

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

2006 Annual Report

Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program

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2006 Annual Report

Massachusetts Enhanced Inspection and Maintenance Program

1 EXECUTIVE SUMMARY

This document is the 2006 Annual Report to the United States Environmental Protection Agency (EPA) on the Massachusetts Enhanced Inspection and Maintenance program (I&M program). This report covers the calendar year January 1 to December 31, 2006.

This Annual Report is required by EPA under 40 CFR 51.366. This regulation requires that annual reports cover four categories of information:¹

- Station and inspector oversight,
- Quality control,
- Compliance and enforcement, and
- Emissions test data.

1.1 Major Findings

Emissions Tests Conducted

A biennial emissions test is required for the majority of the fleet. (Exemptions include vehicles less than two years old and pre-1984 vehicles). An emissions test is also required when a vehicle changes ownership and when relocated to Massachusetts. An annual safety test is also required of all vehicles.

In 2006, there were approximately 4.6 million vehicles registered in Massachusetts. The I&M program conducted initial emissions tests on 2,033,931 unique vehicles (44% of the Massachusetts fleet). Of the vehicles that received initial emissions tests in 2006, 1,992,172 were gasoline fueled and 41,759 were diesel fueled. Massachusetts is one of the few states that goes beyond EPA requirements by routinely testing heavy duty diesel trucks and buses for excess emissions as part of its effort to reduce the significant health problems associated with diesel exhaust.

In total, the I&M program conducted emissions tests on 2,261,678 gasoline- and diesel-fueled vehicles in 2006, including initial tests, retests, and off-cycle tests due to changes of ownership/registration.

Compliance and Enforcement

Of the 4.6 million vehicles registered in Massachusetts in 2006, 4.5 million (98%) were tested for safety or for safety and emissions.

¹ See "Attachment A: Index of Report Pages Relevant to EPA Regulation Sections" for details about where specific required items appear in this report.

Of the 1,992,172 gasoline-fueled vehicles receiving initial emissions tests in 2006, 189,272 (9.5%) failed their initial emissions tests. Of these failures, all but 49,764 (~2.5%) passed a subsequent retest, or received a waiver by March 31, 2007. One hundred and sixty-five waivers from the requirement that failing vehicles pass an emissions re-test were granted in 2006 (less than 0.01% of both vehicles receiving initial emissions tests and vehicles failing initial emissions tests). While some of the vehicles that failed an initial test and did not pass a re-test were taken off the road with expired registrations, sold out of state, or junked, vehicles failing to receive inspections or emissions tests when required are subject to enforcement by the Registry of Motor Vehicles (RMV) as well as state and local law enforcement agencies.

Emissions Reductions From Transient Tested Vehicles

EPA requires states to calculate emission reductions from vehicles that are repaired after failing a “transient” emissions test (This is one of the three types of emissions tests used in Massachusetts. It measures specific pollutants in tailpipe exhaust from gasoline-fueled vehicles). 26,428 transient-tested vehicles that had failed their emissions test in 2006 were successfully repaired and passed a subsequent transient test. Based on the emissions data for these vehicles’ initial failing transient test and their subsequent passing retests, these repairs reduced the emissions of those vehicles by an average of 73% for hydrocarbons, 79% for carbon monoxide and 59% for oxides of nitrogen.

Station and Inspector Oversight

In 2006, the Massachusetts Registry of Motor Vehicles (RMV) performed 6,186 site audits to determine if the inspectors were correctly performing all safety and emissions tests and if the station’s physical conditions continued to meet program requirements. All 1,401 stations operating throughout the year received at least one visit. Based on the results of the site audits and other data, the RMV held 467 hearings for stations and issued 202 adverse actions against stations (e.g. license revoked or suspended). During 2006, 6,010 licensed inspectors performed at least one test during the year. Based on the results of the site audits and other data, the RMV held 453 hearings for inspectors, and issued 181 adverse actions. The adverse actions taken against inspectors ranged from requiring retraining to revoking inspector licenses.

2006 Program Improvements

In 2006, the program continued to improve the accuracy and reliability of emission testing equipment, an effort that started with a contract amendment (No. 4) signed in June 2004 that:

- established specific reliability standards for testing equipment,
- required all testing equipment to be upgraded or replaced, and
- required the contractor to significantly increase its maintenance and monitoring of workstations, to provide early identification of needed adjustments and repairs.

Massachusetts Department of Environmental Protection (MassDEP) continued its program of auditing inspection equipment performance throughout 2006 to ensure that the contract amendment was achieving its goals. 2006 was the first year in which

MassDEP used its audits to evaluate whether workstations were functioning within the contractually-required equipment reliability standards.

On May 30, 2006, the Agencies and the program contractor announced that they had negotiated an additional contract amendment (No. 6) that extended the contract through September 30, 2008. Within the framework of the reliability standards established by Contract Amendment No. 4, the new contract amendment requires the contractor to:

- Improve its response time to requests from inspection stations for workstation repairs,
- Meet performance standards for workstation maintenance and repairs identified by digital and MassDEP audits,
- Upgrade workstation software to correct gas bench response times and VMAS flow adjustments,
- Reformat the Vehicle Inspection Report and implement a communications plan to encourage motorists to use a Registered Repairer for emission control system repairs,
- Update and expand training for emission control repair technicians, and
- Correct the protocol for inspecting heavy-duty vehicles to require that parking brakes are “off” before an inspection is performed.

The contract amendment included schedules for each requirement and performance standards to help ensure that the program contractor meets the requirements throughout the remaining term of the extended contract (September 2008).

1.2 Contents of This Report

Section 2 of this report describes the Massachusetts I&M Program and provides information on the number of vehicles covered, inspection stations and inspectors, and types of emissions tests administered. The remaining sections of the report describe specific aspects of the program:

- Motorist Compliance with Testing Requirements (Section 3)
- Performance of Emissions Test Equipment (Section 4)
- Station and Inspector Oversight (Section 5)
- Emissions Test Results (Section 6)

The attachments to this report contain detailed data on vehicles tested, results of emissions tests, and audit results:

- Attachment A: Index of Report Pages Relevant to EPA Regulation Sections
- Attachment B: Detailed 2006 Emissions Test Data
- Attachment C: 2006 Quality Control Report
- Attachment D: 2006 Test Data by Station

2 THE MASSACHUSETTS I&M PROGRAM

2.1 Why Does Massachusetts Have an I&M Program?

Massachusetts continues to be in non-attainment with federal standards for ground-level ozone pollution. On “bad air” days, there are increases in asthma attacks and hospitalizations for people with severe respiratory ailments. To reduce the number of “bad air” days and to comply with the Federal Clean Air Act and U.S. Environmental Protection Agency (EPA) regulations, Massachusetts must implement a variety of federally mandated programs.² To reduce pollution from motor vehicles, Massachusetts is required to operate an Enhanced Inspection and Maintenance (I&M) program. EPA sets minimum standards for I&M programs³.

The current Massachusetts I&M program was authorized by the Legislature by Chapter 210 of the Acts of 1997. The Department of Environmental Protection (MassDEP or the Department) and the Registry of Motor Vehicles (RMV) jointly administer the Enhanced Emission and Safety Test Program. The program’s goals are to implement a comprehensive test that provides the emission reductions needed for the Massachusetts state implementation plan (SIP), is convenient to motorists, ensures vehicle safety, and works well in local inspection shops. To maximize customer convenience, the legislation combines emissions and safety testing, and requires that the combined test be delivered in local inspection stations, convenient to where people live and work. In January 1999, the Commonwealth contracted with Keating Technologies, Inc.⁴, to supply the inspection equipment and operate the Massachusetts I&M program.

2.2 Vehicles Subject to Inspection

40 CFR 51.366 (d) (1) (i): An estimate of the number of vehicles subject to the inspection program, including the results of an analysis of the registration data base;

In 2006, there were approximately 4.6 million vehicles with active registrations in the Massachusetts fleet. Each vehicle registered in Massachusetts must be inspected annually. All vehicles must receive a safety inspection every year, and the vast majority must receive an emissions test every other year. In 2006, vehicles were exempted from the emissions inspection if they were:

- Model year 1984 or older, or
- Less than 2 years old and still registered to the original owner.

