finding and fixing such tampering as opposed to deterrence effects; and

(iii) The results of undercover surveys of inspector effectiveness as it relates to identifying vehicles that need repair.

(2) In the case of hybrid systems, which may be implemented in basic I/M areas, including both test-only and test-and-repair facilities, full credit shall apply to the portion of the fleet initially tested and subsequently retested at a test-only facility meeting the requirements of paragraph (a) of this section, and to the portion of the fleet initially tested and failed at a test-and-repair facility but subsequently passing a comprehensive retest at a test-only facility meeting those same requirements. The credit loss assumptions described in paragraph (b)(1) of this section shall apply to the portion of the fleet initially passed at a test-and-repair facility, and to the portion initially failed at a test-only facility and retested at a test-and-repair facility.

(3) Areas operating test-and-repair networks or hybrid networks may, in the future, claim greater effectiveness than described in paragraph (b)(1) of this section, if a demonstration of greater effectiveness is made to the satisfaction of the Administrator using the program evaluation protocol described in paragraph (c) of this section.

(c) *Program evaluation.* Enhanced I/M programs shall include an ongoing evaluation to quantify the emission reduction benefits of the program, and to determine if the program is meeting the requirements of the Clean Air Act and this subpart.

(1) The state shall report the results of the program evaluation on a biennial basis, starting two years after the initial start date of mandatory testing as required in § 51.373 of this subpart.

(2) The evaluation shall be considered in establishing actual emission reductions achieved from I/M for the purposes of satisfying the requirements of sections 182(g)(1) and 182(g)(2) of the Clean Air Act, relating to reductions in emissions and compliance demonstration.

(3) The evaluation program shall consist, at a minimum, of those items described in paragraph (b)(1) of this section and mass emission test data using the procedure specified in § 51.357(a)(11) of this subpart, or any other transient, mass emission test procedure approved as equivalent, and evaporative system checks, specified in § 51.357(a)(9) and (10) of this subpart, for model years subject to those evaporative system test procedures. The test data shall be obtained from a representative, random sample, taken at the time of initial inspection (before repair), of at least 0.1 percent of the vehicles subject to inspection in a given year. Such vehicles shall receive a state administered or monitored IM240 mass emission test or equivalent, as specified in this paragraph (c)(3), at the time the initial test is due.

(4) The program evaluation test data shall be submitted to EPA and used by the state to calculate local fleet emission factors, to assess the effectiveness of the I/M program, and to determine if the performance standard is being met. EPA will update its emission factor model periodically to reflect the appropriate emission reduction effectiveness of program elements within § 51.351 of this subpart based on actual performance.

(d) *SIP requirements.* (1) The SIP shall include a description of the network to be employed, the required legal authority, and, in the case of areas making claims under paragraph (b) of this section, the required demonstration.

(2) The SIP shall include a description of the evaluation schedule and protocol, the sampling methodology, the data collection and analysis system, the resources and personnel for evaluation, and related details of the evaluation program, and the legal authority enabling the evaluation program.

§ 51.354 Adequate tools and resources.

(a) *Administrative resources.* The program shall maintain the administrative resources necessary to perform all of the program functions including quality assurance, data analysis and reporting, and the holding of hearings and adjudication of cases. A portion of the test fee or a separately assessed per vehicle fee shall be collected, placed in a dedicated fund and retained, to be used to finance program oversight, management, and capital expenditures. Alternatives to this approach shall be acceptable if the state can demonstrate that adequate funding of the program can be maintained in some other fashion (e.g., through contractual obligation along with demonstrated past performance). Reliance on future uncommitted annual or biennial appropriations from the state or local General Fund is not acceptable,

unless doing otherwise would be a violation of the state's constitution. This section shall in no way require the establishment of a test fee if the state chooses to fund the program in some other manner.

(b) *Personnel.* The program shall employ sufficient personnel to effectively carry out the duties related to the program, including but not limited to administrative audits, inspector audits, data analysis, program oversight, program evaluation, public education and assistance, and enforcement against stations and inspectors as well as against motorists who are out of compliance with program regulations and requirements.

(c) *Equipment.* The program shall possess equipment necessary to achieve the objectives of the program and meet program requirements, including but not limited to a steady supply of vehicles for covert auditing, test equipment and facilities for program evaluation, and computers capable of data processing, analysis, and reporting. Equipment or equivalent services may be contractor supplied or owned by the state or local authority.

(d) *SIP requirements.* The SIP shall include a description of the resources that will be used for program operation, and discuss how the performance standard will be met.

(1) The SIP shall include a detailed budget plan which describes the source of funds for personnel, program administration, program enforcement, purchase of necessary equipment (such as vehicles for undercover audits), and any other requirements discussed throughout, for the period prior to the next biennial self-evaluation required in § 51.366 of this subpart.

(2) The SIP shall include a description of personnel resources. The plan shall include the number of personnel dedicated to overt and covert auditing, data analysis, program administration, enforcement, and other necessary functions and the training attendant to each function.

§ 51.355 Test frequency and convenience.

(a) The performance standards for I/M programs assume an annual test frequency; other schedules may be approved if the required emission targets are achieved. The SIP shall describe the test schedule in detail, including the test year selection scheme if testing is other than annual. The SIP shall include the legal authority necessary to implement and enforce the test frequency requirement and explain how the test frequency will be integrated with the enforcement process.

(b) In enhanced I/M programs, test systems shall be designed in such a way as to provide convenient service to motorists required to get their vehicles tested. The SIP shall demonstrate that the network of stations providing test services is sufficient to insure short waiting times to get a test and short driving distances. Stations shall be required to adhere to regular testing hours and to test any subject vehicle presented for a test during its test period.

§ 51.356 Vehicle coverage.

The performance standard for enhanced I/M programs assumes coverage of all 1968 and later model year light duty vehicles and light duty trucks up to 8,500 pounds GVWR, and includes vehicles operating on all fuel types. The standard for basic I/M programs does not include light duty trucks. Other levels of coverage may be approved if the necessary emission reductions are achieved. Vehicles registered or required to be registered within the I/M program area boundaries and fleets primarily operated within the I/M program area boundaries and belonging to the covered model years and vehicle classes comprise the subject vehicles.

(a) *Subject vehicles.* (1) All vehicles of a covered model year and vehicle type shall be tested according to the applicable test schedule, including leased vehicles whose registration or titling is in the name of an equity owner other than the lessee or user.

(2) All subject fleet vehicles shall be inspected. Fleets may be officially inspected outside of the normal I/M program test facilities, if such alternatives are approved by the program administration, but shall be subject to the same test requirements using the same quality control standards as non-fleet vehicles. If all vehicles in a particular fleet are tested during one part of the cycle, then the quality control requirements shall be met during the time of testing only. Any vehicle available for rent in the I/M area or for use in the I/M area shall be subject. Fleet vehicles not being tested in normal I/M test facilities in enhanced I/M programs, however, shall be inspected in independent, test-only facilities, according to the requirements of § 51.353(a) of this subpart.

(3) Subject vehicles which are registered in the program area but are primarily operated in another I/M area shall be tested, either in the area of primary operation, or in the area of registration. Alternate schedules may be established to permit convenient testing of these vehicles (e.g., vehicles belonging to students away at college should be rescheduled for testing during a visit home). I/M programs shall make provisions for providing official testing to vehicles registered elsewhere.

(4) Vehicles which are operated on Federal installations located within an I/M program area shall be tested, regardless of whether the vehicles are registered in the state or local I/M area. This requirement applies to all employee-owned or leased vehicles (including vehicles owned, leased, or operated by civilian and military personnel on Federal installations) as well as agency-owned or operated vehicles, except tactical military vehicles, operated on the installation. This requirement shall not apply to visiting agency, employee, or military personnel vehicles as long as such visits do not exceed 60 calendar days per year. In areas without test fees collected in the lane, arrangements shall be made by the installation with the I/M program for reimbursement of the costs of tests provided for agency vehicles, at the discretion of the I/M agency. The installation shall provide documentation of proof of compliance to the I/M agency. The documentation shall include a list of subject vehicles and shall be updated periodically, as determined by the I/M program administrator, but no less frequently than each inspection cycle. The installation shall use one of the following methods to establish proof of compliance:

(i) Presentation of a valid certificate of compliance from the local I/M program, from any other I/M program at least as stringent as the local program, or from any program deemed acceptable by the I/M program administrator.

(ii) Presentation of proof of vehicle registration within the geographic area covered by the I/M program, except for any program whose enforcement is not through registration denial.

(iii) Another method approved by the state or local I/M program administrator.

(5) Special exemptions may be permitted for certain subject vehicles provided a demonstration is made that the performance standard will be met.

(b) *SIP requirements.* (1) The SIP shall include a detailed description of the number and types of vehicles to be covered by the program, and a plan for how those vehicles are to be identified, including vehicles that are routinely operated in the area but may not be registered in the area.

(2) The SIP shall include a description of any special exemptions which will be granted by the program, and an estimate

of the percentage and number of subject vehicles which will be impacted. Such exemptions shall be accounted for in the emission reduction analysis.

(3) The SIP shall include the legal authority or rule necessary to implement and enforce the vehicle coverage requirement.

§ 51.357 Test procedures and standards.

Written test procedures and pass/fail standards shall be established and followed for each model year and vehicle type included in the program.

(a) *Test procedure requirements.* Emission tests and functional tests shall be conducted according to good engineering practices to assure test accuracy.

(1) Initial tests (i.e., those occurring for the first time in a test cycle) shall be performed without repair or adjustment at the inspection facility, prior to the test, except as provided in paragraph (a)(10)(i) of this section.

(2) The vehicle owner or driver shall have access to the test area such that observation of the entire official inspection process on the vehicle is permitted. Such access may be limited but shall in no way prevent full observation.

(3) An official test, once initiated, shall be performed in its entirety regardless of intermediate outcomes except in the case of invalid test condition, unsafe conditions, or fast pass/fail algorithms.

(4) Tests involving measurement shall be performed with program-approved equipment that has been calibrated accordingly to the quality procedures contained in appendix A to this subpart.

(5) Vehicles shall be rejected from testing if the exhaust system is missing or leaking, or if the vehicle is in an unsafe condition for testing.

(6) Vehicles shall be retested after repair for any portion of the inspection that is failed on the previous test to determine if repairs were effective. To the extent that repair to correct a previous failure could lead to failure of another portion of the test, that portion shall also be retested. Evaporative system repairs shall trigger an exhaust emissions retest.

(7) *Steady-state testing.* Steady-state tests shall be performed in accordance with the procedures contained in appendix B to this subpart.

(8) *Emission control device inspection.* Visual emission control device checks shall be performed through direct observation or through indirect observation using a mirror, video camera or other visual aid. These inspections shall include a determination as to whether each subject device is present and appears to be properly connected and appears to be the correct type for the certified vehicle configuration.

(9) *Evaporative system purge test procedure.* The purge test procedure shall consist of measuring the total purge flow (in standard liters) occurring in the vehicle's evaporative system during the transient dynamometer emission test specified in paragraph (a)(11) of this section. The purge flow measurement system shall be connected to the purge portion of the evaporative system in series between the canister and the engine, preferably near the canister. The inspector shall be responsible for ensuring that all items that are disconnected in the conduct of the test procedure are properly re-connected at the conclusion of the test procedure. Alternative procedures may be used if they are shown to be equivalent or better to the satisfaction of the Administrator. Except in the case of government-run test facilities claiming sovereign immunity, any damage done to the evaporative emission control system during this test shall be repaired at the expense of the inspection facility.

(10) *Evaporative system integrity test procedure.* The test sequence shall consist of the following steps:

(i) Test equipment shall be connected to the fuel tank canister hose at the canister end. The gas cap shall be checked to ensure that it is properly, but not excessively tightened, and shall be tightened if necessary.

(ii) The system shall be pressurized to 14 ± 0.5 inches of water without exceeding 26 inches of water system pressure.

(iii) Close off the pressure source, seal the evaporative system and monitor pressure decay for up to two minutes.

(iv) Loosen the gas cap after a maximum of two minutes and monitor for a sudden pressure drop, indicating that the fuel tank was pressurized.

(v) The inspector shall be responsible for ensuring that all items that are disconnected in the conduct of the test procedure are properly re-connected at the conclusion of the test procedure.

(vi) Alternative procedures may be used if they are shown to be equivalent or better to the satisfaction of the Administrator. Except in the case of government-run test facilities claiming sovereign immunity, any damage done to the evaporative emission control system during this test shall be repaired at the expense of the inspection facility.

(11) *Transient emission test.* The transient emission test shall consist of 240 seconds of mass emission measurement using a constant volume sampler while the vehicle is driven through a computer-monitored driving cycle on a dynamometer with inertial weight settings appropriate for the weight of the vehicle. The driving cycle shall include acceleration, deceleration, and idle operating modes as specified in appendix E to this subpart. The 240 second sequence may be ended earlier using fast pass or fast fail algorithms and multiple pass/fail algorithms may be used during the test cycle to eliminate false failures. The transient test procedure, including algorithms and other procedural details, shall be approved by the Administrator prior to use in an I/M program.

(12) *On-board diagnostic checks.* [Reserved].

(13) *Approval of alternative tests.* Alternative test procedures may be approved if the Administrator finds that—

(i) Such procedures are in accordance with good engineering practice, including errors of commission (at cutpoints corresponding to equivalent emission reductions) no higher than the tests they would replace;

(ii) Such procedures show a correlation with the Federal Test Procedure (with respect to their ability to detect high emitting vehicles and ensure their effective repair) equal to or better than the tests they would replace; and

(iii) Such procedures would produce equivalent emission reductions in combination with other program elements.

(b) *Test standards*—(1) *Emissions standards.* HC, CO, and $CO+CO_2$ (or CO_2 alone) emission standards shall be applicable to all vehicles subject to the program and repairs shall be required for failure of any standard regardless of the attainment status of the area. NO_x emission standards shall be applied to vehicles subject to a transient test in ozone nonattainment areas and in an ozone transport region, unless a waiver of NO_x controls is provided to the state under § 51.351(d) of this subpart.

(i) *Steady-state short tests.* The steady-state short test emission standards for 1981 and later model year light duty vehicles and light duty trucks shall be at least as stringent as those in appendix C to this subpart.

(ii) *Transient test.* Transient test emission standards shall be established for HC, CO, CO_2, and NO_x for subject vehicles based on model year and vehicle type.

(2) *Visual equipment inspection standards.* (i) Vehicles shall fail visual inspections of subject emission control devices if such devices are part of the original certified configuration and are

found to be missing, modified, disconnected, or improperly connected.

(ii) Vehicles shall fail visual inspections of subject emission control devices if such devices are found to be incorrect for the certified vehicle configuration under inspection. Aftermarket parts, as well as original equipment manufacture parts, may be considered correct if they are proper for the certified vehicle configuration. Where an EPA aftermarket approval or self-certification program exists for a particular class of subject parts, vehicles shall fail visual equipment inspections if the part is neither original equipment manufacture nor from an approved or self-certified aftermarket manufacturer.

(3) *Functional test standards*—(i) *Evaporative system integrity test.* Vehicles shall fail the evaporative system pressure test if the system cannot maintain a system pressure above eight inches of water for up to two minutes after being pressurized to 14±0.5 inches of water or if no pressure drop is detected when the gas cap is loosened as described in paragraph (a)(10)(iv) of this section. Additionally, vehicles shall fail the evaporative test if the canister is missing or obviously damaged, if hoses are missing or obviously disconnected, or if the gas cap is missing.

(ii) *Evaporative canister purge test.* Vehicles with a total purge system flow measuring less than one liter, over the course of the transient test required in paragraph (a)(9) of this section, shall fail the evaporative purge test.

(4) *On-board diagnostics test standards.* [Reserved]

(c) *Fast test algorithms and standards.* Special test algorithms and pass/fail algorithms may be employed to reduce test time when the test outcome is predictable with near certainty, if the Administrator approves by letter the equivalency to full procedure testing.

(d) *Applicability.* In general, section 203(a)(3)(A) of the Clean Air Act prohibits altering a vehicle's configuration such that it changes from a certified to a non-certified configuration. In the inspection process, vehicles that have been altered from their original certified configuration are to be tested in the same manner as other subject vehicles.

(1) Vehicles with engines other than the engine originally installed by the manufacturer or an identical replacement of such engine shall be subject to the test procedures and standards for the chassis type and model year including visual equipment inspections for all parts that are part of the original or now-applicable certified configuration and part of the normal inspection. States may choose to require vehicles with such engines to be subject to the test procedures and standards for the engine model year if it is newer than the chassis model year.

(2) Vehicles that have been switched from an engine of one fuel type to another fuel type that is subject to the program (e.g., from a diesel engine to a gasoline engine) shall be subject to the test procedures and standards for the current fuel type, and to the requirements of paragraph (d)(1) of this section.

(3) Vehicles that are switched to a fuel type for which there is no certified configuration shall be tested according to the most stringent emission standards established for that vehicle type and model year. Emission control device requirements may be waived if the program determines that the alternatively fueled vehicle configuration would meet the new vehicle standards for that model year without such devices.