² These programs are established in legally binding and federally enforceable “State Implementation Plans” or “SIPs”.

³ 40 CFR Part 51, Subpart S (§51.350 et seq.).

⁴ In July 2001, the Contractor changed its name to “Agbar Technologies, Inc.”, and in February 2005, changed its name again to “Applus Technologies, Inc”. In this report, the Contractor is referred to as “Applus”, since the firm did business under this name during the year covered by this report.

Vehicles are required to receive an emissions inspection within seven days of transfer of ownership, or within seven days of initial registration when entering the Commonwealth. In addition, vehicles that are more than 60 days late for a scheduled safety-only test are also tested for emissions.

2.3 Inspection Stations

40 CFR 51.366 (b)⁵ (1): The number of inspection stations and lanes:

- (i) Operating throughout the year; and
- (ii) Operating for only part of the year;

Most Massachusetts vehicles receive their inspections at local public stations. The program also allows owners of vehicle fleets to purchase their own testing equipment so they can test their own vehicles. The number of public and fleet stations fluctuates slightly from month to month as businesses join or leave the program.

In 2006, 1,401 stations conducted emissions tests throughout the year, and another 273 conducted tests during part of the year. There were 1,472 “workstations” or sets of inspection equipment used for testing emissions throughout 2006, and 167 workstations used for testing during part of the year (See Table 1 below). A small number of inspection stations have more than one workstation. At any given time, some of the workstations and stations are not operating, due to factors such as change of ownership or location. The number of workstations and stations testing in any given month is fewer than the total number of workstations and stations, as seen by the number of stations and workstations testing in December, shown in Table 1. In Massachusetts, the number of workstations is equivalent to the number of lanes in a centralized testing program.

Table 1: Number of Stations and Workstations in 2006

	Workstations ⁶	Stations
Testing All Year	1,472	1,401
Testing for Part of Year	167	273
Total During Year	1,639	1,674
Testing in December	1,576	1,545

Table 2 shows the breakdown of fleet and public stations. Out of 1,401 stations that conducted emissions tests throughout 2006, 1,349 were public stations and 52 were fleet

⁵For all references to 40 CFR 51.366: 57 FR 52987, Nov. 5, 1992, as amended at 61 FR 40945, Aug. 6, 1996; 65 FR 45534, July 24, 2000; 66 FR 18178, Apr. 5, 2001.

⁶ If a workstation was moved to a different station during 2006, it was counted as the same workstation, but as a different station. Relocated workstations may have tested for all or part of the year. These statistics reflect the circumstances of each relocated workstation.

stations. An additional 216 public stations and 57 fleet stations conducted emissions tests during part of the year.

Table 2: Public and Fleet Stations in 2006

	Public	Fleet	Total Stations
Testing All Year	1,349	52	1,401
Testing for Part of Year	216	57	273
Total During Year	1,565	109	1,674
Testing in December	1,463	82	1,545

In Tables 1 and 2, a station or workstation must have conducted emissions inspections in each month in 2006 to be counted as “testing all year.” Stations or workstations that were licensed for the entire year, but did not test in one or more months are considered “testing for part of the year,” as are stations that entered or left the program during the year.

2.4 Inspectors

40 CFR 51.366 (b) (5): The number of inspectors licensed or certified to conduct testing;

At the close of calendar year 2006, there were 6,384 trained and licensed inspectors certified to conduct emission tests (See Table 3). However, only 6,010 inspectors tested at least one vehicle during the year.

Table 3: Number of Inspectors in 2006

	# Of Inspectors
Inspectors Trained And Licensed on December 31, 2006	6,384
Inspectors Who Inspected at Least One Vehicle in 2006	6,010

2.5 Emissions Tests Administered

The Massachusetts I&M Program uses four different emissions tests. Gasoline-fueled vehicles receive one of the following tests: On-Board Diagnostic, transient (tailpipe), or two-speed idle (tailpipe). Diesel-fueled vehicles (heavy-duty only) receive a snap acceleration (opacity) test. Each test is described below.

1. **On-Board Diagnostic:** All model year 1996-and-newer gasoline-fueled cars and light trucks have “On Board Diagnostic” (OBD) computers and sensors that assess the

condition of the vehicle's emissions control systems. The emissions test accesses the OBD system in these vehicles to find out whether the emission control system is working properly. Starting on June 15, 2004, all vehicles equipped with modern OBD systems (i.e., OBD II) passed or failed their emissions tests based on the data in those systems. In 2006, 77.7% of vehicles receiving emissions tests were tested using the OBD test.

2. Transient tailpipe tests are used for most gasoline-powered vehicles that are not equipped with modern OBD systems. In this test, vehicles are placed on a dynamometer, a treadmill-like device that puts resistance against the tires to simulate on-road driving. The vehicles are accelerated and decelerated according to a prescribed pattern ("drive trace"), and tailpipe emissions are measured and recorded. Readings for hydrocarbons (HC), Carbon Monoxide (CO) and Oxides of Nitrogen (NOx) are compared to each pollutant's pass/fail points, which are expressed in grams/mile. The pass/fail points vary by vehicle type [car vs. truck], model year, and, for trucks, by weight category. In 2006, 17.6% of vehicles receiving emissions tests were tested using the transient test.

3. Two-speed idle (TSI) tests are used for gasoline-fueled vehicles that cannot receive an OBD or transient test. This test measures emissions while the engine is operating at 2500 revolutions per minute with the transmission in neutral, and while the vehicle is idling. The pollutant levels and pass/fail points for TSI tests are measured in concentrations (parts per million for HC, and percent-per-standard volume for CO). This test does not measure emissions of oxides of nitrogen. All vehicles receiving a TSI tailpipe emission inspection are also visually inspected to confirm that various emissions components, such as the catalytic converter, are present with no apparent tampering. If a vehicle fails the visual inspection, it fails the overall emissions test, even if the vehicle passed the tailpipe portion of the test. Examples of vehicles that receive a TSI test are those with all-wheel drive (where the vehicle cannot be shifted back to two wheel drive) and vehicles weighing more than 10,000 pounds. In 2006, 2.6% of all vehicles receiving emissions tests were tested using the TSI test.

4. The snap acceleration test uses an opacity meter to identify excess emissions from heavy-duty diesel trucks and buses. While not required by EPA, Massachusetts devotes resources to diesel testing because diesel exhaust is linked to significant health problems. Every diesel vehicle that is repaired through this program results in an improvement in air quality for children riding school buses, for people living next to busy urban streets, and for the thousands of Commonwealth residents who suffer from asthma. Diesel testing started in February 2001. In 2006, heavy-duty diesel vehicles comprised 2.1% of all vehicles receiving an emissions test.

Please note that gas caps are tested for most gasoline-fueled vehicles. If a vehicle fails the gas cap test, it fails the overall emissions test, even if the vehicle passed the tailpipe or OBD portion of the test.

3 MOTORIST COMPLIANCE WITH TESTING REQUIREMENTS

3.1 Overall Motorist Compliance with Testing Requirements

40 CFR 51.366 (d) (1) (ii): The percentage of motorist compliance based upon a comparison of the number of valid final tests with the number of subject vehicles;

In Massachusetts, the workstation software determines what tests a vehicle will receive each year. Table 3 summarizes the overall 2006 compliance rate, which compares the total number of unique vehicles receiving an I&M test (including safety-only tests) to the average number of unique registered vehicles during the year. In 2006, this compliance rate was 97.6%

Table 4: 2006 Overall Testing Compliance Rates

	Vehicle Count	Compliance %
Vehicles Subject to 2006 Test (Safety Only or Safety and Emissions)	4,600,200	
Unique Vehicles Tested in 2006 (Safety Only or Safety and Emissions Tests)	4,491,758	97.6%

Please note that a compliance rate specifically for emissions tests cannot be calculated due to insufficient data. In 2006, 49,852 of the 189,715 vehicles that failed their initial emissions tests did not pass a re-test by March 31, 2007 (the re-test would be considered a “final test” as per EPA’s requirement noted above. However, data indicating the number of vehicles that should have obtained an initial emissions test is not available because the Commonwealth does not track the number of registered vehicles that are exempt from the emissions testing requirement (those that are less than two model years old, or were made in model year 1984 or earlier).

3.2 Registration File Audits and Compliance with Deadlines

40 CFR 51.366 (d) (2) (ii): [Registration denial based enforcement programs shall provide. . .] The number of registration file audits, number of registrations reviewed, and compliance rates found in such audits. . . .

40 CFR 51.366 (d) (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;

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The RMV typically completes two scans of the vehicle registration database each month. These registration reviews examine the testing status of each registered vehicle to determine compliance with testing requirements.

Table 5 (below) summarizes the results of these registration reviews for 2006. Please note that the compliance rate is typically higher in the middle of the month than at the start of the month, indicating that a significant number of vehicles were inspected between one day and two weeks after the inspection was due.

Please note that the proportion of the vehicle fleet found to be “in compliance” with inspection requirements by the bi-monthly registration reviews is lower than the proportion determined to be in compliance based on data from the full calendar year (88.6% vs. 97.6% respectively). Since registration reviews are snapshots in time, they tend to understate compliance. Registration reviews determine whether the most recent inspection for each vehicle was performed within the last 12 months and was a “pass.” The I&M regulations allow up to 60 days for emissions repairs. The registration reviews count vehicles that failed an emissions test as “out of compliance” if they have not completed repairs and passed a re-inspection by the time of the registration review, even though the vehicle may still be within its 60-day period. Also, registration reviews only capture compliance status at a particular moment in time. A vehicle that was tested seven weeks late in 2006 would ultimately have been in compliance but would have been counted as out-of-compliance on four registration reviews.

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Table 5: 2006 RMV Registration Reviews

Date	Active Registrations	Number Non Compliant	Percent In Compliance
01/01/06	4,575,867	551,203	88.0%
01/15/06	4,587,088	491,525	89.3%
02/01/06	4,593,619	555,212	87.9%
02/15/06	4,576,273	488,318	89.3%
03/01/06	4,587,501	555,047	87.9%
03/15/06	4,575,328	485,915	89.4%
04/01/06	4,565,807	541,874	88.1%
04/15/06	4,587,637	477,874	89.6%
05/02/06	4,581,628	550,008	88.0%
05/16/06	4,603,569	486,086	89.4%
06/01/06	4,626,698	555,411	88.0%
06/15/06	4,621,023	480,353	89.6%
07/01/06	4,607,167	559,844	87.8%
07/15/06	4,627,878	488,765	89.4%
08/01/06	4,642,734	565,103	87.8%
08/15/06	4,633,771	484,660	89.5%
09/01/06	4,645,980	562,980	87.9%
09/15/06	4,632,199	483,282	89.6%
10/01/06	4,607,703	547,896	88.1%
10/15/06	4,623,106	547,896	88.1%
11/01/06	4,630,476	546,786	88.2%
11/15/06	4,610,516	476,334	89.7%
12/01/06	4,620,184	545,202	88.2%
12/15/06	4,606,169	470,672	89.8%
Average	4,600,199	522,190	88.6%

3.2.1 PARKING LOT SURVEYS

40 CFR 51.366 (d) (4) (iii): [Sticker-based enforcement systems shall provide . . .] The number of parking lot sticker audits conducted, the number of vehicles surveyed in each, and the noncompliance rate found during those audits.

Table 6 summarizes the results of 2006 parking lot surveys conducted by the RMV.

Table 6: 2006 Parking Lot Surveys

Parking lot audits conducted	93
Vehicles surveyed	2,375
Vehicles with valid inspection stickers	2,212
Compliance rate	93.1%

The RMV's registration enforcement program, originally scheduled to begin in late 2004, had not been implemented by the end of 2006.

3.2.2 RMV COMPLIANCE SURVEYS

40 CFR 51.366 (d) (1) (vi): The number of compliance surveys conducted, number of vehicles surveyed in each, and the compliance rates found;

The RMV conducted registration file audits and parking lot surveys, as described in Sections 3.2 and 3.2.1 respectively. No other compliance surveys were conducted in 2006.

3.2.3 MOTORIST TIME EXTENSIONS

40 CFR 51.366 (d) (1) (v): The number of time extensions and other exemptions granted to motorists;

No time extensions and other exemptions were granted to motorists, beyond the program's standard exemptions for certain classes of old or new vehicles.

3.2.4 PREVENTING FALSE REGISTRATION BY MOTORISTS

40 CFR 51.366 (d) (2) (i): [Registration denial based enforcement programs shall provide . . .] 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

40 CFR 51.366 (d) (3) (ii): [Computer-matching based enforcement programs shall provide . . .] 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;

40 CFR 51.366 (d) (4) (ii): [Sticker-based enforcement systems shall provide . . .] 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;

The reporting requirements for efforts to prevent false registration are not relevant to Massachusetts because:

- All of Massachusetts is covered by the program;
- All vehicles are required to be inspected annually for either safety or safety and emissions;
- If a motorist falsely reports fuel type or weight in order to avoid an emissions inspection, the inspector enters corrected data based on his or her examination of the fuel cap and based on vehicle information appearing on the vehicle's door label.

3.2.5 ADDITIONAL STICKER-RELATED ACTIVITIES

40 CFR 51.366 (d) (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;

To support the state and local police with inspection-sticker motor-vehicle violations, the RMV mailed a detailed memorandum to state and local police departments in the Commonwealth regarding sticker characteristics for 2006.

On a monthly basis, the RMV also analyzed monthly digital audits, which include the number of offline inspections, model year changes, failure rates and emissions testing rates and used the result of the analysis to determine targets for overt audits.

In 2006, state and local police issued 104,479 inspection-sticker motor-vehicle violations, a 20% increase from the 86,145 violations issued in 2005. This increase may result from an increase in RMV's joint roadside enforcement conducted with local law enforcement personnel. The higher level of violations issued during roadside enforcement, and the resulting increased awareness of sticker enforcement by local law enforcement personnel, may have contributed to a higher number of sticker violations in 2006 than in 2005.

4 PERFORMANCE OF EMISSIONS TEST EQUIPMENT

This section summarizes the findings of more than 9,100 audits of emissions testing equipment conducted by MassDEP and Applus Technologies, Inc. in 2006. The complete Quality Control Report, with detailed information about the equipment audits and results, can be found in Attachment C. In addition to the results of MassDEP equipment audits, this section summarizes the equipment improvements and equipment performance standards covered by Contract Amendments Nos. 4 and 6, reports whether the performance standards established by Contract Amendment No. 4 were met, and describes the results of equipment audits performed by the contractor, Applus.

MassDEP's equipment auditing program is designed to determine whether emissions testing equipment meets stringent performance standards ("audit criteria") established by the Massachusetts I&M program. Equipment audits are on-site inspections of emissions testing equipment performed throughout the year at working inspection stations. Equipment audits are performed overtly and are either randomly selected or targeted. MassDEP's audits are performed by agency staff and SGS Testcom (a MassDEP contractor not connected to Applus).

As per EPA requirements [40 CFR 363 (c)] and guidance, each state establishes equipment audit criteria and performance standards for its I&M program, based on its own program objectives. States can choose to include additional audit criteria not required by EPA, and some states select performance standards for the equipment audit criteria that differ from EPA guidance. MassDEP's audit criteria are listed in Attachment C.

Massachusetts's criteria are more rigorous and significantly stricter than what EPA requires: while EPA's criteria include 64 checks, Massachusetts' audits cover 88 checks (including everything required by EPA). If a workstation fails to meet one or more of the 88 audit criteria, then that workstation fails the audit, regardless of whether the failure may affect the results of an emissions test. Follow-up audits occur at stations failing items deemed critical during initial or follow-up audits.

4.1 MassDEP Audit Coverage of the Inspection Station Network

40 CFR 51.366 (c) Quality control report. ...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;

In 2006, 1,401 stations and 1,472 workstations (lanes) conducted emissions inspections throughout the year. 1,639 stations and 1,674 workstations conducted emissions tests at some time during the year. These numbers include workstations and stations that are configured for “diesel only” emissions tests and are not subject to equipment audits. In December 2006, 1,505 workstations and 1,478 stations conducted emissions tests for gasoline fueled vehicles and, therefore, were subject to equipment audits.