(4) Mixing vehicle classes (e.g., light-duty with heavy-duty) and certification types (e.g., California with Federal) within a single vehicle configuration shall be considered tampering.

(e) *SIP requirements.* The SIP shall include a description of each test procedure used. The SIP shall include the rule, ordinance or law describing and establishing the test procedures.

§ 51.358 Test equipment.

Computerized test systems are required for performing any measurement on subject vehicles.

(a) *Performance features of computerized test systems.* The test equipment shall be certified by the program to meet the requirements contained in appendix D to this subpart, and newly acquired systems shall be subjected to acceptance test procedures to ensure compliance with program specifications.

(1) Emission test equipment shall be capable of testing all subject vehicles and shall be updated from time to time to accommodate new technology vehicles as well as changes to the program.

(2) At a minimum, emission test equipment:

(i) Shall be automated to the highest degree commercially available to minimize the potential for intentional fraud and/or human error;

(ii) Shall be secure from tampering and/or abuse;

(iii) Shall be based upon written specifications; and

(iv) Shall be capable of simultaneously sampling dual exhaust vehicles.

(3) The vehicle owner or driver shall be provided with a computer-generated record of test results, including all of the items listed in 40 CFR part 85, subpart W as being required on the test record. The test report shall include:

(i) A vehicle description, including license plate number, vehicle identification number, and odometer reading;

(ii) The date and time of test;

(iii) The name or identification number of the individual(s) performing the tests and the location of the test station and lane;

(iv) The type of tests performed, including emission tests, visual checks for the presence of emission control components, and functional, evaporative system checks;

(v) The applicable test standards;

(vi) The test results, including exhaust concentrations and pass/fail results for each mode measured, pass/fail results for evaporative system checks, and which emission control devices inspected were passed, failed, or not applicable;

(vii) A statement indicating the availability of warranty coverage as required in section 207 of the Clean Air Act;

(viii) Certification that tests were performed in accordance with the regulations and, in the case of decentralized programs, the signature of the individual who performed the test; and

(ix) For vehicles that fail the tailpipe emission test, information on the possible causes of the specific pattern of high emission levels found during the test.

(b) *Functional characteristics of computerized test systems.* The test system is composed of emission measurement devices and other motor vehicle test equipment controlled by a computer.

(1) The test system shall automatically:

(i) Make a pass/fail decision for all measurements;

(ii) Record test data to an electronic medium;

(iii) Conduct regular self-testing of recording accuracy;

(iv) Perform electrical calibration and system integrity checks before each test, as applicable; and

(v) Initiate system lockouts for:

(A) Tampering with security aspects of the test system;

(B) Failing to conduct or pass periodic calibration or leak checks;

(C) Failing to conduct or pass the constant volume sampler flow rate check (if applicable);

(D) Failing to conduct or pass any of the dynamometer checks, including coast-down, roll speed and roll distance, power absorption capability, and inertia weight selection checks (if applicable);

(E) Failing to conduct or pass the pressure monitoring device check (if applicable);

(F) Failing to conduct or pass the purge flow metering system check (if applicable); and

(G) A full data recording medium or one that does not pass a cyclical redundancy check.

(2) Test systems in enhanced I/M programs shall include a real-time data link to a host computer that prevents unauthorized multiple initial tests on the same vehicle in a test cycle and to insure test record accuracy.

(3) The test system shall insure accurate data collection by limiting, cross-checking, and/or confirming manual data entry.

(4) *On-board diagnostic test equipment requirements.* [Reserved]

(c) *SIP requirements.* The SIP shall include written technical specifications for all test equipment used in the program and shall address each of the above requirements. The specifications shall describe the emission analysis process, the necessary test equipment, the required features, and written acceptance testing criteria and procedures.

§ 51.359 Quality control.

Quality control measures shall insure that emission measurement equipment is calibrated and maintained properly, and that inspection, calibration records, and control charts are accurately created, recorded and maintained.

(a) *General requirements.* (1) The practices described in this section and in Appendix A to this subpart shall be followed, at a minimum. Alternatives or exceptions to these procedures or frequencies may be approved by the Administrator based on a demonstration, including control chart analysis, of equivalent performance.

(2) Preventive maintenance on all inspection equipment necessary to insure accurate and repeatable operation shall be performed on a periodic basis.

(3) Computerized analyzers shall automatically record quality control check information, lockouts, attempted tampering, and any other recordable circumstances which should be monitored to insure quality control (e.g., service calls).

(b) *Requirements for steady-state emissions testing equipment.* (1) Equipment shall be maintained according to demonstrated good engineering practices to assure test accuracy. The calibration and adjustment requirements in Appendix A to this subpart shall apply to all steady-state test equipment. States may adjust calibration schedules and other quality control frequencies by using statistical process control to monitor equipment performance on an ongoing basis.

(2) For analyzers that use ambient air as zero air, provision shall be made to draw the air from outside the inspection bay or lane in which the analyzer is situated.

(3) The analyzer housing shall be constructed to protect the analyzer bench and electrical components from ambient temperature and humidity fluctuations that exceed the range of the analyzer's design specifications.

(4) Analyzers shall automatically purge the analytical system after each test.

(c) *Requirements for transient exhaust emission test equipment.* Equipment shall be maintained according to demonstrated good engineering practices to assure test accuracy. Computer control of quality assurance checks and quality control charts shall be used whenever possible. Exceptions to the procedures and the frequency of the checks described in Appendix A of this subpart may be approved by the Administrator based on a demonstration of equivalent performance.

(d) *Requirements for evaporative system functional test equipment.* Equipment shall be maintained according to demonstrated good engineering practices to assure test accuracy. Computer control of quality assurance checks and quality control charts shall be used whenever possible. Exceptions to the procedures and the frequency of the checks described in appendix A of this subpart may be approved by the Administrator based on a demonstration of equivalent performance.

(e) *Document security.* Measures shall be taken to maintain the security of all documents by which compliance with the inspection requirement is established including, but not limited to inspection certificates, waiver certificates, license plates, license tabs, and stickers. This section shall in no way require the use of paper documents but shall apply if they are used by the program for these purposes.

(1) Compliance documents shall be counterfeit resistant. Such measures as the use of special fonts, water marks, ultra-violent inks, encoded magnetic strips, unique bar-coded identifiers, and difficult to acquire materials may be used to accomplish this requirement.

(2) All inspection certificates, waiver certificates, and stickers shall be printed with a unique serial number and an official program seal.

(3) Measures shall be taken to ensure that compliance documents cannot be stolen or removed without being damaged.

(f) *SIP requirements.* The SIP shall include a description of quality control and record keeping procedures. The SIP shall include the procedure manual, rule, ordinance or law describing and establishing the quality control procedures and requirements.

§ 51.360 Waivers and compliance via diagnostic inspection.

The program may allow the issuance of a waiver, which is a form of compliance with the program requirements that allows a motorist to comply without meeting the applicable test standards, as long as prescribed criteria are met.

(a) *Waiver issuance criteria.* The waiver criteria shall include the following at a minimum.

(1) Waivers shall be issued only after a vehicle has failed a retest performed after all qualifying repairs have been completed.

(2) Any available warranty coverage shall be used to obtain needed repairs before expenditures can be counted towards the cost limits in paragraphs (a)(5) and (a)(6) of this section. The operator of a vehicle within the statutory age and mileage coverage under section 207(b) of the Clean Air Act shall present a written denial of warranty coverage from the manufacturer or authorized dealer for this provision to be waived for approved tests applicable to the vehicle.

(3) Waivers shall not be issued to vehicles for tampering-related repairs. The cost of tampering-related repairs shall not be applicable to the minimum expenditure in paragraphs (a)(5) and (a)(6) of this section. States may issue exemptions for tampering-related repairs if it can be verified that the part in question or one similar to it is no longer available for sale.

(4) Repairs shall be appropriate to the cause of the test failure, and a visual check shall be made to determine if repairs were actually made if, given the nature of the repair, it can be visually confirmed. Receipts shall be submitted for review to further verify that qualifying repairs were performed.

(5) Repairs shall be performed by a recognized repair technician (i.e., one professionally engaged in vehicle repair, employed by a going concern whose purpose is vehicle repair, or possessing

nationally recognized certification for emission-related diagnosis and repair) in order to qualify for a waiver. I/M programs may allow repairs performed by non-technicians (e.g., owners) to apply toward the waiver limit for pre-1980 model year vehicles.

(6) In basic I/M programs, a minimum of $75 for pre-81 vehicles and $200 for 1981 and later vehicles shall be spent in order to qualify for a waiver.

(7) In enhanced I/M programs, the motorist shall make an expenditure of at least $450 in repairs to qualify for a waiver. The I/M program shall provide that the $450 minimum expenditure shall be adjusted in January of each year by the percentage, if any, by which the Consumer Price Index for the preceding calendar year differs from the Consumer Price Index for 1989.

(i) The Consumer Price Index for any calendar year is the average of the Consumer Price Index for all-urban consumers published by the Department of Labor, as of the close of the 12-month period ending on August 31 of each calendar year. A copy of the current Consumer Price Index may be obtained from the Emission Planning and Strategies Division, U.S. Environmental Protection Agency, 2565 Plymouth Road, Ann Arbor, Michigan 48105.

(ii) The revision of the Consumer Price Index which is most consistent with the Consumer Price Index for calendar year 1989 shall be used.

(8) States may establish lower minimum expenditures if a program is established to scrap vehicles that do meet standards after the lower expenditure is made.

(9) A time extension, not to exceed the period of the inspection frequency, may be granted to obtain needed repairs on a vehicle in the case of economic hardship when waiver requirements have not been met, but the extension may be granted only once for a vehicle and shall be tracked and reported by the program.

(b) *Compliance via diagnostic inspection.* Vehicles subject to a transient IM240 emission test at the cutpoints established in § 51.351(a)(7) of this subpart may be issued a certificate of compliance without meeting the prescribed emission cutpoints, if, after failing a retest on emissions, a complete, documented physical and functional diagnosis and inspection performed by the I/M agency or a contractor to the I/M agency show that no additional emission-related repairs are needed. Any such exemption policy and procedures shall be subject to approval by the Administrator.

(c) *Quality control of waiver issuance.* (1) Enhanced programs shall control waiver issuance and processing by establishing a system of agency-issued waivers. The state may delegate this authority to a single contractor but inspectors in stations and lanes shall not issue waivers. Basic programs may permit inspector-issued waivers as long as quality assurance efforts include a comprehensive review of waiver issuance.

(2) The program shall include methods of informing vehicle owners or lessors of potential warranty coverage, and ways to obtain warranty repairs.

(3) The program shall insure that repair receipts are authentic and cannot be revised or reused.

(4) The program shall insure that waivers are only valid for one test cycle.

(5) The program shall track, manage, and account for time extensions or exemptions so that owners or lessors cannot receive or retain a waiver improperly.

(d) *SIP requirements.* (1) The SIP shall include a maximum waiver rate expressed as a percentage of initially failed vehicles. This waiver rate shall be used for estimating emission reduction benefits in the modeling analysis.

(2) The state shall take corrective action if the waiver rate exceeds that committed to in the SIP or revise the SIP and the emission reductions claimed.

(3) The SIP shall describe the waiver criteria and procedures, including cost limits, quality assurance methods and measures, and administration.

(4) The SIP shall include the necessary legal authority, ordinance, or rules to issue waivers, set and adjust cost limits as required in paragraph (a)(5) of this section, and carry out any other functions necessary to administer the waiver system, including enforcement of the waiver provisions.

§ 51.361 Motorist compliance enforcement.

Compliance shall be ensured through the denial of motor vehicle registration in enhanced I/M programs unless an exception for use of an existing alternative is approved. An enhanced I/M area may use an existing alternative if it demonstrates that the alternative has been more effective than registration denial. An enforcement mechanism may be considered an "existing alternative" only in areas that had approved I/M programs with that mechanism in the State Implementation Plan prior to passage of the 1990 Amendments to the Act. A basic I/M area may use an alternative enforcement mechanism if it demonstrates that the alternative will be as effective as registration denial. Two other types of enforcement programs may qualify for enhanced I/M programs if demonstrated to have been more effective than enforcement of the registration requirement in the past: Sticker-based enforcement programs and computer-matching programs. For newly implementing enhanced areas, including newly subject areas in a state with an I/M program in another part of the state, there is no provision for enforcement alternatives in the Act.

(a) *Registration denial.* Registration denial enforcement is defined as rejecting an application for initial registration or reregistration of a used vehicle (i.e., a vehicle being registered after the initial retail sale and associated registration) unless the vehicle has complied with the I/M requirement prior to granting the application. Pursuant to section 207(g)(3) of the Act, nothing in this subpart shall be construed to require that new vehicles shall receive emission testing prior to initial retail sale. In designing its enforcement program, the state shall:

(1) Provide an external, readily visible means of determining vehicle compliance with the registration requirement to facilitate enforcement of the program;

(2) Adopt a schedule of testing (either annual or biennial) that clearly determines when a vehicle shall comply prior to registration;

(3) Design a testing certification mechanism (either paper-based or electronic) that shall be used for registration purposes and clearly indicates whether the certification is valid for purposes of registration, including:

(i) Expiration date of the certificate;

(ii) Unambiguous vehicle identification information; and

(iii) Whether the vehicle passed or received a waiver;

(4) Routinely issue citations to motorists with expired or missing license plates, with either no registration or an expired registration, and with no license plate decals or expired decals, and provide for enforcement officials other than police to issue citations (e.g., parking meter attendants) to parked vehicles in noncompliance;

(5) Structure the penalty system to deter non-compliance with the registration requirement through the use of mandatory minimum fines (meaning civil, monetary penalties, in this subpart) constituting a meaningful deterrent and through a requirement that compliance be demonstrated before a case can be closed;

(6) Ensure that evidence of testing is available and checked for validity at the time of a new registration of a used vehicle or registration renewal;

(7) Prevent owners or lessors from avoiding testing through manipulation of the title or registration system; title transfers may re-start the clock on the inspection cycle only if proof of current compliance is required at title transfer;

(8) Prevent the fraudulent initial classification or reclassification of a vehicle from subject to non-subject or exempt by requiring proof of address changes prior to registration record modification, and documentation from the testing program (or delegate) certifying based on a physical inspection that the vehicle is exempt;

(9) Limit and track the use of time extensions of the registration requirement to prevent repeated extensions;

(10) Provide for meaningful penalties for cases of registration fraud;

(11) Limit and track exemptions to prevent abuse of the exemption policy for vehicles claimed to be out-of-state; and

(12) Encourage enforcement of vehicle registration transfer requirements when vehicle owners move into the I/M area by coordinating with local and state enforcement agencies and structuring other activities (e.g., drivers license issuance) to effect registration transfers.

(b) *Alternative enforcement mechanisms*—(1) *General requirements.* The program shall demonstrate that a non-registration-based enforcement program is currently more effective than registration-denial enforcement in enhanced I/M programs or, prospectively, as effective as registration denial in basic programs. The following general requirements shall apply:

(i) For enhanced I/M programs, the area in question shall have had an approved SIP with an operating I/M program using the alternative mechanism prior to enactment of the Clean Air Act Amendments of 1990. While modifications to improve compliance may be made to the program that was in effect at the time of enactment, the expected change in effectiveness cannot be considered in determining acceptability;

(ii) The state shall assess the alternative program's effectiveness, as well as the current effectiveness of the registration system, including the following:

(A) Determine the number and percentage of vehicles subject to the I/M program that were in compliance with the program over the course of at least one test cycle; and

(B) Determine the number and fraction of the same group of vehicles as in paragraph (b)(1)(ii)(A) of this section that were in compliance with the registration requirement over the same period. Late registration shall not be considered non-compliance for the purposes of this determination. The precise definition of late registration versus a non-complying vehicle shall be explained and justified in the SIP;

(iii) An alternative mechanism shall be considered more effective if the fraction of vehicles complying with the existing program, as determined according to the requirements of this section, is greater than the fraction of vehicles complying with the registration requirement. An alternative mechanism is as effective if the fraction complying with the program is at least equal to the fraction complying with the registration requirement.

(2) *Sticker-based enforcement.* In addition to the general requirements, a sticker-based enforcement program shall demonstrate that the enforcement mechanism will swiftly and effectively prevent operation of subject vehicles that fail to comply. Such demonstration shall include the following:

(i) An assessment of the current extent of the following forms of non-compliance and demonstration that mechanisms exist to keep such non-compliance within acceptable limits:

(A) Use of stolen, counterfeit, or fraudulently obtained stickers;

(B) In states with safety inspections, the use of "Safety Inspection Only" stickers on vehicles that should be subject to the I/M requirement as well; and

(C) Operation of vehicles with expired stickers, including a stratification of non-compliance by length of noncompliance and model year.