MassDEP performed a total of 2,065 audits in 2006, of 1,282 different workstations (lanes) and 1,271 different inspection stations⁷. 674 workstations were audited 1 time, 460 workstations were audited two times, 125 workstations were audited three times, 19 workstations were audited four times, and 4 workstations were audited five times. These audits include re-audits at stations with critical failures during initial or follow-up audits. As EPA agreed, MassDEP randomly selected workstations to receive audits between July 2006 and July 2007. Therefore, not all workstations may be scheduled for audits in any given calendar year.

4.2 MassDEP Audit Results

4.2.1 NUMBER OF STATIONS THAT FAILED AN AUDIT IN 2006

40 CFR 51.366 (c) Quality control report. ...Basic statistics on the quality control program for January through December of the previous year, including:

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

Of the 2,065 equipment audits conducted, 630 failed one or more audit parts, which was a 30.5% failure rate overall. In total, 542 different inspection stations failed at least one MassDEP audit criteria on at least one audit. This constituted 42.6% of the 1,271 stations audited in 2006 and 32.4% of the 1,674 stations that tested at some time during the year. Please note that failing any one of the 88 parts of a Massachusetts audit results in an “audit failure”. Most failures were associated with audit criteria that are minor, in that they do not directly affect the outcome of emissions tests (e.g., a clock that is not within five minutes of the correct time).

4.2.2 NUMBER OF STATIONS SHUT DOWN DUE TO AN EQUIPMENT AUDIT IN 2006

40 CFR 51.366 (c) Quality control report. ...Basic statistics on the quality control program for January through December of the previous year, including:

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

Of the 2,065 equipment audits performed in 2006, only 24 (or 1.2%) of the audits resulted in workstations being immediately shut down and suspended from performing

⁷ Starting in July 2005, MassDEP began to implement a randomly determined audit schedule, to establish a statistical basis for evaluations of workstation performance. While MassDEP’s audit program intends to audit each workstation at least once during each 12-month period, the use of randomized scheduling may result in some workstations not being audited during that period. EPA has agreed to the use of this approach for MassDEP’s audits.

inspections until repairs could be made. These 24 audits occurred at 24 different workstations located at 24 different stations. They constituted 1.4% of all 1,674 stations and 1.5% of all 1,639 workstations.

Eleven workstations were shut down because they failed more than one audit part: nine workstations were shut down because of problems with the gas bench, one workstation was shut down because of the gas cap tester and OBD system, and one was shut down because of the gas bench and VMAS. There were five workstations that were shut down due to serious gas bench issues that prevented a calibration after the first bench audit failure (and prevented the subsequent second bench audit).

4.2.3 AUDIT FAILURE SUMMARY

Table 7 summarizes the results of equipment audits from 2003 through 2006. Of particular interest is the significant improvement from the 13% failure rate for “combined critical gas bench/VMAS audit” items in 2004 to a 5% failure rate in 2006. Table 7 also demonstrates that the dramatic improvement in the overall audit failure rate, following the June 2004 program changes, continued in 2006. In 2006, 31% (630 of 2,065) of equipment audits failed one or more of the 88 audit criteria (described in Attachment C), compared with the 39% failure rate in 2005, the 55% failure rate in 2004 and the 83% failure rate in 2003. As noted in Section 4.2.1 above, most of these audit failures concerned minor audit criteria that do not directly affect the results of emissions tests.

As Table 7 shows, the 2006 failure rates for each audit part were either lower or equal to 2005 failure rates for all parts, with the exception of failures for the first gas bench audit and the second gas bench audit, which both increased slightly (2% and 3%, respectively). These minor increases were offset by the significant contractor declines in failure rates of other audit items, which largely result from improved maintenance of the workstations during the year (through the use of more frequent calibrations and digital audits, and through more frequent auditing).

The minor 2006 increases in gas bench failure rates should be considered in the context of trends in failure rates of all audit items since 2003. Failure rates for first gas bench audits have declined from a 22% failure rate in 2003 to a 6% failure rate in 2006. The 2% increase over 2005 failure rates is not significant, as it is within the bounds of reasonable year-to-year variation.

Second gas bench audits identify gas benches that fail their first audit, are successfully recalibrated, and then fail a second audit. While failures of these audits appear to be high, and have increased from 76% in 2003 to 83% in 2006, there are several considerations for an evaluation of this statistic:

- In 2006, MassDEP conducted 1,933 first gas bench audits, of which 108 failed. Of the first gas bench failures, 10 had such significant problems that they could not be recalibrated for a second audit, and calls for service were initiated. Of the

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remaining 98 gas benches that could be recalibrated and audited a second time, 81 (or 83%) failed the second audit.

- Since the number of gas benches that failed their first bench audit has decreased significantly since 2003, the small number of failed second gas bench audits is a large percentage of the number of first gas bench audit failures.
- The high percentage of second gas bench audit failures indicates two qualitative improvements since 2003: 1) these audits are successfully identifying gas benches that experienced a substantive failure after their last audit, and 2) better maintenance conducted by the program contractor generally takes care of small problems before they become audit failures so that these audits are no longer identifying gas benches that have minor problems that are temporarily resolved by a calibration.

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**Table 7: Equipment Audit Data Summary
2003 – 2006**

Audit Part	2003 Failure Rate	2004 Failure Rate	2005 Failure Rate	2006 Failure Rate
Visual Inspection	7%	6%	4%	4%
Gas Analyzer Visual Inspection	34%	11%	17%	8%
Weather Station	47%	27%	21%	17%
Leak Check	44%	7%	1%	1%
1 st Gas Bench Audit	22%	12%	4%	6%
2 nd Gas Bench Audit ⁸	76%	73%	80%	83%
Gas Cap Tester	17%	7%	2%	<1%
Inductive RPM Pickup	2%	3%	1%	<1%
OBDII RPM Pickup	1%	1%	<1% ⁹	<1%
OBDII Tester	5%	1%	<1%	0%
VMAS Visual Inspection	20%	4%	2%	2%
VMAS Dilute O ₂ Sensor	31%	27%	8%	3%
VMAS SAO Flow	11%	4%	2%	<1%
Overall Audit Result ¹⁰	83%	55%	39%	31%
Combined Gas Bench and VMAS ¹¹	38%	32%	12%	8%
Combined Critical Gas Bench/VMAS Audit Items ¹²	NA	13%	5%	5%

Six audit parts were selected from Table 7 and displayed in Figure 1 below. These audit parts represent continual decreases in failure rates.

⁸ Because the 2nd gas bench audit is conducted only after an initial bench audit failure and a successful calibration, a relatively small number of workstations receive a second bench audit (132 in 2003, 99 in 2004, 59 in 2005, and 98 in 2006).

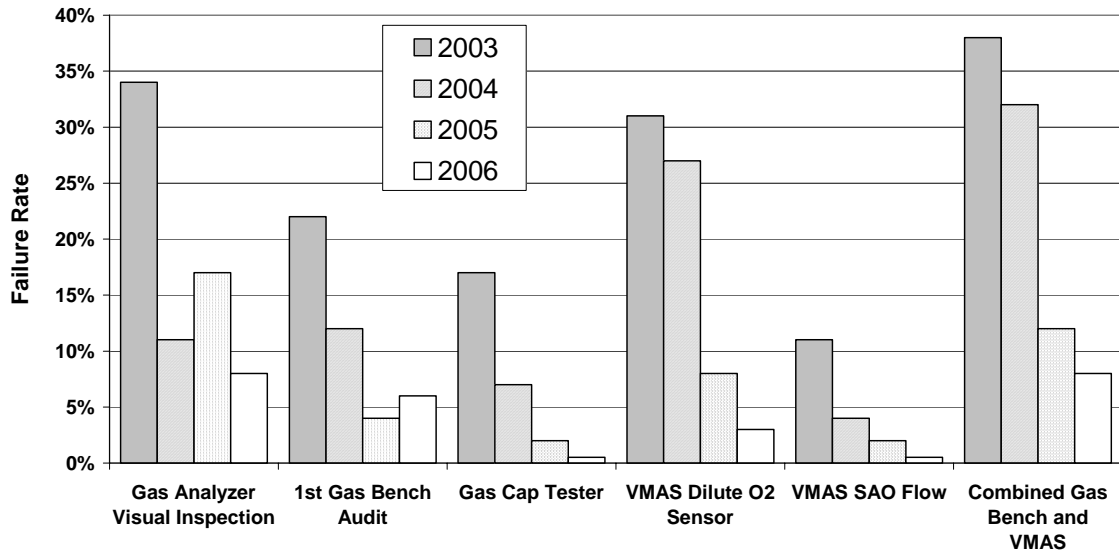
⁹ audit failure rates less than 1% are indicated as "<1%".