(ii) The program as currently implemented or as proposed to be improved shall also:

(A) Require an easily observed external identifier such as the county name on the license plate, an obviously unique license plate tab, or other means that shows whether or not a vehicle is subject to the I/M requirement;

(B) Require an easily observed external identifier, such as a windshield sticker or license plate tab that shows whether a subject vehicle is in compliance with the inspection requirement;

(C) Impose monetary fines at least as great as the estimated cost of compliance with I/M requirements (e.g., test fee plus minimum waiver expenditure) for the absence of such identifiers;

(D) Require that such identifiers be of a quality that makes them difficult to counterfeit, difficult to remove without destroying once installed, and durable enough to last until the next inspection without fading, peeling, or other deterioration;

(E) Perform surveys in a variety of locations and at different times for the presence of the required identifiers such that at least 10% of the vehicles or 10,000 vehicles (whichever is less) in the subject vehicle population are sampled each year;

(F) Track missing identifiers for all inspections performed at each station, with stations being held accountable for all such identifiers they are issued; and

(G) Assess and collect significant fines for each identifier that is unaccounted for by a station.

(3) *Computer matching.* In addition to the general requirements, computer-matching programs shall demonstrate that the enforcement mechanism will swiftly and effectively prevent operation of subject vehicles that fail to comply. Such demonstration shall:

(i) Require an expeditious system that results in at least 90% of the subject vehicles in compliance within 4 months of the compliance deadline;

(ii) Require that subject vehicles be given compliance deadlines based on the regularly scheduled test date, not the date of previous compliance;

(iii) Require that motorists pay monetary fines at least as great as the estimated cost of compliance with I/M requirements (e.g., test fee plus minimum waiver expenditure) for the continued operation of a noncomplying vehicle beyond 4 months of the deadline;

(iv) Require that continued non-compliance will eventually result in preventing operation of the non-complying vehicle (no later than the date of the next test cycle) through, at a minimum, suspension of vehicle registration and subsequent denial of reregistration;

(v) Demonstrate that the computer system currently in use is adequate to store and manipulate the I/M vehicle database, generate computerized notices, and provide regular backup to said system while maintaining auxiliary storage devices to insure ongoing operation of the system and prevent data losses;

(vi) Track each vehicle through the steps taken to ensure compliance, including:

(A) The compliance deadline;

(B) The date of initial notification;

(C) The dates warning letters are sent to non-complying vehicle owners;

(D) The dates notices of violation or other penalty notices are sent; and

(E) The dates and outcomes of other steps in the process, including the final compliance date;

(vii) Compile and report monthly summaries including statistics on the percentage of vehicles at each stage in the enforcement process; and

(viii) Track the number and percentage of vehicles initially identified as requiring testing but which are never tested as a result of being junked, sold to a motorist in a non-I/M program area, or for some other reason.

(c) *SIP requirements.* (1) The SIP shall provide information concerning the enforcement process, including:

(i) A description of the existing compliance mechanism if it is to be used in the future and the demonstration that it is as effective or more effective than registration-denial enforcement;

(ii) An identification of the agencies responsible for performing each of the applicable activities in this section;

(iii) A description of and accounting for all classes of exempt vehicles; and

(iv) A description of the plan for testing fleet vehicles, rental car fleets, leased vehicles, and any other subject vehicles, e.g., those operated in (but not necessarily registered in) the program area.

(2) The SIP shall include a determination of the current compliance rate based on a study of the system that includes an estimate of compliance losses due to loopholes, counterfeiting, and unregistered vehicles. Estimates of the effect of closing such loopholes and otherwise improving the enforcement mechanism shall be supported with detailed analyses.

(3) The SIP shall include the legal authority to implement and enforce the program.

(4) The SIP shall include a commitment to an enforcement level to be used for modeling purposes and to be maintained, at a minimum, in practice.

§ 51.362 Motorist compliance enforcement program oversight.

The enforcement program shall be audited regularly and shall follow effective program management practices, including adjustments to improve operation when necessary.

(a) *Quality assurance and quality control.* A quality assurance program shall be implemented to insure effective overall performance of the enforcement system. Quality control procedures are required to instruct individuals in the enforcement process regarding how to properly conduct their activities. At a minimum, the quality control and quality assurance program shall include:

(1) Verification of exempt vehicle status by inspecting and confirming such vehicles by the program or its delegate;

(2) Facilitation of accurate critical test data and vehicle identifier collection through the use of automatic data capture systems such as bar-code scanners or optical character readers, or through redundant data entry;

(3) Maintenance of an audit trail to allow for the assessment of enforcement effectiveness;

(4) Establishment of written procedures for personnel directly engaged in I/M enforcement activities;

(5) Establishment of written procedures for personnel engaged in I/M document handling and processing, such as registration clerks or personnel involved in sticker dispensing and waiver processing, as well as written procedures for the auditing of their performance;

(6) Follow-up validity checks on out-of-area or exemption-triggering registration changes;

(7) Analysis of registration-change applications to target potential violators;

(8) A determination of enforcement program effectiveness through periodic audits of test records and program compliance documentation;

(9) Enforcement procedures for disciplining, retraining, or removing enforcement personnel who deviate from established requirements, or in the case of non-government entities that process registrations, for defranchising, revoking or otherwise discontinuing the activity of the entity issuing registrations; and

(10) The prevention of fraudulent procurement or use of inspection documents by controlling and tracking document distribution and handling, and making stations financially liable for missing or unaccounted for documents by assessing monetary fines reflecting the "street value" of these documents (i.e., the test fee plus the minimum waiver expenditure).

(b) *Information management.* In establishing an information base to be used in characterizing, evaluating, and enforcing the program, the state shall:

(1) Determine the subject vehicle population;

(2) Permit EPA audits of the enforcement process;

(3) Assure the accuracy of registration and other program document files;

(4) Maintain and ensure the accuracy of the testing database through periodic internal and/or third-party review; through automated or redundant data entry; and, through automated analysis for valid alpha-numeric sequences of the vehicle identification number (VIN), certificate number, or license plate number;

(5) Compare the testing database to the registration database to determine program effectiveness, establish compliance rates, and to trigger potential enforcement action against non-complying motorists; and

(6) Sample the fleet as a determination of compliance through parking lot surveys, road-side pull-overs, or other in-use vehicle measurements.

(c) *SIP requirements.* The SIP shall include a description of enforcement program oversight and information management activities.

§ 51.363 Quality assurance.

An ongoing quality assurance program shall be implemented to discover, correct and prevent fraud, waste, and abuse and to determine whether procedures are being followed, are adequate, whether equipment is measuring accurately, and whether other problems might exist which would impede program performance. The quality assurance and quality control procedures shall be periodically evaluated to assess their effectiveness and relevance in achieving program goals.

(a) *Performance audits.* Performance audits shall be conducted on a regular basis to determine whether inspectors are correctly performing all tests and other required functions. Performance audits shall be of two types: overt and covert, and shall include:

(1) Performance audits based upon written procedures and results shall be reported using either electronic or written forms to be retained in the inspector and station history files, with sufficient detail to support either an administrative or civil hearing;

(2) Performance audits in addition to regularly programmed audits for stations employing inspectors suspected of violating regulations as a result of audits, data analysis, or consumer complaints;

(3) Overt performance audits shall be performed at least twice per year for each lane or test bay and shall include:

(i) A check for the observance of appropriate document security;

(ii) A check to see that required record keeping practices are being followed;

(iii) A check for licenses or certificates and other required display information; and

(iv) Observation and written evaluation of each inspector's ability to properly perform an inspection;

(4) Covert performance audits shall include:

(i) Remote visual observation of inspector performance, which may include the use of aids such as binoculars or video cameras, at least once per year per inspector in high-volume stations (i.e., those performing more than 4000 tests per year);

(ii) Site visits at least once per year per number of inspectors using covert vehicles set to fail (this requirement sets a minimum level of activity, not a requirement that each inspector be involved in a covert audit);

(iii) For stations that conduct both testing and repairs, at least one covert vehicle visit per station per year including the purchase of repairs and subsequent retesting if the vehicle is initially failed for tailpipe emissions (this activity may be accomplished in conjunction with paragraph (a)(4)(ii) of this section but must involve each station at least once per year);

(iv) Documentation of the audit, including vehicle condition and preparation, sufficient for building a legal case and establishing a performance record;

(v) Covert vehicles covering the range of vehicle technology groups (e.g., carbureted and fuel-injected vehicles) included in the program, including a full range of introduced malfunctions covering the emission test, the evaporative system tests, and emission control component checks (as applicable);

(vi) Sufficient numbers of covert vehicles and auditors to allow for frequent rotation of both to prevent detection by station personnel; and

(vii) Access to on-line inspection databases by state personnel to permit the creation and maintenance of covert vehicle records.

(b) *Record audits.* Station and inspector records shall be reviewed or screened at least monthly to assess station performance and identify problems that may indicate potential fraud or incompetence. Such review shall include:

(1) Software-based, computerized analysis to identify statistical inconsistencies, unusual patterns, and other discrepancies;

(2) Visits to inspection stations to review records not already covered in the electronic analysis (if any); and

(3) Comprehensive accounting for all official forms that can be used to demonstrate compliance with the program.

(c) *Equipment audits.* During overt site visits, auditors shall conduct quality control evaluations of the required test equipment, including (where applicable):

(1) A gas audit using gases of known concentrations at least as accurate as those required for regular equipment quality control and comparing these concentrations to actual readings;

(2) A check for tampering, worn instrumentation, blocked filters, and other conditions that would impede accurate sampling;

(3) A check for critical flow in critical flow CVS units;

(4) A check of the Constant Volume Sampler flow calibration;

(5) A check for the optimization of the Flame Ionization Detection fuel-air ratio using methane;

(6) A leak check;

(7) A check to determine that station gas bottles used for calibration purposes are properly labelled and within the relevant tolerances;

(8) Functional dynamometer checks addressing coast-down, roll speed and roll distance, inertia weight selection, and power absorption;

(9) A check of the system's ability to accurately detect background pollutant concentrations;

(10) A check of the pressure monitoring devices used to perform the evaporative canister pressure test; and

(11) A check of the purge flow metering system.

(d) *Auditor training and proficiency.* (1) Auditors shall be formally trained and knowledgeable in:

(i) The use of analyzers;

(ii) Program rules and regulations;

(iii) The basics of air pollution control;

(iv) Basic principles of motor vehicle engine repair, related to emission performance;

(v) Emission control systems;

(vi) Evidence gathering;

(vii) State administrative procedures laws;

(viii) Quality assurance practices; and

(ix) Covert audit procedures.

(2) Auditors shall themselves be audited at least once annually.

(3) The training and knowledge requirements in paragraph (d)(1) of this section may be waived for temporary auditors engaged solely for the purpose of conducting covert vehicle runs.

(e) *SIP requirements.* The SIP shall include a description of the quality assurance program, and written procedures manuals covering both overt and covert performance audits, record audits, and equipment audits. This requirement does not include materials or discussion of details of enforcement strategies that would ultimately hamper the enforcement process.

§ 51.364 Enforcement against contractors, stations and inspectors.

Enforcement against licensed stations or contractors, and inspectors shall include swift, sure, effective, and consistent penalties for violation of program requirements.

(a) *Imposition of penalties.* A penalty schedule shall be developed that establishes minimum penalties for violations of program rules and procedures.

(1) The schedule shall categorize and list violations and the minimum penalties to be imposed for first, second, and subsequent violations and for multiple violation of different requirements. In the case of contracted systems, the state may use compensation retainage in lieu of penalties.

(2) Substantial penalties or retainage shall be imposed on the first offense for violations that directly affect emission reduction benefits. At a minimum, in test-and-repair programs inspector and station license suspension shall be imposed for at least 6 months whenever a vehicle is intentionally improperly passed for any required portion of the test. In test-only programs, inspectors shall be removed from inspector duty for at least 6 months (or a retainage penalty equivalent to the inspector's salary for that period shall be imposed).

(3) All findings of serious violations of rules or procedural requirements shall result in mandatory fines or retainage. In the case of gross neglect, a first offense shall result in a fine or retainage of no less than $100 or 5 times the inspection fee, whichever is greater, for the contractor or the licensed station, and the inspector if involved.

(4) Any finding of inspector incompetence shall result in mandatory training before inspection privileges are restored.

(5) License or certificate suspension or revocation shall mean the individual is barred from direct or indirect involvement in any inspection operation during the term of the suspension or revocation.

(b) *Legal authority.* (1) The quality assurance officer shall have the authority to temporarily suspend station and inspector licenses or certificates (after approval of a superior) immediately upon finding a violation or equipment failure that directly affects emission reduction benefits, pending a hearing when requested. In the case of immediate suspension, a hearing shall be held within fourteen calendar days of a written request by the station licensee or the inspector. Failure to hold a hearing within 14 days when requested shall cause the suspension to lapse. In the event that a state's constitution precludes such a temporary license suspension, the enforcement system shall be designed with adequate resources and mechanisms to hold a hearing to suspend or revoke the station or inspector license within three station business days of the finding.

(2) The oversight agency shall have the authority to impose penalties against the licensed station or contractor, as

well as the inspector, even if the licensee or contractor had no direct knowledge of the violation but was found to be careless in oversight of inspectors or has a history of violations. Contractors and licensees shall be held fully responsible for inspector performance in the course of duty.

(c) *Recordkeeping.* The oversight agency shall maintain records of all warnings, civil fines, suspensions, revocations, and violations and shall compile statistics on violations and penalties on an annual basis.

(d) *SIP requirements.* (1) The SIP shall include the penalty schedule and the legal authority for establishing and imposing penalties, civil fines, license suspension, and revocations.

(2) In the case of state constitutional impediments to immediate suspension authority, the state Attorney General shall furnish an official opinion for the SIP explaining the constitutional impediment as well as relevant case law.

(3) The SIP shall describe the administrative and judicial procedures and responsibilities relevant to the enforcement process, including which agencies, courts, and jurisdictions are involved; who will prosecute and adjudicate cases; and other aspects of the enforcement of the program requirements, the resources to be allocated to this function, and the source of those funds. In states without immediate suspension authority, the SIP shall demonstrate that sufficient resources, personnel, and systems are in place to meet the three day case management requirement for violations that directly affect emission reductions.

§ 51.365 Data collection.

Accurate data collection is essential to the management, evaluation, and enforcement of an I/M program. The program shall gather test data on individual vehicles, as well as quality control data on test equipment.

(a) *Test data.* The goal of gathering test data is to unambiguously link specific test results to a specific vehicle, I/M program registrant, test site, and inspector, and to determine whether or not the correct testing parameters were observed for the specific vehicle in question. In turn, these data can be used to distinguish complying and noncomplying vehicles as a result of analyzing the data collected and comparing it to the registration database, to screen inspection stations and inspectors for investigation as to possible irregularities, and to help establish the overall effectiveness of the program. At a minimum, the program shall collect the following with respect to each test conducted:

(1) Test record number;

(2) Inspection station and inspector numbers;

(3) Test system number;

(4) Date of the test;

(5) Emission test start time and the time final emission scores are determined;

(6) Vehicle Identification Number;

(7) License plate number;

(8) Test certificate number;

(9) Gross Vehicle Weight Rating (GVWR);

(10) Vehicle model year, make, and type;

(11) Number of cylinders or engine displacement;

(12) Transmission type;

(13) Odometer reading;

(14) Category of test performed (i.e., initial test, first retest, or subsequent retest);

(15) Fuel type of the vehicle (i.e., gas, diesel, or other fuel);

(16) Type of vehicle preconditioning performed (if any);

(17) Emission test sequence(s) used;

(18) Hydrocarbon emission scores and standards for each applicable test mode;

(19) Carbon monoxide emission scores and standards for each applicable test mode;

(20) Carbon dioxide emission scores ($CO+CO_2$) and standards for each applicable test mode;

(21) Nitrogen oxides emission scores and standards for each applicable test mode;

(22) Results (Pass/Fail/Not Applicable) of the applicable visual inspections for the catalytic converter, air system, gas cap, evaporative system, positive crankcase ventilation (PCV) valve, fuel inlet restrictor, and any other visual inspection for which emission reduction credit is claimed;

(23) Results of the evaporative system pressure test expressed as a pass or fail; and

(24) Results of the evaporative system purge test expressed as a pass or fail along with the total purge flow in liters achieved during the test.

(b) *Quality control data.* At a minimum, the program shall gather and report the results of the quality control checks required under § 51.359 of this subpart, identifying each check by station number, system number, date, and start time. The data report shall also contain the concentration values of the calibration gases used to perform the gas characterization portion of the quality control checks.

§ 51.366 Data analysis and reporting.

Data analysis and reporting are required to allow for monitoring and evaluation of the program by program management and EPA, and shall provide information regarding the types of program activities performed and their final outcomes, including summary statistics and effectiveness evaluations of the enforcement mechanism, the quality assurance system, the quality control program, and the testing element. Initial submission of the following annual reports shall commence within 18 months of initial implementation of the program as required by § 51.373 of this subpart. The biennial report shall commence within 30 months of initial implementation of the program as required by § 51.373 of this subpart.

(a) *Test data report.* The program shall submit to EPA by July of each year a report providing basic statistics on the testing program for January through December of the previous year, including:

(1) The number of vehicles tested by model year and vehicle type;

(2) By model year and vehicle type, the number and percentage of vehicles:

(i) Failing the emissions test initially;

(ii) Failing each emission control component check initially;

(iii) Failing the evaporative system functional and integrity checks initially;

(iv) Failing the first retest for tailpipe emissions;

(v) Passing the first retest for tailpipe emissions;

(vi) Initially failed vehicles passing the second or subsequent retest for tailpipe emissions;

(vii) Initially failed vehicles passing each emission control component check on the first or subsequent retest by component;

(viii) Initially failed vehicles passing the evaporative system functional and integrity checks on the first or subsequent retest by component;

(ix) Initially failed vehicles receiving a waiver; and

(x) Vehicles with no known final outcome (regardless of reason);

(3) The initial test volume by model year and test station;

(4) The initial test failure rate by model year and test station; and

(5) The average increase or decrease in tailpipe emission levels for HC, CO, and NO_x (if applicable) after repairs by model year and vehicle type for vehicles receiving a mass emissions test.

(b) *Quality assurance report.* The program shall submit to EPA by July of each year a report providing basic statistics on the quality assurance

program for January through December of the previous year, including:

(1) The number of inspection stations and lanes:

(i) Operating throughout the year; and

(ii) Operating for only part of the year;

(2) The number of inspection stations and lanes operating throughout the year:

(i) Receiving overt performance audits in the year;

(ii) Not receiving overt performance audits in the year;

(iii) Receiving covert performance audits in the year;

(iv) Not receiving covert performance audits in the year; and

(v) That have been shut down as a result of overt performance audits;

(3) The number of covert audits:

(i) Conducted with the vehicle set to fail the emission test;

(ii) Conducted with the vehicle set to fail the component check;

(iii) Conducted with the vehicle set to fail the evaporative system checks;

(iv) Conducted with the vehicle set to fail any combination of two or more of the above checks;

(v) Resulting in a false pass for emissions;

(vi) Resulting in a false pass for component checks;

(vii) Resulting in a false pass for the evaporative system check; and

(viii) Resulting in a false pass for any combination of two or more of the above checks;

(4) The number of inspectors and stations:

(i) That were suspended, fired, or otherwise prohibited from testing as a result of covert audits;

(ii) That were suspended, fired, or otherwise prohibited from testing for other causes; and

(iii) That received fines;

(5) The number of inspectors licensed or certified to conduct testing;

(6) The number of hearings:

(i) Held to consider adverse actions against inspectors and stations; and

(ii) Resulting in adverse actions against inspectors and stations;

(6) The total amount collected in fines from inspectors and stations by type of violation;

(7) The total number of covert vehicles available for undercover audits over the year; and

(8) The number of covert auditors available for undercover audits.

(c) *Quality control report.* The program shall submit to EPA by July of each year a report providing basic statistics on the quality control program for January through December of the previous year, including:

(1) The number of emission testing sites and lanes in use in the program;

(2) The number of equipment audits by station and lane;

(3) The number and percentage of stations that have failed equipment audits; and

(4) Number and percentage of stations and lanes shut down as a result of equipment audits.

(d) *Enforcement report.* (1) All varieties of enforcement programs shall, at a minimum, submit to EPA by July of each year a report providing basic statistics on the enforcement program for January through December of the previous year, including:

(i) An estimate of the number of vehicles subject to the inspection program, including the results of an analysis of the registration data base;

(ii) The percentage of motorist compliance based upon a comparison of the number of valid final tests with the number of subject vehicles;

(iii) The total number of compliance documents issued to inspection stations;

(iv) The number of missing compliance documents;

(v) The number of time extensions and other exemptions granted to motorists; and

(vi) The number of compliance surveys conducted, number of vehicles surveyed in each, and the compliance rates found.

(2) Registration denial based enforcement programs shall provide the following additional information:

(i) A report of the program's efforts and actions to prevent motorists from falsely registering vehicles out of the program area or falsely changing fuel type or weight class on the vehicle registration, and the results of special studies to investigate the frequency of such activity; and

(ii) The number of registration file audits, number of registrations reviewed, and compliance rates found in such audits.

(3) Computer-matching based enforcement programs shall provide the following additional information:

(i) The number and percentage of subject vehicles that were tested by the initial deadline, and by other milestones in the cycle;

(ii) A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity; and

(iii) The number of enforcement system audits, and the error rate found during those audits.

(4) Sticker-based enforcement systems shall provide the following additional information:

(i) A report on the program's efforts to prevent, detect, and enforce against sticker theft and counterfeiting, and the frequency of this type of activity;

(ii) A report on the program's efforts to detect and enforce against motorists falsely changing vehicle classifications to circumvent program requirements, and the frequency of this type of activity; and

(iii) The number of parking lot sticker audits conducted, the number of vehicles surveyed in each, and the noncompliance rate found during those audits.

(e) *Additional reporting requirements.* In addition to the annual reports in paragraphs (a) through (d) of this section, programs shall submit to EPA by July of every other year, biennial reports addressing:

(1) Any changes made in program design, funding, personnel levels, procedures, regulations, and legal authority, with detailed discussion and evaluation of the impact on the program of all such changes; and

(2) Any weaknesses or problems identified in the program within the two-year reporting period, what steps have already been taken to correct those problems, the results of those steps, and any future efforts planned.

(f) *SIP requirements.* The SIP shall describe the types of data to be collected.

§ 51.367 Inspector training and licensing or certification.

All inspectors shall receive formal training and be licensed or certified to perform inspections.

(a) *Training.* (1) Inspector training shall impart knowledge of the following:

(i) The air pollution problem, its causes and effects;

(ii) The purpose, function, and goal of the inspection program;

(iii) Inspection regulations and procedures;

(iv) Technical details of the test procedures and the rationale for their design;

(v) Emission control device function, configuration, and inspection;

(vi) Test equipment operation, calibration, and maintenance;

(vii) Quality control procedures and their purpose;

(viii) Public relations; and

(ix) Safety and health issues related to the inspection process.

(2) If inspector training is not administered by the program, the responsible state agency shall monitor and evaluate the training program delivery.

(3) In order to complete the training requirement, a trainee shall pass (i.e., a minimum of 80% of correct responses or lower if an occupational analysis justifies it) a written test covering all aspects of the training. In addition, a hands-on test shall be administered in which the trainee demonstrates without assistance the ability to conduct a proper inspection, to properly utilize equipment and to follow other procedures. Inability to properly conduct all test procedures shall constitute failure of the test. The program shall take appropriate steps to insure the security and integrity of the testing process.

(b) *Licensing and certification.* (1) All inspectors shall be either licensed by the program (in the case of test-and-repair systems that do not use contracts with stations) or certified by an organization other than the employer (in test-only programs and test-and-repair programs that require station owners to enter into contracts with the state) in order to perform official inspections.

(2) Completion of inspector training and passing required tests shall be a condition of licensing or certification.

(3) Inspector licenses and certificates shall be valid for no more than 2 years, at which point refresher training and testing shall be required prior to renewal. Alternative approaches based on more comprehensive skill examination and determination of inspector competency may be used.

(4) Licenses or certificates shall not be considered a legal right but rather a privilege bestowed by the program conditional upon adherence to program requirements.

(c) *SIP requirements.* The SIP shall include a description of the training program, the written and hands-on tests, and the licensing or certification process.

§ 51.368 Public information and consumer protection.

(a) *Public awareness.* The SIP shall include a plan for informing the public on an ongoing basis throughout the life of the I/M program of the air quality problem, the requirements of federal and state law, the role of motor vehicles in the air quality problem, the need for and benefits of an inspection program, how to maintain a vehicle in a low-emission condition, how to find a qualified repair technician, and the requirements of the I/M program. Motorists that fail the I/M test in enhanced I/M areas shall be offered a list of repair facilities in the area and information on the results of repairs performed by repair facilities in the area, as described in § 51.369(b)(1) of this subpart. Motorists that fail the I/M test shall also be provided with software-generated, interpretive diagnostic information based on the particular portions of the test that were failed.

(b) *Consumer protection.* The oversight agency shall institute procedures and mechanisms to protect the public from fraud and abuse by inspectors, mechanics, and others involved in the I/M program. This shall include a challenge mechanism by which a vehicle owner can contest the results of an inspection. It shall include mechanisms for protecting whistle blowers and following up on complaints by the public or others involved in the process. It shall include a program to assist owners in obtaining warranty covered repairs for eligible vehicles that fail a test. The SIP shall include a detailed consumer protection plan.

§ 51.369 Improving repair effectiveness.

Effective repairs are the key to achieving program goals and the state shall take steps to ensure the capability exists in the repair industry to repair vehicles that fail I/M tests.

(a) *Technical assistance.* The oversight agency shall provide the repair industry with information and assistance related to vehicle inspection diagnosis and repair.

(1) The agency shall regularly inform repair facilities of changes in the inspection program, training course schedules, common problems being found with particular engine families, diagnostic tips and the like.

(2) The agency shall provide a hot line service to assist repair technicians with specific repair problems, answer technical questions that arise in the repair process, and answer questions related to the legal requirements of state and federal law with regard to emission control device tampering, engine switching, or similar issues.

(b) *Performance monitoring.* (1) In enhanced I/M program areas, the oversight agency shall monitor the performance of individual motor vehicle repair facilities, and provide to the public at the time of initial failure, a summary of the performance of local repair facilities that have repaired vehicles for retest. Performance monitoring shall include statistics on the number of vehicles submitted for a retest after repair by the repair facility, the percentage passing on first retest, the percentage requiring more than one repair/retest trip before passing, and the percentage receiving a waiver. Programs may provide motorists with alternative statistics that convey similar information on the relative ability of repair facilities in providing effective and convenient repair, in light of the age and other characteristics of vehicles presented for repair at each facility.

(2) Programs shall provide feedback, including statistical and qualitative information to individual repair facilities on a regular basis (at least annually) regarding their success in repairing failed vehicles.

(3) A prerequisite for a retest shall be a completed repair form that indicates which repairs were performed, as well as any technician recommended repairs that were not performed, and identification of the facility that performed the repairs.

(c) *Repair technician training.* The state shall assess the availability of adequate repair technician training in the I/M area and, if the types of training described in paragraphs (c)(1) through (4) of this section are not currently available, shall insure that training is made available to all interested individuals in the community either through private or public facilities. This may involve working with local community colleges or vocational schools to add curricula to existing programs or start new programs or it might involve attracting private training providers to offer classes in the area. The training available shall include:

(1) Diagnosis and repair of malfunctions in computer controlled, close-loop vehicles;

(2) The application of emission control theory and diagnostic data to the diagnosis and repair of failures on the transient emission test and the evaporative system functional checks;

(3) Utilization of diagnostic information on systematic or repeated failures observed in the transient emission test and the evaporative system functional checks; and

(4) General training on the various subsystems related to engine emission control.

(d) *SIP requirements.* The SIP shall include a description of the technical assistance program to be implemented, a description of the procedures and criteria to be used in meeting the performance monitoring requirements of this section, and a description of the repair technician training resources available in the community.

§ 51.370 Compliance with recall notices.

States shall establish methods to ensure that vehicles subject to enhanced I/M and that are included in either a "Voluntary Emissions Recall" as defined at 40 CFR 85.1902(d), or in a remedial plan determination made pursuant to section 207(c) of the Act, receive the required repairs. States shall require

that owners of recalled vehicles have the necessary recall repairs completed, either in order to complete an annual or biennial inspection process or to obtain vehicle registration renewal. All recalls for which owner notification occurs after January 1, 1995 shall be included in the enhanced I/M recall requirement.

(a) *General requirements.* (1) The state shall have an electronic means to identify recalled vehicles based on lists of VINs with unresolved recalls made available by EPA, the vehicle manufacturers, or a third party supplier approved by the Administrator. The state shall update its list of unresolved recalls on a quarterly basis at a minimum.

(2) The state shall require owners or lessees of vehicles with unresolved recalls to show proof of compliance with recall notices in order to complete either the inspection or registration cycle.

(3) Compliance shall be required on the next registration or inspection date, allowing a reasonable period to comply, after notification of recall was received by the state.

(b) *Enforcement.* (1) A vehicle shall either fail inspection or be denied vehicle registration if the required recall repairs have not been completed.

(2) In the case of vehicles obtaining recall repairs but remaining on the updated list provided in paragraph (a)(1) of this section, the state shall have a means of verifying completion of the required repairs; electronic records or paper receipts provided by the authorized repair facility shall be required. The vehicle inspection or registration record shall be modified to include (or be supplemented with other VIN-linked records which include) the recall campaign number(s) and the date(s) repairs were performed. Documentation verifying required repairs shall include the following:

(i) The VIN, make, and model year of the vehicle; and

(ii) The recall campaign number and the date repairs were completed.

(c) *Reporting requirements.* The state shall submit to EPA, by July of each year for the previous calendar year, an annual report providing the following information:

(1) The number of vehicles in the I/M area initially listed as having unresolved recalls, segregated by recall campaign number;

(2) The number of recalled vehicles brought into compliance by owners;

(3) The number of listed vehicles with unresolved recalls that, as of the end of the calendar year, were not yet due for inspection or registration;

(4) The number of recalled vehicles still in non-compliance that have either failed inspection or been denied registration on the basis of non-compliance with recall; and

(5) The number of recalled vehicles that are otherwise not in compliance.

(d) *SIP submittals.* The SIP shall describe the procedures used to incorporate the vehicle lists provided in paragraph (a)(1) of this section into the inspection or registration database, the quality control methods used to insure that recall repairs are properly documented and tracked, and the method (inspection failure or registration denial) used to enforce the recall requirements.

§ 51.371 On-road testing.

On-road testing is defined as the measurement of HC, CO, NO_x, and/or CO_2 emissions on any road or roadside in the nonattainment area or the I/M program area. On-road testing is required in enhanced I/M areas and is an option for basic I/M areas.

(a) *General requirements.* (1) On-road testing is to be part of the emission testing system, but is to be a complement to testing otherwise required.

(2) On-road testing is not required in every season or on every vehicle but shall evaluate the emission performance of 0.5% of the subject fleet statewide or 20,000 vehicles, whichever is less, including any vehicles that may be subject to the follow-up inspection provisions of paragraph (a)(4) of this section, each inspection cycle.

(3) The on-road testing program shall provide information about the emission performance of in-use vehicles, by measuring on-road emissions through the use of remote sensing devices or roadside pullovers including tailpipe emission testing. The program shall collect, analyze and report on-road testing data.

(4) Owners of vehicles that have previously been through the normal periodic inspection and passed the final retest and found to be high emitters shall be notified that the vehicles are required to pass an out-of-cycle follow-up inspection; notification may be by mailing in the case of remote sensing on-road testing or through immediate notification if roadside pullovers are used.

(b) *SIP requirements.* (1) The SIP shall include a detailed description of the on-road testing program, including the types of testing, test limits and criteria, the number of vehicles (the percentage of the fleet) to be tested, the number of employees to be dedicated to the on-road testing effort, the methods for collecting, analyzing, utilizing, and reporting the results of on-road testing and, the portion of the program budget to be dedicated to on-road testing.

(2) The SIP shall include the legal authority necessary to implement the on-road testing program, including the authority to enforce off-cycle inspection and repair requirements.

(3) Emission reduction credit for on-road testing programs shall be granted for a program designed to obtain significant emission reductions over and above those already predicted to be achieved by other aspects of the I/M program. The SIP shall include technical support for the claimed additional emission reductions.

§ 51.372 State implementation plan submissions.

(a) *SIP submittals.* The SIP shall address each of the elements covered in this subpart, including, but not limited to:

(1) A schedule of implementation of the program including interim milestones leading to mandatory testing. The milestones shall include, at a minimum:

(i) Passage of enabling statutory or other legal authority;

(ii) Proposal of draft regulations and promulgation of final regulations;

(iii) Issuance of final specifications and procedures;

(iv) Issuance of final Request for Proposals (if applicable);

(v) Licensing or certifications of stations and inspectors;

(vi) The date mandatory testing will begin for each model year to be covered by the program;

(vii) The date full-stringency cutpoints will take effect;

(viii) All other relevant dates;

(2) An analysis of emission level targets for the program using the most current EPA mobile source emission model or an alternative approved by the Administrator showing that the program meets the performance standard described in § 51.351 or § 51.352 of this subpart, as applicable;

(3) A description of the geographic coverage of the program, including ZIP codes if the program is not county-wide;

(4) A detailed discussion of each of the required design elements, including provisions for federal facility compliance;

(5) Legal authority requiring or allowing implementation of the I/M program and providing either broad or specific authority to perform all required elements of the program;

(6) Legal authority for I/M program operation until such time as it is no longer necessary (i.e., until a Section 175

maintenance plan without an I/M program is approved by EPA);

(7) Implementing regulations, interagency agreements, and memoranda of understanding; and

(8) Evidence of adequate funding and resources to implement all aspects of the program.