¹⁰ To pass the overall audit, the workstation cannot fail any individual audit part.

¹¹ Combined results from first gas bench, VMAS dilute O₂, and VMAS flow audits for each workstation audited.

¹² A Critical Gas Bench audit failure occurs when a bench fails its first bench audit, is re-calibrated, and then fails a second bench audit immediately after the calibration. Critical VMAS failure occurs when the VMAS fails the flow audit or 15% dilute O₂ audit. The Combined Critical Gas Bench/VMAS failure occurs when the workstation has a Critical Gas Bench or VMAS failure.

Figure 1: MassDEP Audit Failures for Select Audit Parts 2003-2006



4.2.4 AUDIT RESULTS FOR CRITICAL ITEMS

Of the critical workstation components, MassDEP monitors the performance of the gas bench and VMAS most closely. Figure 2 includes data from both initial audits and re-audits and presents the failure rate for combined critical gas bench/VMAS audits for 2004, 2005, and 2006. This graph highlights the significant improvement in failure rates for the combination of these critical components during the last half of the 2004, with continued improvements throughout 2005 and 2006.

Figure 2: Combined Critical Gas Bench/VMAS Audit Failure Rate 2004-2006

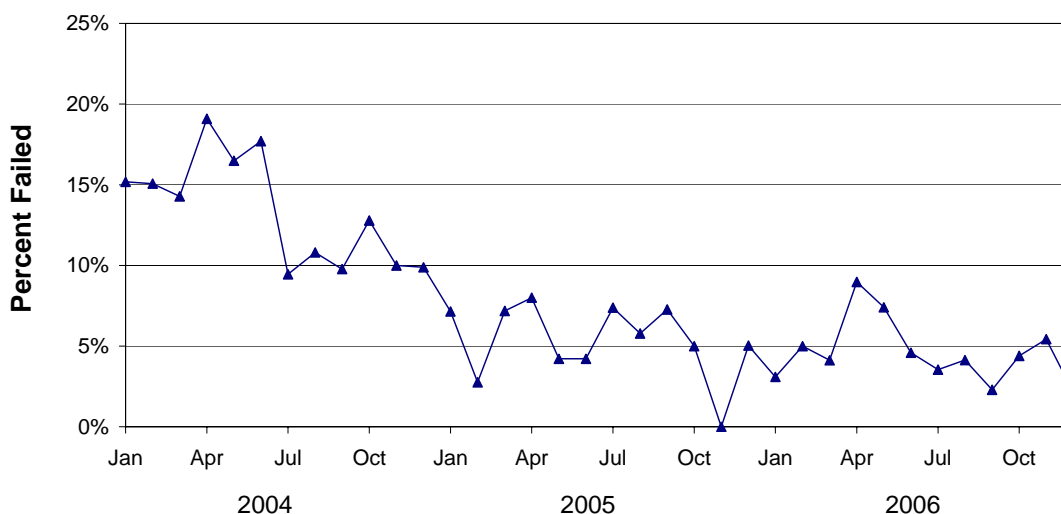


Figure 2 above also shows that the 2006 failure rate was highest in April and May. Applus investigated the April failures and identified bench issues that were tied to seasonal changes in humidity. Applus then trained all the repair technicians on newly developed repair strategies and preventative maintenance procedures. The improved failure rates in June 2006 reflect the implementation of the new repair strategies and preventative maintenance procedures.

4.3 Equipment Improvements and Contract Equipment Reliability Standards

Contract Amendment No. 4 (which was signed in June 2004) required specific changes in the Massachusetts I&M program that were designed to deal with equipment reliability issues that had been identified through audits in 2002 and 2003. To meet the Amendment’s reliability requirements, Applus found it necessary to replace all equipment supplied by one of the program’s two equipment vendors. The replacement

was completed in February 2005, and 2006 was the first complete calendar year in which the program functioned with the upgraded equipment.

Contract Amendment No. 4 also established specific equipment reliability standards, which required the program contractor to significantly increase its maintenance and monitoring of workstations and to provide early identification of needed adjustments and repairs. These standards ensure that the test equipment works reliably enough to consistently identify vehicles with emission systems in need of repair. The standards are used to determine whether the equipment is working at a sufficiently high level of reliability:

- Equipment components that are critical for accurately measuring vehicle emissions (known as “Tier 1” equipment components) must achieve a 90% reliability rate, based on initial random audits performed by MassDEP or its auditing contractor;¹³
- Other, less critical equipment components (known as “Tier 2” equipment components) must achieve an 85% reliability rate, based on initial random audits performed by MassDEP or its auditing contractor; and
- Critical components that are repaired after failing any audit must achieve a 95% reliability rate based on follow-up audits performed by MassDEP or its auditing contractor. (This contract requirement is known as the “Tier 1 reliability standard for follow-up audits.”)

To ensure that these reliability standards are met, Applus agreed to:

- Audit each inspection station quarterly to identify equipment that needed to be repaired;
- Increase its maintenance and monitoring of workstations as well as other Quality Control measures that identify degrading equipment before it fails an audit; and
- Automatically lock workstations out of the computer network when it fails periodic self-checks so it cannot be used until repaired.

An additional contract amendment (No. 6, signed by the Agencies and Applus on May 30, 2006) extended the contract through September 30, 2008, and augmented the reliability standards described above by requiring the contractor to:

- Improve its response time to requests from inspection stations for workstation repairs,
- Meet performance standards for workstation maintenance and repairs identified by digital and MassDEP audits;
- Upgrade workstation software to correct gas bench response times and VMAS flow adjustments,
- Reformat the Vehicle Inspection Report and implement a communications plan to encourage motorists to use a Registered Repairer for emission control system repairs,

¹³ Initial Random Audits are randomly selected using a protocol agreed to by Mass DEP and Applus. MassDEP conducted the first Initial Random Audits pursuant to this protocol in July 2005.

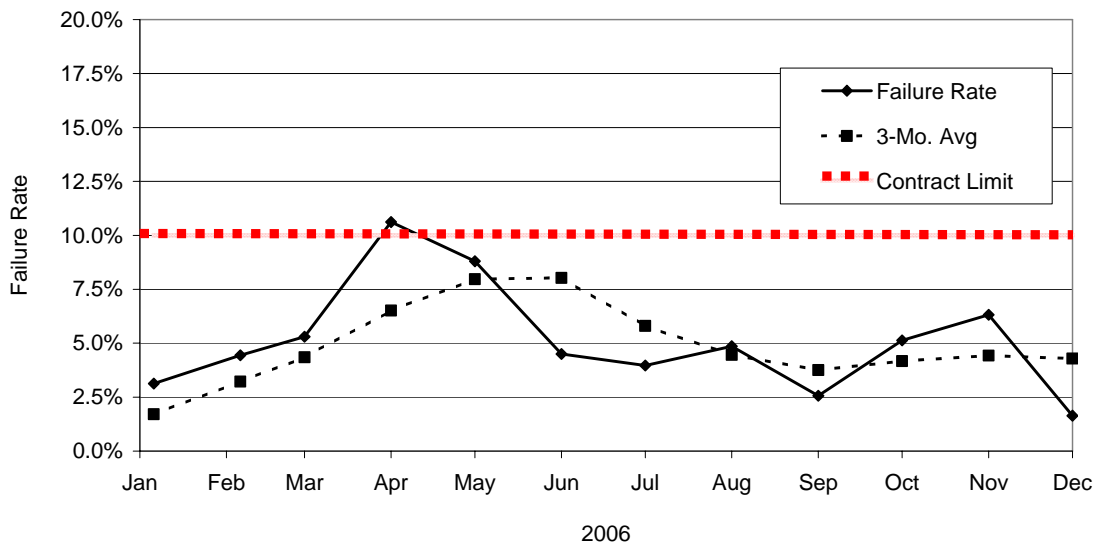
- Update and expand training for emission control repair technicians, and
- Correct the protocol for inspecting heavy-duty vehicles to require that parking brakes are “off” during an inspection.