(b) *Submittal schedule.* The SIP shall be submitted to EPA according to the following schedule:

(1) States shall submit a SIP revision by November 15, 1992 which includes the schedule required in paragraph (a)(1) of this section and a formal commitment from the Governor to the adoption and implementation of an I/M program meeting all requirements of this subpart.

(2) A SIP revision, including all necessary legal authority and the items specified in (a)(1) through (a)(8) of this section, shall be submitted no later than November 15, 1993.

(3) States will be required to revise SIPs as EPA develops further regulations. Revisions to incorporate onboard diagnostic checks in the I/M program shall be submitted within 2 years after promulgation of OBD regulations under section 202(m)(3) of the Clean Air Act, as amended.

§ 51.373 Implementation deadlines.

I/M programs shall be implemented as expeditiously as practicable.

(a) Decentralized basic programs shall be fully implemented by January 1, 1994, and centralized basic programs shall be fully implemented by July 1, 1994.

(b) For areas newly required to implement basic I/M after promulgation of this subpart (as a result of failure to attain, reclassification, or redesignation) decentralized programs shall be fully implemented within one year of obtaining legal authority. Centralized programs shall be fully implemented within two years of obtaining legal authority. More implementation time may be approved by the Administrator if an enhanced I/M program is implemented.

(c) All requirements related to enhanced I/M programs shall be implemented by January 1, 1995, with the following exceptions.

(1) Areas switching from an existing test-and-repair network to a test-only network may phase in the change between January of 1995 and January of 1996. Starting in January of 1995 at least 30% of the subject vehicles shall participate in the test-only system (in states with multiple I/M areas, implementation is not required in every area by January 1995 as long as statewide, 30% of the subject vehicles are involved in testing) and shall be subject to the new test procedures (including the evaporative system checks, visual inspections, and tailpipe emission tests). By January 1, 1996, all applicable vehicle model years and types shall be included in the test-only system. During the phase-in period, all requirements of this subpart shall be applied to the test-only portion of the program; existing requirements may continue to apply for the test-and-repair portion of the program until it is phased out by January 1, 1996.

(2) Areas starting new test-only programs and those with existing test-only programs may also phase in the new test procedures between January 1, 1995 and January 1, 1996. Other program requirements shall be fully implemented by January 1, 1995.

(d) In the case of areas newly required to implement enhanced I/M after promulgation of this subpart (as a result of failure to attain, reclassification, or nonattainment designation) enhanced I/M shall be implemented within 24 months of obtaining legal authority.

(e) Legal authority for the implementing agency or agencies to implement and enforce an I/M program consistent with this subpart shall be obtained from the state legislature or local governing body in the first legislative session after November 5, 1992, or after being newly required to implement or upgrade an I/M program as in paragraph (b) or (c) of this section, including sessions already in progress if at least 21 days remain before the final bill submittal deadline.

Appendices to Subpart S of Part 51

Appendix A to Subpart S—Calibrations, Adjustments and Quality Control

(I) *Steady-State Test Equipment*

States may opt to use transient emission test equipment for steady-state tests and follow the quality control requirements in paragraph (II) of this appendix instead of the following requirements.

(a) Equipment shall be calibrated in accordance with the manufacturers' instructions.

(b) *Prior to each test.* (1) *Hydrocarbon hang-up check.* Immediately prior to each test the analyzer shall automatically perform a hydrocarbon hang-up check. If the HC reading, when the probe is sampling ambient air, exceeds 20 ppm, the system shall be purged with clean air or zero gas. The analyzer shall be inhibited from continuing the test until HC levels drop below 20 ppm.

(2) *Automatic zero and span.* The analyzer shall conduct an automatic zero and span check prior to each test. The span check shall include the HC, CO, and CO2 channels, and the NO and O_2 channels, if present. If zero and/or span drift cause the signal levels to move beyond the adjustment range of the analyzer, it shall lock out from testing.

(3) *Low flow.* The system shall lock out from testing if sample flow is below the acceptable level as defined in paragraph (I)(b)(6) of appendix D to this subpart.

(c) *Leak check.* A system leak check shall be performed within twenty-four hours before the test in low volume stations (those performing less than the 5,000 inspections per year) and within four hours in high-volume stations (5,000 or more inspections per year) and may be performed in conjunction with the gas calibration described in paragraph (I)(d)(1) of this appendix. If a leak check is not performed within the preceding twenty-four hours in low volume stations and within four hours in high-volume stations or if the analyzer fails the leak check, the analyzer shall lock out from testing. The leak check shall be a procedure demonstrated to effectively check the sample hose and probe for leaks and shall be performed in accordance with good engineering practices. An error of more than ±2% of the reading using low range span gas shall cause the analyzer to lock out from testing and shall require repair of leaks.

(d) *Gas calibration.* (1) On each operating day in high-volume stations, analyzers shall automatically require and successfully pass a two-point gas calibration for HC, CO, and CO2 and shall continually compensate for changes in barometric pressure. Calibration shall be checked within four hours before the test and the analyzer adjusted if the reading is more than 2% different from the span gas value. In low-volume stations, analyzers shall undergo a two-point calibration within seventy-two hours before each test, unless changes in barometric pressure are compensated for automatically and statistical process control demonstrates equal or better quality control using different frequencies. Gas calibration shall be accomplished by introducing span gas that meets the requirements of paragraph (I)(d)(3) of this appendix into the analyzer through the calibration port. If the analyzer reads the span gas within the allowable tolerance range (i.e., the square root of sum of the squares of the span gas tolerance described in paragraph (I)(d)(3) of this appendix and the calibration tolerance, which shall be equal to 2%), no adjustment of the analyzer is necessary. The gas calibration procedure shall correct readings that exceed the allowable tolerance range to the center of the allowable tolerance range. The pressure in the sample cell shall be the same with the calibration gas flowing during calibration as with the sample gas flowing during sampling. If the system is not calibrated, or the system fails the calibration check, the analyzer shall lock out from testing.

(2) *Span points.* A two point gas calibration procedure shall be followed. The span shall be accomplished at one of the following pairs of span points:

(A) 300—ppm propane (HC)
1.0—% carbon monoxide (CO)
6.0—% carbon dioxide (CO2)
1000—ppm nitric oxide (if equipped with NO)
1200—ppm propane (HC)
4.0—% carbon monoxide (CO)
12.0—% carbon dioxide (CO2)
3000—ppm nitric oxide (if equipped with NO)

(B) 0—ppm propane
0.0—% carbon monoxide
0.0—% carbon dioxide
0—ppm nitric oxide (if equipped with NO)
600—ppm propane (HC)
1.6—% carbon monoxide (CO)
11.0—% carbon dioxide (CO2)
1200—ppm nitric oxide (if equipped with NO)

(3) *Span gases.* The span gases used for the gas calibration shall be traceable to National Institute of Standards and Technology (NIST) standards ±2%, and shall be within two percent of the span points specified in paragraph (d)(2) of this appendix. Zero gases shall conform to the specifications given in § 86.114–79(a)(5) of this chapter.

(e) *Dynamometer checks*—(1) *Monthly check.* Within one month preceding each loaded test, the accuracy of the roll speed indicator shall be verified and the dynamometer shall be checked for proper power absorber settings.

(2) *Semi-annual check.* Within six months preceding each loaded test, the road-load response of the variable-curve dynamometer or the frictional power absorption of the dynamometer shall be checked by a coast down procedure similar to that described in § 86.118–78 of this chapter. The check shall be done at 30 mph, and a power absorption load setting to generate a total horsepower (hp) of 4.1 hp. The actual coast down time from 45 mph to 15 mph shall be within ±1 second of the time calculated by the following equation:

$$\text{Coast Down Time} = \frac{0.0508 \times W}{HP}$$

where W is the total inertia weight as represented by the weight of the rollers (excluding free rollers), and any inertia flywheels used, measured in pounds. If the coast down time is not within the specified tolerance the dynamometer shall be taken out of service and corrective action shall be taken.

(f) *Other checks.* In addition to the above periodic checks, these shall also be used to verify system performance under the following special circumstances.

(1) *Gas Calibration.* (A) Each time the analyzer electronic or optical systems are repaired or replaced, a gas calibration shall be performed prior to returning the unit to service.

(B) In high-volume stations, monthly multi-point calibrations shall be performed. Low-volume stations shall perform multi-point calibrations every six months. The calibration curve shall be checked at 20%, 40%, 60%, and 80% of full scale and adjusted or repaired if the specifications in appendix D(I)(b)(1) to this subpart are not met.

(2) *Leak checks.* Each time the sample line integrity is broken, a leak check shall be performed prior to testing.

(II) Transient Test Equipment

(a) *Dynamometer.* Once per week, the calibration of each dynamometer and each fly wheel shall be checked by a dynamometer coast-down procedure comparable to that in § 86.118–78 of this chapter between the speeds of 55 to 45 mph, and between 30 to 20 mph. All rotating dynamometer components shall be included in the coast-down check for the inertia weight selected. For dynamometers with uncoupled rolls, the uncoupled rollers may undergo a separate coast-down check. If a vehicle is used to motor the dynamometer to the beginning coast-down speed, the vehicle shall be lifted off the dynamometer rolls before the coast-down test begins. If the difference between the measured coast-down time and the theoretical coast-down time is greater than +1 second, the system shall lock out, until corrective action brings the dynamometer into calibration.

(b) *Constant volume sampler.* (1) The constant volume sampler (CVS) flow calibration shall be checked daily by a procedure that identifies deviations in flow from the true value. Deviations greater than ±4% shall be corrected.

(2) The sample probe shall be cleaned and checked at least once per month. The main CVS venturi shall be cleaned and checked at least once per year.

(3) Verification that flow through the sample probe is adequate for the design shall be done daily. Deviations greater than the design tolerances shall be corrected.

(c) *Analyzer system* —(1) *Calibration checks.* (A) Upon initial operation, calibration curves shall be generated for each analyzer. The calibration curve shall consider the entire range of the analyzer as one curve. At least 6 calibration points plus zero shall be used in the lower portion of the range corresponding to an average concentration of approximately 2 ppm for HC, 30 ppm for CO, 3 ppm for NO_x, and 400 ppm for CO_2. For the case where a low and a high range analyzer is used, the high range analyzer shall use at least 6 calibration points plus zero in the lower portion of the high range scale corresponding to approximately 100% of the full-scale value of the low range analyzer. For all analyzers, at least 6 calibration points shall also be used to define the calibration curve in the region above the 6 lower calibration points. Gas dividers may be used to obtain the intermediate points for the general range classifications specified. The calibration curves generated shall be a polynomial of no greater order than 4th order, and shall fit the date within 0.5% at each calibration point.

(B) For all calibration curves, curve checks, span adjustments, and span checks, the zero gas shall be considered a down-scale reference gas, and the analyzer zero shall be set at the trace concentration value of the specific zero gas used.

(2) The basic curve shall be checked monthly by the same procedure used to generate the curve, and to the same tolerances.

(3) On a daily basis prior to vehicle testing—

(A) The curve for each analyzer shall be checked by adjusting the analyzer to correctly read a zero gas and an up-scale span gas, and then by correctly reading a mid-scale span gas within 2% of point. If the analyzer does not read the mid-scale span point within 2% of point, the system shall lock out. The up-scale span gas concentration for each analyzer shall correspond to approximately 80 percent of full scale, and the mid-point concentration shall correspond to approximately 15 percent of full scale; and

(B) After the up-scale span check, each analyzer in a given facility shall analyze a sample of a random concentration corresponding to approximately 0.5 to 3 times the cut point (in gpm) for the constituent. The value of the random sample may be determined by a gas blender. The deviation in analysis from the sample concentration for each analyzer shall be recorded and compared to the historical mean and standard deviation for the analyzers at the facility and at all facilities. Any reading exceeding 3 sigma shall cause the analyzer to lock out.

(4) *Flame ionization detector check.* Upon initial operation, and after maintenance to the detector, each Flame Ionization Detector (FID) shall be checked, and adjusted if necessary, for proper peaking and characterization. Procedures described in SAE Paper No. 770141 are recommended for this purpose. A copy of this paper may be obtained from the Society of Automotive Engineers, Inc. (SAE), 400 Commonwealth Drive, Warrendale, Pennsylvania, 15096–0001. Additionally, every month the response of each FID to a methane concentration of approximately 50 ppm CH_4 shall be checked. If the response is outside of the range of 1.10 to 1.20, corrective action shall be taken to bring the FID response within this range. The response shall be computed by the following formula:

$$\text{Ratio of Methane Response} = \frac{\text{FID response in ppmC}}{\text{ppm methane in cylinder}}$$

(5) *Spanning frequency.* The zero and up-scale span point shall be checked, and adjusted if necessary, at 2 hour intervals following the daily mid-scale curve check. If the zero or the up-scale span point drifts by more than 2% for the previous check (except for the first check of the day), the system shall lock out, and corrective action shall be taken to bring the system into compliance.

(6) *Spanning limit checks.* The tolerance on the adjustment of the up-scale span point is 0.4% of point. A software algorithm to perform the span adjustment and subsequent calibration curve adjustment shall be used. However, software up-scale span adjustments greater than ±10% shall cause the system to lock out, requiring system maintenance.

(7) *Integrator checks.* Upon initial operation, and every three months thereafter, emissions from a randomly selected vehicle with official test value greater than 80% of the standard (determined retrospectively) shall be simultaneously sampled by the normal integration method and by the bag method in each lane. The data from each method shall be put into a historical data base for determining normal and deviant performance for each test lane, facility, and all facilities

combined. Specific deviations exceeding ±5% shall require corrective action.

(8) *Interference.* CO and CO_2 analyzers shall be checked prior to initial service, and on a yearly basis thereafter, for water interference. The specifications and procedures used shall generally comply with either § 86.122–78 or § 86.321–79 of this chapter.

(9) *NO_x converter check.* The converter efficiency of the NO_2 to NO converter shall be checked on a weekly basis. The check shall generally conform to § 86.123–78 of this chapter, or EPA MVEL Form 305–01. Equivalent methods may be approved by the Administrator.

(10) *NO/NO_x flow balance.* The flow balance between the NO and NO_x test modes shall be checked weekly. The check may be combined with the NO_x convertor check as illustrated in EPA MVEL Form 305–01.

(11) *Additional checks.* Additional checks shall be performed on the HC, CO, CO_2, and NO_x analyzers according to best engineering practices for the measurement technology used to ensure that measurements meet specified accuracy requirements.

(12) *System artifacts (hang-up).* Prior to each test a comparison shall be made between the background HC reading, the HC reading measured through the sample probe (if different), and the zero gas. Deviations from the zero gas greater than 10 parts per million carbon (ppmC) shall cause the analyzer to lock out.

(13) *Ambient background.* The average of the pre-test and post-test ambient background levels shall be compared to the permissible levels of 10 ppmC HC, 20 ppm CO, and 1 ppm NO_x. If the permissible levels are exceeded, the test shall be voided and corrective action taken to lower the ambient background concentrations.

(14) *Analytical gases.* Zero gases shall meet the requirements of § 86.114–79(a)(5) of this chapter. NO_x calibration gas shall be a single blend using nitrogen as the diluent. Calibration gas for the flame ionization detector shall be a single blend of propane with a diluent of air. Calibration gases for CO and CO_2 shall be single blends using nitrogen or air as a diluent. Multiple blends of HC, CO, and CO_2 in air may be used if shown to be stable and accurate.

(III) Purge Analysis System

On a daily basis each purge flow meter shall be checked with a simulated purge flow against a reference flow measuring device with performance specifications equal to or better than those specified for the purge meter. The check shall include a mid-scale rate check, and a total flow check between 10 and 20 liters. Deviations greater than ±5% shall be corrected. On a monthly basis, the calibration of purge meters shall be checked for proper rate and total flow with three equally spaced points across the flow rate and the totalized flow range. Deviations exceeding the specified accuracy shall be corrected. The dynamometer quality assurance checks required under paragraph (II) of this appendix shall also apply to the dynamometer used for purge tests.

(IV) Evaporative System Integrity Test Equipment

(a) On a weekly basis pressure measurement devices shall be checked against a reference device with performance specifications equal to or better than those specified for the measurement device. Deviations exceeding the performance specifications shall be corrected. Flow measurement devices, if any, shall be checked according to paragraph III of this appendix.

(b) Systems that monitor evaporative system leaks shall be checked for integrity on a daily basis by sealing and pressurizing.

Appendix B to Subpart S—Test Procedures

(I) Idle test

(a) *General requirements*—(1) *Exhaust gas sampling algorithm.* The analysis of exhaust gas concentrations shall begin 10 seconds after the applicable test mode begins. Exhaust gas concentrations shall be analyzed at a minimum rate of two times per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over five seconds.

(2) *Pass/fail determination.* A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in appendix C to this subpart, and the measured value for HC and CO as described in paragraph (I)(a)(1) of this appendix. A vehicle shall pass the test mode if any pair of simultaneous measured values for HC and CO are below or equal to the applicable short test standards. A vehicle shall fail the test mode if the values for either HC or CO, or both, in all simultaneous pairs of values are above the applicable standards.