The contract amendment included schedules for each requirement and performance standards to help ensure that the program contractor meets the requirements throughout the remaining term of the extended contract.

As a direct result of improvements in equipment service and maintenance made throughout 2006, Applus achieved the equipment reliability standards established in Contract Amendment No. 4.

The Tier 1 reliability standard focuses on four audit criteria (combined critical bench and VMAS, gas cap tester, weather station barometric pressure, and OBDII test system), and requires that their failure rates do not exceed 10% for initial random audits, measured by averaging failure rates for these items over rolling three-month periods. Figure 3 below describes monthly failure rates for combined bench and VMAS, the rolling three-month average failure rate, and the 90% reliability standard for initial random audits in 2006. Although combined bench and VMAS failures in April exceeded the Tier 1 standard of 10%, the three-month average failure rate did not exceed the 10% limit.

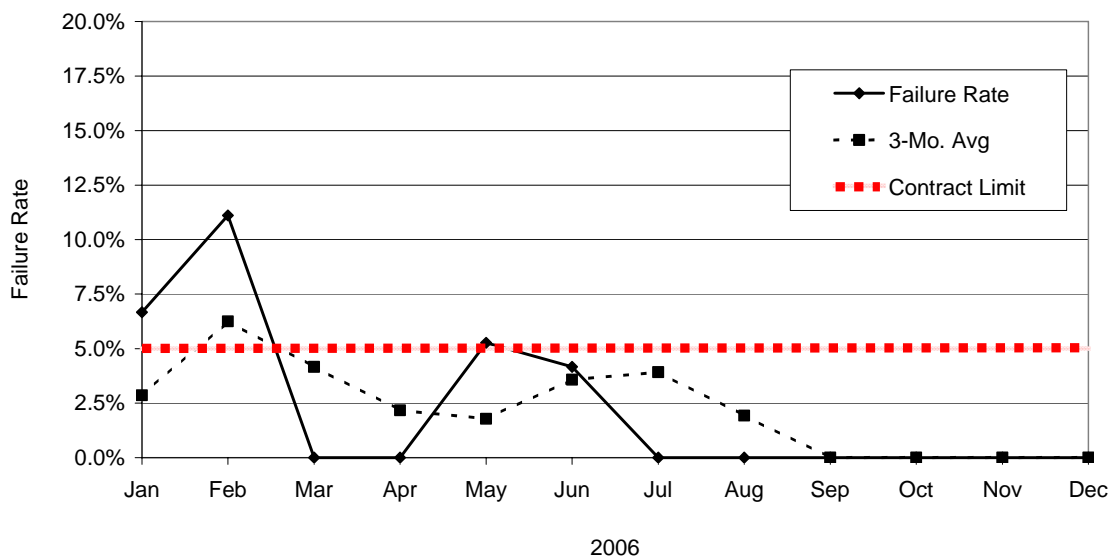
Figure 3: Tier 1 Initial Random Audit Failure Rate – Combined Bench & VMAS



The Tier 1 reliability standard also established a maximum failure rate of 5% for follow-up audits of the four critical items, averaged over rolling three-month periods. Figure 4 below describes the monthly failure rate in 2006 for follow-up audits of the combined bench and VMAS, the rolling three-month average failure rate, and the 95% reliability

standard. In 2006, there were only 4 months with Tier 1 follow-up audit failures: January, February, May and June. While three-month-average combined bench and VMAS failures exceeded 5% in February, there were an insufficient number of combined bench and VMAS audits for this performance standard to apply.¹⁴

Figure 4: Tier 1 Follow-Up Audit Failure Rate – Combined Bench & VMAS



The Tier 2 standards require that the three-month failure rate not exceed 15% for two additional but less critical audit criteria during initial random audits:

- First Gas Bench: the first gas bench audit fails, but the second gas bench audit (conducted after calibrating the bench) passes (i.e. the bench audit failure is not a Tier 1 failure) and
- Gas Cap Tester: the gas cap audit fails, but the second gas cap audit (conducted after calibrating the gas cap tester) passes (i.e. the gas cap audit failure is not a Tier 1 failure).

The Tier 2 audit results have a uniformly low failure rate: monthly failure rates were usually zero, and were always below 3%. Therefore, in 2006 the failure rates for Tier 2 items met the established performance standards.

¹⁴ To evaluate contractor performance with the Tier 1 standard for follow-up audits, the number of follow-up audits must be 3-1/3% of the workstations capable of performing emissions tests of nondiesel vehicles. Because the number of critical component failures is typically low, the number of follow-up audits is frequently below this minimum threshold.

4.4 Equipment Audits Performed by the Program Contractor

Applus also performs equipment audits, using performance standards that are comparable to those used by MassDEP and SGS Testcom. Applus has provided MassDEP with data from their equipment audits conducted in 2006. A summary of this data is presented in Table 8.

**Table 8: 2006 Equipment Audit Failure Rates:
A Comparison of MassDEP and Applus Technologies Audit Results**

Audit Part	2006 MassDEP Failure Rate	2006 Applus Technologies Failure Rate
Visual Inspection	4%	1%
Gas Analyzer Visual Inspection	8%	12%
Weather Station	17%	NA ¹⁵
Leak Check	1%	3%
1 st Gas Bench Audit	6%	7%
2 nd Gas Bench Audit	83%	NA
Gas Cap Tester	<1%	<1%
Inductive RPM Pickup	<1%	NA
OBDII RPM Pickup	<1%	NA
OBDII Tester	0%	NA
VMAS Visual Inspection	2%	3%
VMAS Dilute O2 Sensor	3%	3%
VMAS SAO Flow	<1%	4%
Overall Audit Result ¹⁶	31%	24%
Combined Gas Bench and VMAS ¹⁷	8%	11%

Table 8 identifies a few areas where MassDEP and Applus equipment audits found notably different failure rates. This was due to a few differences in audit procedures. Most significantly, workstation components whose condition would result in a failure of a MassDEP audit were replaced or repaired during Applus' equipment audits. Table 8 identifies Applus audits as "failures" if Applus replaces or repairs a component during

¹⁵ "NA" means "not applicable" because Applus does not conduct this portion of the MassDEP audit.

¹⁶ To pass the overall audit, the workstation cannot fail any individual audit criteria. The Mass DEP audit includes more audit criteria than Applus' audit.

¹⁷ This reflects combined results from first gas bench, VMAS dilute O2, and VMAS flow audits for each workstation audited.

the audit even though the condition of the equipment at the end of an Applus audit would pass.

5 STATION AND INSPECTOR OVERSIGHT

In the Massachusetts I&M Program, overt and covert audits are conducted to assess station and inspector performance. The results of each type of audit in 2006 are described in this section.

5.1 Overt Performance Audits

40 CFR 51.366 (b) (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;

The RMV conducts regular site visits/performance audits to determine if the inspectors are correctly performing all tests and the station's physical conditions continue to meet program requirements. RMV typically visits inspection stations quarterly and performs additional visits to follow up on past problems or to investigate stations or inspectors that are suspected of violating regulations based on consumer complaints or data analysis.

Applus (through a subcontractor) maintains records of all inspections in a database to which MassDEP and RMV had access. RMV conducts monthly "digital audits" before visiting stations, to identify areas and stations that may need investigation. A "digital audit" is a query of the database for information that may indicate issues warranting attention during the site visit. Digital audit items include the station's inspection failure rate and vehicle characteristics recorded during the inspection that do not match the vehicle information in the registration database.