(3) *Void test conditions.* The test shall immediately end and any exhaust gas measurements shall be voided if the measured concentration of CO plus CO_2 falls below six percent or the vehicle's engine stalls at any time during the test sequence.

(4) *Multiple exhaust pipes.* Exhaust gas concentrations from vehicle engines equipped with multiple exhaust pipes shall be sampled simultaneously.

(5) This test shall be immediately terminated upon reaching the overall maximum test time.

(b) *Test sequence.* (1) The test sequence shall consist of a first-chance test and a second-chance test as follows:

(i) The first-chance test, as described under paragraph (c) of this section, shall consist of an idle mode.

(ii) The second-chance test as described under paragraph (I)(d) of this appendix shall be performed only if the vehicle fails the first-chance test.

(2) The test sequence shall begin only after the following requirements are met:

(i) The vehicle shall be tested in as-received condition with the transmission in neutral or park and all accessories turned off. The engine shall be at normal operating temperature (as indicated by a temperature gauge, temperature lamp, touch test on the radiator hose, or other visual observation for overheating).

(ii) The tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.

(iii) The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, a tailpipe extension shall be used.

(iv) The measured concentration of CO plus CO_2 shall be greater than or equal to six percent.

(c) *First-chance test.* The test timer shall start (tt=0) when the conditions specified in paragraph (I)(b)(2) of this appendix are met. The first-chance test shall have an overall maximum test time of 145 seconds (tt=145). The first-chance test shall consist of an idle mode only.

(1) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset zero and resume timing. The minimum mode length shall be determined as described under paragraph (I)(c)(2) of this appendix. The maximum mode length shall be 90 seconds elapsed time (mt=90).

(2) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(i) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(ii) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30), if prior to that time the criteria of paragraph (I)(c)(2)(i) of this appendix are not satisfied and the measured values are less than or equal to the applicable short test standards as described in paragraph (I)(a)(2) of this appendix.

(iii) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), the measured values are less than or equal to the applicable short test standards as described in paragraph (I)(a)(2) of this appendix.

(iv) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (I)(c)(2)(i), (ii) and (iii) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90). Alternatively, the vehicle may be failed if the provisions of paragraphs (I)(c)(2)(i) and (ii) of this appendix are not met within an elapsed time of 30 seconds.

(v) *Optional.* The vehicle may fail the first-chance test and the second-chance test shall be omitted if no exhaust gas concentration lower than 1800 ppm HC is found by an elapsed time of 30 seconds (mt=30).

(d) *Second-chance test.* If the vehicle fails the first-chance test, the test timer shall reset to zero (tt=0) and a second-chance test shall be performed. The second-chance test shall have an overall maximum test time of 425 seconds (tt=425). The test shall consist of a

preconditioning mode followed immediately by an idle mode.

(1) *Preconditioning mode.* The mode timer shall start (mt=0) when the engine speed is between 2200 and 2800 rpm. The mode shall continue for an elapsed time of 180 seconds (mt=180). If engine speed falls below 2200 rpm or exceeds 2800 rmp for more than five seconds in any one excursion, or 15 seconds over all excursions, the mode timer shall reset to zero and resume timing.

(2) *Idle mode*—(i) *Ford Motor Company and Honda vehicles.* The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and restarted. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure.

(ii) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum idle mode length shall be determined as described in paragraph (I)(d)(2)(iii) of this appendix. The maximum idle mode length shall be 90 seconds elapsed time (mt=90).

(iii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the idle mode shall be terminated as follows:

(A) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30), if prior to that time the criteria of paragraph (I)(d)(2)(iii)(A) of this appendix are not satisfied and the measured values are less than or equal to the applicable short test standards as described in paragraph (I)(a)(2) of this appendix.

(C) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), measured values are less than or equal to the applicable short test standards described in paragraph (I)(a)(2) of this appendix.

(D) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (I)(d)(2)(iii)(A), (d)(2)(iii)(B), and (d)(2)(iii)(C) of this appendix are satisfied by an elapsed time of 90 seconds (mt=90).

(II) Two Speed Idle Test

(a) *General requirements*—(1) *Exhaust gas sampling algorithm.* The analysis of exhaust gas concentrations shall begin 10 seconds after the applicable test mode begins. Exhaust gas concentrations shall be analyzed at a rate of two times per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over five seconds.

(2) *Pass/fail determination.* A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in Appendix C to this subpart, and the measured value for HC and CO as described in paragraph (II)(a)(1) of this appendix. A vehicle shall pass the test mode if any pair of simultaneous values for HC and CO are below or equal to the applicable short test standards. A vehicle shall fail the test mode if the values for either HC or CO, or both, in all simultaneous pairs of values are above the applicable standards.

(3) *Void test conditions.* The test shall immediately end and any exhaust gas measurements shall be voided if the measured concentration of CO plus CO_2 falls below six percent or the vehicle's engine stalls at any time during the test sequence.

(4) *Multiple exhaust pipes.* Exhaust gas concentrations from vehicle engines equipped with multiple exhaust pipes shall be sampled simultaneously.

(5) The test shall be immediately terminated upon reaching the overall maximum test time.

(b) *Test sequence.* (1) The test sequence shall consist of a first-chance test and a second-chance test as follows:

(i) The first-chance test, as described under paragraph (II)(c) of this appendix, shall consist of an idle mode followed by a high-speed mode.

(ii) The second-chance high-speed mode, as described under paragraph (II)(c) of this appendix, shall immediately follow the first-chance high-speed mode. It shall be performed only if the vehicle fails the first-chance test. The second-chance idle mode, as described under paragraph (II)(d) of this appendix, shall follow the second-chance high-speed mode and be performed only if the vehicle fails the idle mode of the first-chance test.

(2) The test sequence shall begin only after the following requirements are met:

(i) The vehicle shall be tested in as-received condition with the transmission in neutral or park and all accessories turned off. The engine shall be at normal operating temperature (as indicated by a temperature gauge, temperature lamp, touch test on the radiator hose, or other visual observation for overheating).

(ii) The tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.

(iii) The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, a tailpipe extension shall be used.

(iv) The measured concentration of CO plus CO_2 shall be greater than or equal to six percent.

(c) *First-chance test and second-chance high-speed mode.* The test timer shall start (tt=0) when the conditions specified in paragraph (b)(2) of this section are met. The first-chance test and second-chance high-speed mode shall have an overall maximum test time of 425 seconds (tt=425). The first-chance test shall consist of an idle mode followed immediately by a high-speed mode. This is followed immediately by an additional second-chance high-speed mode, if necessary.

(1) *First-chance idle mode.* (i) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum idle mode length shall be determined as described in paragraph (II)(c)(1)(ii) of this appendix. The maximum idle mode length shall be 90 seconds elapsed time (mt=90).

(ii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode terminated as follows:

(A) The vehicle shall pass the idle mode and the mode shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the idle mode and the mode shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (II)(c)(1)(ii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(C) The vehicle shall pass the idle mode and the mode shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(D) The vehicle shall fail the idle mode and the mode shall be terminated if none of the provisions of paragraphs (II)(c)(1)(ii)(A), (B), and (C) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90). Alternatively, the vehicle may be failed if the provisions of paragraphs (II)(c)(2)(i) and (ii) of this appendix are not met within an elapsed time of 30 seconds.

(E) *Optional.* The vehicle may fail the first-chance test and the second-chance test shall be omitted if no exhaust gas concentration less than 1800 ppm HC is found by an elapsed time of 30 seconds (mt=30).

(2) *First-chance and second-chance high-speed modes.* This mode includes both the first-chance and second-chance high-speed modes, and follows immediately upon termination of the first-chance idle mode.

(i) The mode timer shall reset (mt=0) when the vehicle engine speed is between 2200 and 2800 rpm. If engine speed falls below 2200 rpm or exceeds 2800 rpm for more than two seconds in one excursion, or more than six seconds over all excursions within 30 seconds of the final measured value used in the pass/fail determination, the measured value shall be invalidated and the mode continued. If any excursion lasts for more than ten seconds, the mode timer shall reset to zero (mt=0) and timing resumed. The minimum high-speed mode length shall be determined as described under paragraphs (II)(c)(2)(ii) and (iii) of this appendix. The maximum high-speed mode length shall be 180 seconds elapsed time (mt=180).

(ii) *Ford Motor Company and Honda vehicles.* For 1981–1987 model year Ford Motor Company vehicles and 1984–1985 model year Honda Preludes, the pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10) using the following procedure. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles.

(A) A pass or fail determination, as described below, shall be used, for vehicles that passed the idle mode, to determine whether the high-speed test should be terminated prior to or at the end of an elapsed time of 180 seconds (mt=180).

(*1*) The vehicle shall pass the high-speed mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), the measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(*2*) The vehicle shall pass the high-speed mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (II)(c)(2)(ii)(A)(*1*) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(*3*) The vehicle shall pass the high-speed mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 180 seconds (mt=180), the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(*4*) *Restart.* If at an elapsed time of 90 seconds (mt=90) the measured values are greater than the applicable short test standards as described in paragraph (II)(a)(2) of this appendix, the vehicle's engine shall be shut off for not more than 10 seconds after returning to idle and then shall be restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure. The mode timer will stop upon engine shut off (mt=90) and resume upon engine restart. The pass/fail determination shall resume as follows after 100 seconds have elapsed (mt=100).

(*i*) The vehicle shall pass the high-speed mode and the test shall be immediately terminated if, at any point between an elapsed time of 100 seconds (mt=100) and 180 seconds (mt=180), the measured values are less than or equal to the applicable short test standards described in paragraph (II)(a)(2) of this appendix.

(*ii*) The vehicle shall fail the high-speed mode and the test shall be terminated if paragraph (II)(c)(2)(ii)(A)(*4*)(*i*) of this appendix is not satisfied by an elapsed time of 180 seconds (mt=180).

(B) A pass or fail determination shall be made for vehicles that *failed* the idle mode and the high-speed mode terminated at the *end* of an elapsed time of 180 seconds (mt=180) as follows:

(*1*) The vehicle shall pass the high-speed mode and the mode shall be terminated at an elapsed time of 180 seconds (mt=180) if any measured values of HC and CO exhaust gas concentrations during the high-speed mode are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(*2*) *Restart.* If at an elapsed time of 90 seconds (mt=90) the measured values of HC and CO exhaust gas concentrations during the high-speed mode are greater than the applicable short test standards as described in paragraph (II)(a)(2) of this appendix, the vehicle's engine shall be shut off for not more than 10 seconds after returning to idle and then shall be restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure. The mode timer will stop upon engine shut off (mt=90) and resume upon engine restart. The pass/fail determination shall resume as follows after 100 seconds have elapsed (mt=100).

(*i*) The vehicle shall pass the high-speed mode and the mode shall be terminated at an elapsed time of 180 seconds (mt=180) if any measured values of HC and CO exhaust gas concentrations during the high-speed mode are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(*ii*) The vehicle shall fail the high-speed mode and the test shall be terminated if paragraph (II)(c)(2)(ii)(B)(*2*)(*i*) of this appendix is not satisfied by an elapsed time of 180 seconds (mt=180).

(*iii*) *All other light-duty motor vehicles.* The pass/fail analysis for vehicles not specified in paragraph (II)(c)(2)(ii) of this appendix shall begin after an elapsed time of 10 seconds (mt=10) using the following procedure.

(A) A pass or fail determination, as described below, shall be used for vehicles that passed the idle mode, to determine whether the high-speed mode should be terminated prior to or at the end of an elapsed time of 180 seconds (mt=180).

(*1*) The vehicle shall pass the high-speed mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), any measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(*2*) The vehicle shall pass the high-speed mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (II)(c)(2)(iii)(A)(*1*) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(*3*) The vehicle shall pass the high-speed mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 180 seconds (mt=180), the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(*4*) The vehicle shall fail the high-speed mode and the test shall be terminated if none of the provisions of paragraphs (II)(c)(2)(iii)(A)(*1*), (*2*), and (*3*) of this appendix is satisfied by an elapsed time of 180 seconds (mt=180).

(B) A pass or fail determination shall be made for vehicles that *failed* the idle mode and the high-speed mode terminated at the *end* of an elapsed time of 180 seconds (mt=180) as follows:

(*1*) The vehicle shall pass the high-speed mode and the mode shall be terminated at an elapsed time of 180 seconds (mt=180) if any measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(*2*) The vehicle shall fail the high-speed mode and the test shall be terminated if paragraph (II)(c)(2)(iii)(B)(*1*) of this appendix is not satisfied by an elapsed time of 180 seconds (mt=180).

(d) *Second-chance idle mode.* If the vehicle fails the first-chance idle mode and passes the high-speed mode, the test timer shall reset to zero (tt=0) and a second-chance idle mode shall commence. The second-chance idle mode shall have an overall maximum test time of 145 seconds (tt=145). The test shall consist of an idle mode only.

(1) The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles.

(2) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If the engine speed exceeds 1100 rpm or falls below 350 rpm the mode timer shall reset to zero and resume timing. The minimum second-chance idle mode length shall be determined as described in paragraph (II)(d)(3) of this appendix. The maximum second-chance idle mode length shall be 90 seconds elapsed time (mt=90).

(3) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the second-chance idle mode shall be terminated as follows:

(i) The vehicle shall pass the second-chance idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), any measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(ii) The vehicle shall pass the second-chance idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (II)(d)(3)(i) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(iii) The vehicle shall pass the second-chance idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), the measured values are less than or equal to the applicable short test standards as described in paragraph (II)(a)(2) of this appendix.

(iv) The vehicle shall fail the second-chance idle mode and the test shall be terminated if none of the provisions of paragraph (II)(d)(3)(i), (ii), and (iii) of this

appendix is satisfied by an elapsed time of 90 seconds (mt=90).

(III) Loaded Test

(a) *General requirements*—(1) *Exhaust gas sampling algorithm.* The analysis of exhaust gas concentrations shall begin 10 seconds after the applicable test mode begins. Exhaust gas concentrations shall be analyzed at a minimum rate of two times per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over five seconds.

(2) *Pass/fail determination.* A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in Appendix C to this subpart and the measured value for HC and CO as described in paragraph (III)(a)(1) of this appendix. A vehicle shall pass the test mode if any pair of simultaneous values for HC and CO are below or equal to the applicable short test standards. A vehicle shall fail the test mode if the values for either HC or CO, or both, in all simultaneous pairs of values are above the applicable standards.

(3) *Void test conditions.* The test shall immediately end and any exhaust gas measurements shall be voided if the measured concentration of CO plus CO_2 falls below six percent or the vehicle's engine stalls at any time during the test sequence.

(4) *Multiple exhaust pipes.* Exhaust gas concentrations from vehicle engines equipped with multiple exhaust pipes shall be sampled simultaneously.

(5) The test shall be immediately terminated upon reaching the overall maximum test time.

(b) *Test sequence.* (1) The test sequence shall consist of a loaded mode using a chassis dynamometer followed immediately by an idle mode as described under paragraphs (III)(c)(1) and (2) of this appendix.

(2) The test sequence shall begin only after the following requirements are met:

(i) The dynamometer shall be warmed up, in stabilized operating condition, adjusted, and calibrated in accordance with the procedures of appendix A to this subpart. Prior to each test, variable-curve dynamometers shall be checked for proper setting of the road-load indicator or road-load controller.

(ii) The vehicle shall be tested in as-received condition with all accessories turned off. The engine shall be at normal operating temperature (as indicated by a temperature gauge, temperature lamp, touch test on the radiator hose, or other visual observation for overheating).

(iii) The vehicle shall be operated during each mode of the test with the gear selector in the following position:

(A) In drive for automatic transmissions and in second (or third if more appropriate) for manual transmissions for the loaded mode;

(B) In park or neutral for the idle mode.

(iv) The tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.

(v) The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, a tailpipe extension shall be used.

(vi) The measured concentration of CO plus CO_2 shall be greater than or equal to six percent.

(c) *Overall test procedure.* The test timer shall start (tt=0) when the conditions specified in paragraph (III)(b)(2) of this appendix are met and the mode timer initiates as specified in paragraph (III)(c)(1) of this appendix. The test sequence shall have an overall maximum test time of 240 seconds (tt=240). The test shall be immediately terminated upon reaching the overall maximum test time.

(1) *Loaded mode*—(i) *Ford Motor Company and Honda vehicles.* (Optional) The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and restarted. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure.

(ii) The mode timer shall start (mt=0) when the dynamometer speed is within the limits specified for the vehicle engine size according to the following schedule. If the dynamometer speed falls outside the limits for more than five seconds in one excursion, or 15 seconds over all excursions, the mode timer shall reset to zero and resume timing. The minimum mode length shall be determined as described in paragraph (III)(c)(1)(iii)(A) of this appendix. The maximum mode length shall be 90 seconds elapsed time (mt=90).

DYNAMOMETER TEST SCHEDULE

Gasoline engine size (cylinders)	Roll speed (mph)	Normal loading (brake horsepower)
4 or less	22–25	2.8–4.1
5–6	29–32	6.8–8.4
7 or more	32–35	8.4–10.8

(iii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the loaded mode and the mode shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), measured values are less than or equal to the applicable short test standards described in paragraph (a)(2) of this section.

(B) The vehicle shall fail the loaded mode and the mode shall be terminated if paragraph (III)(c)(1)(iii)(A) of this appendix is not satisfied by an elapsed time of 90 seconds (mt=90).

(C) *Optional.* The vehicle may fail the loaded mode and any subsequent idle mode shall be omitted if no exhaust gas concentration less than 1800 ppm HC is found by an elapsed time of 30 seconds (mt=30).

(2) *Idle mode*—(i) *Ford Motor Company and Honda vehicles.* (Optional) The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and restarted. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure.

(ii) The mode timer shall start (mt=0) when the dynamometer speed is zero and the vehicle engine speed is between 350 and 1100 rpm. If engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum idle mode length shall be determined as described in paragraph (II)(c)(2)(ii) of this appendix. The maximum idle mode length shall be 90 seconds elapsed time (mt=90).

(iii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (III)(c)(2)(iii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (III)(a)(2) of this appendix.

(C) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), measured values are less than or equal to the applicable short test standards described in paragraph (III)(a)(2) of this appendix.

(D) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (III)(c)(2)(iii)(A), (c)(2)(iii)(B), and (c)(2)(iii)(C) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90).

(IV) *Preconditioned IDLE TEST*

(a) *General requirements*—(1) *Exhaust gas sampling algorithm.* The analysis of exhaust gas concentrations shall begin 10 seconds after the applicable test mode begins. Exhaust gas concentrations shall be analyzed at a minimum rate of two times per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over five seconds.

(2) *Pass/fail determination.* A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in appendix C to this subpart, and the measured value for HC and CO as described in paragraph (IV)(a)(1) of this appendix. A vehicle shall pass the test mode if any pair of simultaneous values for HC and CO are

below or equal to the applicable short test standards. A vehicle shall fail the test mode if the values for either HC or CO, or both, in all simultaneous pairs of values are above the applicable standards.

(3) *Void test conditions.* The test shall immediately end and any exhaust gas measurements shall be voided if the measured concentration of CO plus CO_2 falls below six percent or the vehicle's engine stalls at any time during the test sequence.

(4) *Multiple exhaust pipes.* Exhaust gas concentrations from vehicle engines equipped with multiple exhaust pipes shall be sampled simultaneously.

(5) The test shall be immediately terminated upon reaching the overall maximum test time.

(b) *Test sequence.* (1) The test sequence shall consist of a first-chance test and a second-chance test as follows:

(i) The first-chance test, as described under paragraph (IV)(c) of this appendix, shall consist of a preconditioning mode followed by an idle mode.

(ii) The second-chance test, as described under paragraph (IV)(d) of this appendix, shall be performed only if the vehicle fails the first-chance test.

(2) The test sequence shall begin only after the following requirements are met:

(i) The vehicle shall be tested in as-received condition with the transmission in neutral or park and all accessories turned off. The engine shall be at normal operating temperature (as indicated by a temperature gauge, temperature lamp, touch test on the radiator hose, or other visual observation for overheating).

(ii) The tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.

(iii) The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, a tailpipe extension shall be used.

(iv) The measured concentration of CO plus CO2 shall be greater than or equal to six percent.

(c) *First-chance test.* The test timer shall start (tt=0) when the conditions specified in paragraph (IV)(b)(2) of this appendix are met. The test shall have an overall maximum test time of 200 seconds (tt=200). The first-chance test shall consist of a preconditioning mode followed immediately by an idle mode.

(1) *Preconditioning mode.* The mode timer shall start (mt=0) when the engine speed is between 2200 and 2800 rpm. The mode shall continue for an elapsed time of 30 seconds (mt=30). If engine speed falls below 2200 rpm or exceeds 2800 rpm for more than five seconds in any one excursion, or 15 seconds over all excursions, the mode timer shall reset to zero and resume timing.

(2) *Idle mode.* (i) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum idle mode length shall be determined as described in paragraph (IV)(c)(2)(ii) of this appendix. The maximum idle mode length shall be 90 seconds elapsed time (mt=90).

(ii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (IV)(c)(2)(ii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (IV)(a)(2) of this appendix.

(C) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), measured values are less than or equal to the applicable short test standards as described in paragraph (IV)(a)(2) of this section.

(D) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (IV)(c)(2)(ii)(A), (B), and (C) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90). Alternatively, the vehicle may be failed if the provisions of paragraphs (IV)(c)(2) (i) and (ii) of this appendix are not met within an elapsed time of 30 seconds.

(E) *Optional.* The vehicle may fail the first-chance test and the second-chance test shall be omitted if no exhaust gas concentration less than 1800 ppm HC is found at an elapsed time of 30 seconds (mt=30).

(d) *Second-chance test.* If the vehicle fails the first-chance test, the test timer shall reset to zero and a second-chance test shall be performed. The second-chance test shall have an overall maximum test time of 425 seconds. The test shall consist of a preconditioning mode followed immediately by an idle mode.

(1) *Preconditioning mode.* The mode timer shall start (mt=0) when engine speed is between 2200 and 2800 rpm. The mode shall continue for an elapsed time of 180 seconds (mt=180). If the engine speed falls below 2200 rpm or exceeds 2800 rpm for more than five seconds in any one excursion, or 15 seconds over all excursions, the mode timer shall reset to zero and resume timing.

(2) *Idle mode*—(i) *Ford Motor Company and Honda vehicles.* The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and then shall be restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles.

(ii) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If the engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum idle mode length shall be determined as described in paragraph (IV)(d)(2)(iii) of this appendix. The maximum idle mode length shall be 90 seconds elapsed time (mt=90).

(iii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (IV)(d)(2)(iii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (IV)(a)(2) of this appendix.

(C) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), measured values are less than or equal to the applicable short test standards described in paragraph (IV)(a)(2) of this appendix.

(D) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (IV)(d)(2)(iii) (A), (B), and (C) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90).

(V) *Idle Test With Loaded Preconditioning*

(a) *General requirements*—(1) *Exhaust gas sampling algorithm.* The analysis of exhaust gas concentrations shall begin 10 seconds after the applicable test mode begins. Exhaust gas concentrations shall be analyzed at a minimum rate of two times per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over five seconds.

(2) *Pass/fail determination.* A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in appendix C to this subpart, and the measured value for HC and CO as described in paragraph (V)(a)(1) of this appendix. A vehicle shall pass the test mode if any pair of simultaneous values for HC and CO are below or equal to the applicable short test standards. A vehicle shall fail the test mode if the values for either HC or CO, or both, in all simultaneous pairs of values are above the applicable standards.

(3) *Void test conditions.* The test shall immediately end and any exhaust gas measurements shall be voided if the measured concentration of CO plus CO_2 falls below six percent or the vehicle's engine stalls at any time during the test sequence.

(4) *Multiple exhaust pipes.* Exhaust gas concentrations from vehicle engines equipped with multiple exhaust pipes shall be sampled simultaneously.

(5) The test shall be immediately terminated upon reaching the overall maximum test time.

(b) *Test sequence.* (1) The test sequence shall consist of a first-chance test and a second-chance test as follows:

(i) The first-chance test, as described under paragraph (V)(c) of this appendix, shall consist of an idle mode.

(ii) The second-chance test as described under paragraph (V)(d) of this appendix shall be performed only if the vehicle fails the first-chance test.

(2) The test sequence shall begin only after the following requirements are met:

(i) The dynamometer shall be warmed up, in stabilized operating condition, adjusted, and calibrated in accordance with the procedures of appendix A to this subpart. Prior to each test, variable-curve dynamometers shall be checked for proper setting of the road-load indicator or road-load controller.

(ii) The vehicle shall be tested in as-received condition with all accessories turned off. The engine shall be at normal operating temperature (as indicated by a temperature gauge, temperature lamp, touch test on the radiator hose, or other visual observation for overheating).

(iii) The vehicle shall be operated during each mode of the test with the gear selector in the following position:

(A) In drive for automatic transmissions and in second (or third if more appropriate) for manual transmissions for the loaded preconditioning mode;

(B) In park or neutral for the idle mode.

(iv) The tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.

(v) The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, a tailpipe extension shall be used.

(vi) The measured concentration of CO plus CO_2 shall be greater than or equal to six *percent*.

(c) *First-chance test.* The test timer shall start (tt=0) when the conditions specified in paragraph (V)(b)(2) of this appendix are met. The test shall have an overall maximum test time of 155 seconds (tt=155). The first-chance test shall consist of an idle mode only.

(1) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If the engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum mode length shall be determined as described in paragraph (V)(c)(2) of this appendix. The maximum mode length shall be 90 seconds elapsed time (mt=90).

(2) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(i) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(ii) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (V)(c)(2)(i) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (V)(a)(2) of this appendix.

(iii) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), the measured values are less than or equal to the applicable short test standards as described in paragraph (V)(a)(2) of this appendix.

(iv) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (V)(c)(2)(i), (ii), and (iii) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90). Alternatively, the vehicle may be failed if the provisions of paragraphs (V)(c)(2)(i) and (ii) of this appendix are not met within an elapsed time of 30 seconds.

(v) *Optional.* The vehicle may fail the first-chance test and the second-chance test shall be omitted if no exhaust gas concentration less than 1800 ppm HC is found at an elapsed time of 30 seconds (mt=30).

(d) *Second-chance test.* If the vehicle fails the first-chance test, the test timer shall reset to zero (tt=0) and a second-chance test shall be performed. The second-chance test shall have an overall maximum test time of 200 seconds (tt=200). The test shall consist of a preconditioning mode using a chassis dynamometer, followed immediately by an idle mode.

(1) *Preconditioning mode.* The mode timer shall start (mt=0) when the dynamometer speed is within the limits specified for the vehicle engine size in accordance with the following schedule. The mode shall continue for a minimum elapsed time of 30 seconds (mt=30). If the dynamometer speed falls outside the limits for more than five seconds in one excursion, or 15 seconds over all excursions, the mode timer shall reset to zero and resume timing.

Gasoline engine size (cylinders)	Dynamometer test schedule	
	Roll speed (mph)	Normal loading (brake horsepower)
4 or less	22–25	2.8–4.1
5–6	29–32	6.8–8.4
7 or more	32–35	8.4–10.8

(2) *Idle mode.* (i) *Ford Motor Company and Honda vehicles.* (Optional) The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and restarted. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure.

(ii) The mode timer shall start (mt=0) when the dynamometer speed is zero and the vehicle engine speed is between 350 and 1100 rpm. If the engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum idle mode length shall be determined as described in paragraph (V)(d)(2)(ii) of this appendix. The maximum idle mode length shall be 90 seconds elapsed time (mt=90).

(iii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (V)(d)(2)(ii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (V)(a)(2) of this appendix.

(C) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), the measured values are less than or equal to the applicable short test standards as described in paragraph (V)(a)(2) of this appendix.

(D) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (V)(d)(2)(ii)(A), (B), and (C) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90).

(VI) Preconditioned Two Speed Idle Test

(a) *General requirements*—(1) *Exhaust gas sampling algorithm.* The analysis of exhaust gas concentrations shall begin 10 seconds after the applicable test mode begins. Exhaust gas concentrations shall be analyzed at a minimum rate of two times per second. The measured value for pass/fail determinations shall be a simple running average of the measurements taken over five seconds.

(2) *Pass/fail determination.* A pass or fail determination shall be made for each applicable test mode based on a comparison of the short test standards contained in appendix C to this subpart, and the measured value for HC and CO as described in paragraph (VI)(a)(1) of this appendix. A vehicle shall pass the test mode if any pair of simultaneous values for HC and CO are below or equal to the applicable short test standards. A vehicle shall fail the test mode if the values for either HC or CO, or both, in all simultaneous pairs of values are above the applicable standards.

(3) *Void test conditions.* The test shall immediately end and any exhaust gas measurements shall be voided if the measured concentration of CO plus CO_2 falls below six percent or the vehicle's engine stalls at any time during the test sequence.

(4) *Multiple exhaust pipes.* Exhaust gas concentrations from vehicle engines equipped with multiple exhaust pipes shall be sampled simultaneously.

(5) The test shall be immediately terminated upon reaching the overall maximum test time.

(b) *Test sequence.*—(1) The test sequence shall consist of a first-chance test and a second-chance test as follows:

(i) The first-chance test, as described under paragraph (VI)(c) of this appendix, shall consist of a first-chance high-speed mode followed immediately by a first-chance idle mode.

(ii) The second-chance test as described under paragraph (VI)(d) of this appendix shall be performed only if the vehicle fails the first-chance test.

(2) The test sequence shall begin only after the following requirements are met:

(i) The vehicle shall be tested in as-received condition with the transmission in neutral or park and all accessories turned off. The engine shall be at normal operating temperature (as indicated by a temperature gauge, temperature lamp, touch test on the radiator hose, or other visual observation for overheating).

(ii) The tachometer shall be attached to the vehicle in accordance with the analyzer manufacturer's instructions.

(iii) The sample probe shall be inserted into the vehicle's tailpipe to a minimum depth of 10 inches. If the vehicle's exhaust system prevents insertion to this depth, a tailpipe extension shall be used.

(iv) The measured concentration of CO plus CO_2 shall be greater than or equal to six percent.

(c) *First-chance test.* The test timer shall start (tt=0) when the conditions specified in paragraph (VI)(b)(2) of this appendix are met. The test shall have an overall maximum test time of 290 seconds (tt=290). The first-chance test shall consist of a high-speed mode followed immediately by an idle mode.

(1) *First-chance high-speed mode.* (i) The mode timer shall reset (mt=0) when the vehicle engine speed is between 2200 and 2800 rpm. If the engine speed falls below 2200 rpm or exceeds 2800 rpm for more than two seconds in one excursion, or more than six seconds over all excursions within 30 seconds of the final measured value used in the pass/fail determination, the measured value shall be invalidated and the mode continued. If any excursion lasts for more than ten seconds, the mode timer shall reset to zero (mt=0) and timing resumed. The high-speed mode length shall be 90 seconds elapsed time (mt=90).

(ii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the high-speed mode and the mode shall be terminated at an elapsed time of 90 seconds (mt=90) if any measured values are less than or equal to the applicable short test standards as described in paragraph (VI)(a)(2) of this appendix.

(B) The vehicle shall fail the high-speed mode and the mode shall be terminated if the requirements of paragraph (VI)(c)(1)(ii)(A) of this appendix are not satisfied by an elapsed time of 90 seconds (mt=90).

(C) *Optional.* The vehicle shall fail the first-chance test and any subsequent test shall be omitted if no exhaust gas concentration lower than 1800 ppm HC is found at an elapsed time of 30 seconds (mt=30).

(2) *First-chance idle mode.* (i) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If the engine speed exceeds 1100 rpm or falls below 350 rpm, the mode timer shall reset to zero and resume timing. The minimum first-chance idle mode length shall be determined as described in paragraph (VI)(c)(2)(ii) of this appendix. The maximum first-chance idle mode length shall be 90 seconds elapsed time (mt=90).

(ii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (VI)(c)(2)(ii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (VI)(a)(2) of this appendix.

(C) The vehicle shall pass the idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), the measured values are less than or equal to the applicable short test standards as described in paragraph (VI)(a)(2) of this appendix.

(D) The vehicle shall fail the idle mode and the test shall be terminated if none of the provisions of paragraphs (VI)(c)(2)(ii) (A), (B), and (C) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90). Alternatively, the vehicle may be failed if the provisions of paragraphs (VI)(c)(2)(i) and (ii) of this appendix are not met within the elapsed time of 30 seconds.

(d) *Second-chance test.* (1) If the vehicle fails either mode of the first-chance test, the test timer shall reset to zero (tt=0) and a second-chance test shall commence. The second-chance test shall be performed based on the first-chance test failure mode or modes as follows:

(A) If the vehicle failed only the first-chance high-speed mode, the second-chance test shall consist of a second-chance high-speed mode as described in paragraph (VI)(d)(2) of this appendix. The overall maximum test time shall be 280 seconds (tt=280).

(B) If the vehicle failed only the first-chance idle mode, the second-chance test shall consist of a second-chance pre-conditioning mode followed immediately by a second-chance idle mode as described in paragraphs (VI)(d) (3) and (4) of this appendix. The overall maximum test time shall be 425 seconds (tt=425).

(C) If both the first-chance high-speed mode and first-chance idle mode were failed, the second-chance test shall consist of the second-chance high-speed mode followed immediately by the second-chance idle mode as described in paragraphs (VI)(d) (2) and (4) of this appendix. However, if during this second-chance procedure the vehicle fails the second-chance high-speed mode, then the second-chance idle mode may be eliminated. The overall maximum test time shall be 425 seconds (tt=425).