The RMV site visits cover a wide range of items including:

- Observing inspectors performing an inspection;
- Examining station and inspector licenses;
- Collecting voided inspection stickers and checking to see that stickers are stored in a secure location;
- Examining the inspection equipment and bay;
- Supplementing the inspector's training; and
- Investigating consumer complaints and/or anomalous digital audit findings.

RMV staff prepares a written report summarizing the results of each inspection. Violations of policies or regulations identified at site visits are forwarded to RMV headquarters for possible enforcement action.

In 2006, RMV conducted 6,186 overt station visits/audits. All 1,401 stations and 1,472 workstations that operated throughout the year received at least one audit in 2006, and most stations received an audit each quarter.

5.2 Covert Audits

Covert audits, or “covert performance audits” are under-cover inspections done with vehicles set to fail one or more parts of the emissions test. This section summarizes covert audits performed by Applus. While Registry staff also conduct covert audits as part of their enforcement activities, their covert audits are not included in the following tables.

Stations are selected for covert audits for four reasons, as described in Table 9.

Table 9: 2006 Covert Audit Selection Criteria

Selection Criteria	Count of Audits
Mass DEP or RMV Request	15
Data Analysis	538
Random Selection	1,086
No Reason Listed	12
TOTAL 2006 COVERT AUDITS	1,651

Some stations received more than one covert audit, as described in Table 10.

Table 10: 2006 Covert Audits Per Station

Number of Audits Per Station	Count of Stations
1	549
2	503
3	32
Total Number of Stations Audited	1,084
Total Number of 2006 Audits	1,651

5.2.1 COVERT AUDITORS AND COVERT VEHICLES

40 CFR 51.366 (b) (8): The total number of covert vehicles available for undercover audits over the year;
 (b) (9): The number of covert auditors available for undercover audits.

Covert audit vehicles are selected to represent the range of vehicle technology groups (e.g., carbureted and fuel injected vehicles) covered by the program. Eleven vehicles were used for covert audits in 2006. The types and technologies of these vehicles are described in Table 14, in section 5.2.4 below.

Covert auditors are re-certified on an annual basis to perform covert vehicle and visual audits.

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Table 11: Covert Auditors¹⁸ in 2006

Number of full time auditors on staff at all times during 2006	5
Total full time auditors employed during 2006	5
<u>Additional personnel trained and certified to perform covert audits</u>	<u>12</u>

5.2.2 NUMBER OF COVERT AUDITS CONDUCTED IN 2006

40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year: . . .
(iii) Receiving covert performance audits in the year;
(iv) Not receiving covert performance audits in the year;

Table 12 summarizes the number of covert audits conducted during 2006 for each type of inspection station.

¹⁸ Though the RMV conducts covert performance audits and covert visual audits as part of their investigations, the RMV auditors are not included in the counts of covert auditors.

Table 12: Number of Inspection Stations and Covert Audits in 2006

		2006 # of Stations ²⁰	2006 Covert Audits ¹⁹		Stations NOT Receiving Covert Audits
			Audited Stations	# Of Audits	
Operating Throughout the Year	Fleet stations	52	0	0	52
	Public stations	1,349	977	1,524	372
	All stations	1,401	977	1,524	424
Operating Part of the Year	Fleet stations	57	0	0	57
	Public Stations	216	107	127	109
	All stations	273	107	127	166
TOTAL		1,674	1,084	1,651	590

Table 13 shows the total number of workstations in the inspection network and the number of workstations that received covert audits. A workstation is counted as “operating throughout the year” if it conducted at least one emissions inspection each month of the year. Since a workstation may have been located at multiple stations, more workstations operated throughout the year than did inspection stations.

Since the inspector is required to drive the vehicle into the inspection bay during a covert audit, the covert auditor has no control over which workstation is used at stations with multiple workstations.

¹⁹ Only public stations can receive covert audits because fleet stations only test vehicles that are part of the company’s fleet, making it impossible for Applus to present a covert, or “undercover” vehicle for testing. Also, covert audits are not conducted at stations that inspect only diesel-fueled vehicles.

²⁰ In order to be considered “operating throughout the year” a station must have conducted at least one emissions test during each month of the year.

Table 13: Number of Workstations and Covert Audits in 2006

	# of Workstations	Audited Workstations	# Of Audits	Workstations Not Audited
Operating Throughout the Year	1,472	1,009	1,576	463
Operating Part of the Year	167	60	75	107
TOTAL	1,639	1,069	1,651	570

5.2.3 COVERT AUDIT OVERVIEW

A “false pass” on a covert audit is an inspection that passes a vehicle that was set to fail. The covert audit does not indicate whether the cause of a false pass was related to the equipment or the inspector. Follow-up investigations conducted by Applus and the RMV address the cause of any false passes. When RMV staff investigates false passes as part of a site visit, they initiate enforcement actions and/or provide supplementary inspector training on proper test procedures. RMV refers other information about possible emissions equipment problems to MassDEP for follow-up.

Covert vehicles are set to fail in one of two ways:

- set to fail one test type: either the transient test, two-speed idle, or OBD test, or
- set to fail a combination of test types including: the gas cap test in addition to either a transient, two-speed idle, or OBD test.

5.2.4 COVERT AUDIT RESULTS BY TYPE OF FAILING EMISSIONS TEST

40 CFR 51.366 (b) (3): The number of covert audits:

- (i) Conducted with the vehicle set to fail per test type;
- (iii) Resulting in a false pass per test type;

Table 14 and Table 15 (below) summarize the results of the covert audits by the type of emissions failure that was implanted in the covert vehicle. Table 14 shows the false passes for transient, TSI, and OBD tests. All audits were conducted with vehicles set to fail one of these emissions test types.

Some audits were conducted with vehicles set to fail a second emissions test: the gas cap test. Table 15 summarizes the number of audits that falsely passed the gas cap test, when the gas cap was set to fail.

Key findings from the emissions tests presented in Table 14 are:

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- 8.8% of all covert audits resulted in false passes for transient, TSI or OBDII emissions tests.
- 62% (90 of 145) of the false passes in Table 14 were caused by inspectors improperly changing the test type from transient to TSI (the TSI test does not test for NO_x). These switched test types were for a single audit vehicle with four-wheel drive that can be disengaged.
- Nine covert audits (0.5%) that should have received an emissions test incorrectly received a safety-only test. These nine audits are counted as falsely passing in Table 14.

**Table 14: 2006 Covert Audit Results:
False Passes for Transient TSI and OBD Tests²¹**

Emissions Test Type Set to Fail	Model Year	Vehicle Type and Technology²²	Specific Failures	Total Audits	Falsely Passed²³	Percent Falsely Passed
Transient	1984 to 1987	LDGV & LDGT	HC and/or CO Failure	79	6	7.6%
Transient	1988 to 1995	LDGV & LDGT	HC and/or CO Failure	521	10	1.9%
Transient	1988 to 1995	LDGV & LDGT	NOx Failure	365	106 ²⁴	29.0%
OBDII	1996 +	LDGV & LDGT, OBDII equipped	OBDII Failure	456	3	0.7%
Two-Speed Idle	Any	LDGV, AWD	HC and/or CO Failure	230	20	8.7%
Totals for Audits with One Test Type Set to Fail				1,651	145	8.8%

Because all covert audits are that are set to fail the gas cap test are also set to fail another type of emissions test (transient, TSI, or OBDII), the false passes for gas cap tests are summarized separately in Table 15 below. The vast majority of covert audit false passes were for the gas cap test, with 57.4% of gas cap audits resulting in a false pass.

**Table 15: 2006 Covert Audit Results:
False Passes for Gas Cap Tests**

Emissions Test Type Set to Fail	Model Year	Vehicle Type and Technology	Specific Failures	Total Audits	Falsely Passed²⁵	Percent Falsely Passed
Gas Cap	Any	Any	Gas Cap Functional Failure	784	450	57.4%

²¹ The Registry also conducts some covert audits as part of its investigations. Registry audits are not included in the "Covert Audit Results" tables.

²² LDGV: light duty gasoline vehicle; LDGT: light duty gasoline truck; AWD: all wheel drive.