(2) *Second-chance high-speed mode*—(i) *Ford Motor Company and Honda vehicles.* The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and then shall be restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles.

(ii) The mode timer shall reset (mt=0) when the vehicle engine speed is between 2200 and 2800 rpm. If the engine speed falls below 2200 rpm or exceeds 2800 rpm for more than two seconds in one excursion, or more than six seconds over all excursions within 30 seconds of the final measured value used in the pass/fail determination, the measured value shall be invalidated and the mode continued. The minimum second-chance high-speed mode length shall be determined as described in paragraphs (VI)(d)(2) (iii) and (iv) of this appendix. If any excursion lasts for more than ten seconds, the mode timer shall reset to zero (mt=0) and timing resumed. The maximum second-chance high-speed mode length shall be 180 seconds elapsed time (mt=180).

(iii) In the case where the second-chance high-speed mode is *not* followed by the second-chance idle mode, the pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the high-speed mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the high-speed mode and the test shall be terminated if at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (VI)(d)(2)(iii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (VI)(a)(2) of this appendix.

(C) The vehicle shall pass the high-speed mode and the test shall be immediately terminated if, at any point between an elapsed time for 30 seconds (mt=30) and 180 seconds (mt=180), the measured values are less than or equal to the applicable short test standards as described in paragraph (VI)(a)(2) of this appendix.

(D) The vehicle shall fail the high-speed mode and the test shall be terminated if none of the provisions of paragraphs (VI)(d)(2)(iii) (A), (B), and (C) of this appendix is satisfied by an elapsed time of 180 seconds (mt=180).

(iv) In the case where the second-chance high-speed mode *is* followed by the second-chance idle mode, the pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall

be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the high-speed mode and the mode shall be terminated at the end of an elapsed time of 180 seconds (mt=180) if any measured values are less than or equal to the applicable short test standards as described in paragraph (VI)(a)(2) of this appendix.

(B) The vehicle shall fail the high-speed mode and the mode shall be terminated if paragraph (VI)(d)(2)(iv)(A) of this appendix is not satisfied by an elapsed time of 180 seconds (mt=180).

(3) *Second-chance preconditioning mode.* The mode timer shall start (mt=0) when engine speed is between 2200 and 2800 rpm. The mode shall continue for an elapsed time of 180 seconds (mt=180). If the engine speed falls below 2200 rpm or exceeds 2800 rpm for more than five seconds in any one excursion, or 15 seconds over all excursions, the mode timer shall reset to zero and resume timing.

(4) *Second-chance idle mode*—(i) *Ford Motor Company and Honda vehicles.* The engines of 1981–1987 Ford Motor Company vehicles and 1984–1985 Honda Preludes shall be shut off for not more than 10 seconds and then shall be restarted. The probe may be removed from the tailpipe or the sample pump turned off if necessary to reduce analyzer fouling during the restart procedure. This procedure may also be used for 1988–1989 Ford Motor Company vehicles but should not be used for other vehicles.

(ii) The mode timer shall start (mt=0) when the vehicle engine speed is between 350 and 1100 rpm. If the engine exceeds 1100 rpm or falls below 350 rpm the mode timer shall reset to zero and resume timing. The minimum second-chance idle mode length shall be determined as described in paragraph (VI)(d)(4)(iii) of this appendix. The maximum second-chance idle mode length shall be 90 seconds elapsed time (mt=90).

(iii) The pass/fail analysis shall begin after an elapsed time of 10 seconds (mt=10). A pass or fail determination shall be made for the vehicle and the mode shall be terminated as follows:

(A) The vehicle shall pass the second-chance idle mode and the test shall be immediately terminated if, prior to an elapsed time of 30 seconds (mt=30), measured values are less than or equal to 100 ppm HC and 0.5 percent CO.

(B) The vehicle shall pass the second-chance idle mode and the test shall be terminated at the end of an elapsed time of 30 seconds (mt=30) if, prior to that time, the criteria of paragraph (VI)(d)(4)(iii)(A) of this appendix are not satisfied, and the measured values are less than or equal to the applicable short test standards as described in paragraph (VI)(a)(2) of this appendix.

(C) The vehicle shall pass the second-chance idle mode and the test shall be immediately terminated if, at any point between an elapsed time of 30 seconds (mt=30) and 90 seconds (mt=90), measured values are less than or equal to the applicable short test standards described in paragraph (VI)(a)(2) of this appendix.

(D) The vehicle shall fail the second-chance idle mode and the test shall be terminated if none of the provisions of paragraphs (VI)(d)(4)(iii) (A), (B), and (C) of this appendix is satisfied by an elapsed time of 90 seconds (mt=90).

Appendix C to Subpart S—Steady-State Short Test Standards

(I) Short Test Standards for 1981 and Later Model Year Light-Duty Vehicles

For 1981 and later model year light-duty vehicles for which any of the test procedures described in appendix B to this subpart are utilized to establish Emissions Performance Warranty eligibility (i.e., 1981 and later model year light-duty vehicles at low altitude and 1982 and later model year vehicles at high altitude to which high altitude certification standards of 1.5 gpm HC and 15 gpm CO or less apply), short test emissions for all tests and test modes shall not exceed:

(a) Hydrocarbons: 220 ppm as hexane.

(b) Carbon monoxide: 1.2%.

(II) Short Test Standards for 1981 and Later Model Year Light-Duty Trucks

For 1981 and later model year light-duty trucks for which any of the test procedures described in appendix B to this subpart are utilized to establish Emissions Performance Warranty eligibility (i.e., 1981 and later model year light-duty trucks at low altitude and 1982 and later model year trucks at high altitude to which high altitude certification standards of 2.0 gpm HC and 26 gpm CO or less apply), short test emissions for all tests and test modes shall not exceed:

(a) Hydrocarbons: 220 ppm as hexane.

(b) Carbon monoxide: 1.2%.

Appendix D to Subpart S—Steady-State Short Test Equipment

(I) Steady-State Test Exhaust Analysis System

(a) *Sampling system*—(1) *General requirements.* The sampling system for steady-state short tests shall, at a minimum, consist of a tailpipe probe, a flexible sample line, a water removal system, particulate trap, sample pump, flow control components, tachometer or dynamometer, analyzers for HC, CO, and CO_2, and digital displays for exhaust concentrations of HC, CO, and CO_2, and engine rpm. Materials that are in contact with the gases sampled shall not contaminate or change the character of the gases to be analyzed, including gases from alcohol fueled vehicles. The probe shall be capable of being inserted to a depth of at least ten inches into the tailpipe of the vehicle being tested, or into an extension boot if one is used. A digital display for dynamometer speed and load shall be included if the test procedures described in appendix B to this subpart, paragraphs (III) and (V), are conducted. Minimum specifications for optional NO analyzers are also described in this appendix. The analyzer system shall be able to test, as specified in at least one section in appendix B to this subpart, all model vehicles in service at the time of sale of the analyzer.

(2) *Temperature operating range.* The sampling system and all associated hardware shall be of a design certified to operate within the performance specifications described in paragraph (I)(b) of this appendix in ambient air temperatures ranging from 41 to 110 degrees Fahrenheit. The analyzer system shall, where necessary, include features to keep the sampling system within the specified range.

(3) *Humidity operating range.* The sampling system and all associated hardware shall be of a design certified to operate within the performance specifications described in paragraph (I)(b) of this appendix at a minimum of 80 percent relative humidity throughout the required temperature range.

(4) *Barometric pressure compensation.* Barometric pressure compensation shall be provided. Compensation shall be made for elevations up to 6,000 feet (above mean sea level). At any given altitude and ambient conditions specified in paragraph (I)(b) of this appendix, errors due to barometric pressure changes of ±2 inches of mercury shall not exceed the accuracy limits specified in paragraph (I)(b) of this appendix.

(5) *Dual sample probe requirements.* When testing a vehicle with dual exhaust pipes, a dual sample probe of a design certified by the analyzer manufacturer to provide equal flow in each leg shall be used. The equal flow requirement is considered to be met if the flow rate in each leg of the probe has been measured under two sample pump flow rates (the normal rate and a rate equal to the onset of low flow), and if the flow rates in each of the legs are found to be equal to each other (within 15% of the flow rate in the leg having lower flow).

(6) *System lockout during warm-up.* Functional operation of the gas sampling unit shall remain disabled through a system lockout until the instrument meets stability and warm-up requirements. The instrument shall be considered "warmed up" when the zero and span readings for HC, CO, and CO_2 have stabilized, within ±3% of the full range of low scale, for five minutes without adjustment.

(7) *Electromagnetic isolation and interference.* Electromagnetic signals found in an automotive service environment shall not cause malfunctions or changes in the accuracy in the electronics of the analyzer system. The instrument design shall ensure that readings do not vary as a result of electromagnetic radiation and induction devices normally found in the automotive service environment, including high energy vehicle ignition systems, radio frequency transmission radiation sources, and building electrical systems.

(8) *Vibration and shock protection.* System operation shall be unaffected by the vibration and shock encountered under the normal operating conditions encountered in an automotive service environment.

(9) *Propane equivalency factor.* The propane equivalency factor shall be displayed in a manner that enables it to be viewed conveniently, while permitting it to be altered only by personnel specifically authorized to do so.

(b) *Analyzers*—(1) *Accuracy.* The analyzers shall be of a design certified to meet the following accuracy requirements when calibrated to the span points specified in appendix A to this subpart:

Channel	Range	Accuracy	Noise	Repeatability
as hexane	401-1000	± 30	10	15
	1001-2000	± 80	20	30
CO, %	0-2.00	± 0.06	0.02	0.03
	2.01-5.00	± 0.15	0.06	0.08
	5.01-9.99	± 0.40	0.10	0.15
CO_2, %	0-4.0	± 0.6	0.2	0.3
	4.1-14.0	± 0.5	0.2	0.3
NO, ppm	0-1000	± 32	16	20
	1001-2000	± 60	25	30
	2001-4000	± 120	50	60

(2) *Minimum analyzer display resolution.* The analyzer electronics shall have sufficient resolution to achieve the following:

HC ..... 1ppm HC as hexane.
CO ..... 0.01% CO.
CO_2 ..... 0.1% CO_2.
NO ..... 1ppm NO.
RPM ..... 1rpm.

(3) *Response time.* The response time from the probe to the display for HC, CO, and CO_2 analyzers shall not exceed eight seconds to 90% of a step change in input. For NO analyzers, the response time shall not exceed twelve seconds to 90% of a step change in input.

(4) *Display refresh rate.* Dynamic information being displayed shall be refreshed at a minimum rate of twice per second.

(5) *Interference effects.* The interference effects for non-interest gases shall not exceed ±10 ppm for hydrocarbons, ±0.05 percent for carbon monoxide, ±0.20 percent for carbon dioxide, and ±20 ppm for oxides of nitrogen.

(6) *Low flow indication.* The analyzer shall provide an indication when the sample flow is below the acceptable level. The sampling system shall be equipped with a flow meter (or equivalent) that shall indicate sample flow degradation when meter error exceeds three percent of full scale, or causes system response time to exceed 13 seconds to 90 percent of a step change in input, whichever is less.

(7) *Engine speed detection.* The analyzer shall utilize a tachometer capable of detecting engine speed in revolutions per minute (rpm) with a 0.5 second response time and an accuracy of ±3% of the true rpm.

(8) *Test and mode timers.* The analyzer shall be capable of simultaneously determining the amount of time elapsed in a test, and in a mode within that test.

(9) *Sample rate.* The analyzer shall be capable of measuring exhaust concentrations of gases specified in this section at a minimum rate of twice per second.

(c) *Demonstration of conformity.* The analyzer shall be demonstrated to the satisfaction of the inspection program manager, through acceptance testing procedures, to meet the requirements of this section and that it is capable of being maintained as required in appendix A to this subpart.

(II) Steady-State Test Dynamometer

(a) The chassis dynamometer for steady-state short tests shall provide the following capabilities:

(1) *Power absorption.* The dynamometer shall be capable of applying a load to the vehicle's driving tire surfaces at the horsepower and speed levels specified in paragraph (II)(b) of this appendix.

(2) *Short-term stability.* Power absorption at constant speed shall not drift more than ±0.5 horsepower (hp) during any single test mode.

(3) *Roll weight capacity.* The dynamometer shall be capable of supporting a driving axle weight up to four thousand (4,000) pounds or greater.

(4) *Between roll wheel lifts.* These shall be controllable and capable of lifting a minimum of four thousand (4,000) pounds.

(5) *Roll brakes.* Both rolls shall be locked when the wheel lift is up.

(6) *Speed indications.* The dynamometer speed display shall have a range of 0–60 mph, and a resolution and accuracy of at least 1 mph.

(7) *Safety interlock.* A roll speed sensor and safety interlock circuit shall be provided which prevents the application of the roll brakes and upward lift movement at any roll speed above 0.5 mph.

(b) The dynamometer shall produce the load speed relationships specified in paragraphs (III) and (V) of appendix B to this subpart.

(III) Transient Emission Test Equipment [Reserved]

(IV) Evaporative System Purge Test Equipment [Reserved]

(V) Evaporative System Integrity Test Equipment [Reserved]

Appendix E to Subpart S—Transient Test Driving Cycle

(I) *Driver's trace.* All excursions in the transient driving cycle shall be evaluated by the procedures defined in § 86.115-78(b)(1) and § 86.115(c) of this chapter. Excursions exceeding these limits shall cause a test to be void. In addition, provisions shall be available to utilize cycle validation criteria, as described in § 86.1341-90 of this chapter, for trace speed versus actual speed as a means to determine a valid test.

(II) *Driving cycle.* The following table shows the time speed relationship for the transient IM240 test procedure.

Section	MPH
0	0
1	0
2	0
3	0
4	0
5	3
6	5.9
7	8.6
8	11.5
9	14.3
10	16.9
11	17.3
12	18.1
13	20.7
14	21.7
15	22.4
16	22.5
17	22.1
18	21.5
19	20.9
20	20.4
21	19.8
22	17
23	14.9
24	14.9
25	15.2
26	15.5
27	16
28	17.1
29	19.1
30	21.1
31	22.7
32	22.9
33	22.7
34	22.6
35	21.3
36	19
37	17.1
38	15.8
39	15.8
40	17.7
41	19.8
42	21.6
43	23.2
44	24.2
45	24.6
46	24.9
47	25
48	25.7
49	26.1
50	26.7
51	27.5
52	28.6
53	29.3
54	29.8
55	30.1
56	30.4
57	30.7
58	30.7
59	30.5
60	30.4
61	30.3
62	30.4
63	30.8
64	30.4

Section	MPH	Section	MPH	Section	MPH
65	29.9	125	22.4	185	53.2
66	29.5	126	22.5	186	54.1
67	29.8	127	22.1	187	54.6
68	30.3	128	21.5	188	54.9
69	30.7	129	20.9	189	55
70	30.9	130	20.4	190	54.9
71	31	131	19.8	191	54.6
72	30.9	132	17	192	54.6
73	30.4	133	17.1	193	54.8
74	29.8	134	15.8	194	55.1
75	29.9	135	15.8	195	55.5
76	30.2	136	17.7	196	55.7
77	30.7	137	19.8	197	56.1
78	31.2	138	21.6	198	56.3
79	31.8	139	22.2	199	56.6
80	32.2	140	24.5	200	56.7
81	32.4	141	24.7	201	56.7
82	32.2	142	24.8	202	56.3
83	31.7	143	24.7	203	56
84	28.6	144	24.6	204	55
85	25.1	145	24.6	205	53.4
86	21.6	146	25.1	206	51.6
87	18.1	147	25.6	207	51.8
88	14.6	148	25.7	208	52.1
89	11.1	149	25.4	209	52.5
90	7.6	150	24.9	210	53
91	4.1	151	25	211	53.5
92	0.6	152	25.4	212	54
93	0	153	26	213	54.9
94	0	154	26	214	55.4
95	0	155	25.7	215	55.6
96	0	156	26.1	216	56
97	0	157	26.7	217	56
98	3.3	158	27.3	218	55.8
99	6.6	159	30.5	219	55.2
100	9.9	160	33.5	220	54.5
101	13.2	161	36.2	221	53.6
102	16.5	162	37.3	222	52.5
103	19.8	163	39.3	223	51.5
104	22.2	164	40.5	224	50.5
105	24.3	165	42.1	225	48
106	25.8	166	43.5	226	44.5
107	26.4	167	45.1	227	41
108	25.7	168	46	228	37.5
109	25.1	169	46.8	229	34
110	24.7	170	47.5	230	30.5
111	25.2	171	47.5	231	27
112	25.4	172	47.3	232	23.5
113	27.2	173	47.2	233	20
114	26.5	174	47.2	234	16.5
115	24	175	47.4	235	13
116	22.7	176	47.9	236	9.5
117	19.4	177	48.5	237	6
118	17.7	178	49.1	238	2.5
119	17.2	179	49.5	239	0
120	18.1	180	50		
121	18.6	181	50.6		
122	20	182	51		
123	20.7	183	51.5		
124	21.7	184	52.2		

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