²³ "Falsely passed" includes inspections that passed on the correct type of emissions test, that passed on the incorrect type of emissions test, or that skipped the transient test based on the inspector's claim there was a safety issue. For the transient tests that were skipped due to safety, a transient test would have been required if the vehicle returned to the station for a re-test.

²⁴ These false passes include 90 passes for vehicles that were incorrectly given a TSI test. The TSI test does not address NOx.

²⁵ "Falsely passed" includes inspections that passed the functional gas cap test or that incorrectly indicated that a gas cap adaptor was not available.

5.2.5 COVERT AUDIT RESULTS OF VEHICLES SET TO FAIL A COMBINATION OF TEST TYPES

40 CFR 51.366 (b) (3): The number of covert audits:
 (ii) Conducted with the vehicle set to fail any combination of two or more test types;
 (iv) Resulting in a false pass for any combination of two or more test types;

Table 16 below summarizes the false passes for covert vehicles, by the number of emissions tests the vehicles were set to fail. Covert audits conducted with vehicles set to fail two types of emissions tests used a combination of test types including the gas cap test and one of the other three emissions tests: transient, TSI, and OBD II. 71% of these covert audits falsely passed one or more item.

As can be seen in Table 16:

- 40.8% of all covert audits resulted in false passes for one or more test type.
- Falsely passing gas caps constituted 27.3% of all covert audits

**Table 16: 2006 Covert Audit Results:
By Number of Emissions Tests Set to Fail**

Covert Audit Results by Vehicle Test Type	Total Audits	Falsely Passed 1 or More Test Type	Percent Falsely Passed 1 or More Test Type
Totals for Audits with Only One Type of Emissions Test Set to Fail	867	116	13.4%
Totals for Audits with Two Types of Emissions Tests Set to Fail	784	557	71.0%
Totals for All Audits	1,651	673	40.8%

While the percentage of false passes may appear to be high, many (more than 30% of all covert audits) are prompted by suspected problems at stations. Therefore, the expected percentage of false passes for the fleet as a whole may be lower than the false-pass rate for covert audits.

Of the covert audit vehicles that had two audit criteria set to "fail", many were OBD-equipped. Since the OBD test checks the entire vapor control system, the inspectors who falsely passed these vehicles may not have understood that the gas cap test remains part of the inspection protocol, and therefore may have skipped this test element. Because more than three-quarters of the Massachusetts fleet is equipped with OBD, and because the OBD system performs a more comprehensive check of vapor controls than the gas cap-only test that is also used for testing non-OBD equipped vehicles, Massachusetts will

phase out the gas cap test when the program transitions to an OBD-only emissions test (starting in October 2008).

When a covert audit identifies a false passing test, the result is sent to RMV for more in-depth investigation and possible enforcement action against the station and/or the inspector. Enforcement actions are described in Section 5.2.6 below.

5.2.6 STATION AND INSPECTOR HEARING RESULTS

40 CFR 51.366 (b) (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;

40 CFR 51.366 (b) (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

40 CFR 51.366 (b) (2): The number of inspection stations and lanes operating throughout the year: . . .

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

Table 17 summarizes the results of the Registry's hearings for stations and inspectors, and tabulates the written violations issued to stations and inspectors.²⁶

²⁶ A tally of the adverse actions, such as "cease and desist," that were instituted on-site before the hearings is not available.

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Table 17: 2006 Audit and Enforcement Statistics

	Number of Enforcement Actions	
Stations		
Total Number of Written Violations	563	
Warning Letters (no hearing)		69
Other		27
Total Number of Hearings	467	
Revoke		9
Suspensions		192
Warnings		173
No action taken		4
Other ²⁷		89
Inspectors		
Total Number of Written Violations	565	
Warning Letters (no hearing)		112
Total Number of Hearings	453	
Revoke		9
Suspensions		153
Retraining		19
Warnings		251
Other		5
No Action Taken		16

5.2.7 FINES COLLECTED

40 CFR 51.366 (b) (4): The number of inspectors and stations: . . . (iii) That received fines;
 40 CFR 51.366 (b) (7): The total amount collected in fines from inspectors and stations by type of violation;

Massachusetts does not collect fines from stations or inspectors.

5.2.8 STATION COMPLIANCE DOCUMENTS - ISSUED AND MISSING DOCUMENTS

40 CFR 51.366 (d) (1) (iii): The total number of compliance documents issued to inspection stations;
 (iv) The number of missing compliance documents;

²⁷ "Other" includes cases for which proceedings (including any appeals) had not been completed by the end of the calendar year.

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Stations were issued 5,454,900 stickers in 2006. A total of 220 stickers were “unaccounted for” by the contractor. Those “unaccounted for” stickers include stickers that were damaged, misprinted, or were otherwise defective, as well as damaged stickers that were picked up by the RMV on site visits. In addition to the 220 unaccounted for stickers, the stations noted in the database that another 278 stickers were stolen.

6 EMISSIONS TEST RESULTS

6.1 Emissions Tests and the Massachusetts Fleet

Of the 1,992,172 unique gasoline-fueled vehicles that received an initial emissions test during 2006, 189,272 (or 9.5%) failed their initial test. Of the 41,759 unique diesel-fueled vehicles that received an initial emissions test in 2006, 443 (or 1.1%) failed their initial test. The Massachusetts Program requires that the vehicle be repaired and re-tested within 60 days of the failing test.

Table 18 summarizes the failure rates for initial emissions tests in Massachusetts in 2006:

Table 18: 2006 Failure Rate for Initial Emissions Tests

	Initial Emissions Failure Rate ²⁸		
	Model Years 1984-1995	Model Years 1996 and newer	Total
Gasoline-Fueled Vehicles	11.7%	9.0%	9.5%
Diesel fueled	2.8%	0.4%	1.1%
All Initial Emissions Tests	11.4%	8.9%	9.3%

Please note:

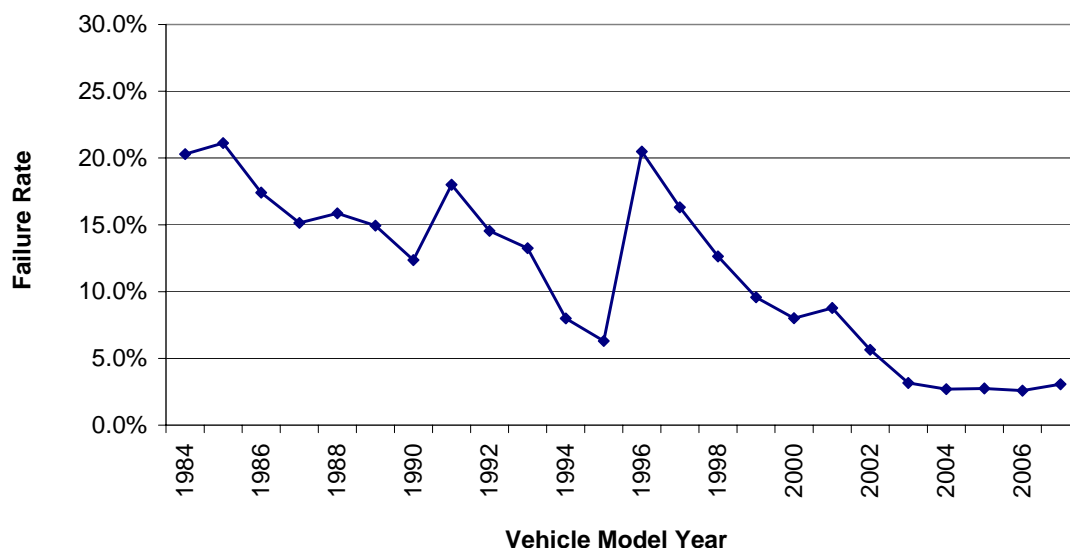
- Eighty-six percent of the vehicles that failed their initial emissions test passed a re-test (presumably after repairing the problem that caused them to fail the initial test).
- A very few vehicles were repaired but were still not able to pass a re-test, and were granted a waiver of the emission requirements. In 2006, waivers were granted for 165 vehicles (or less than 0.1% of the vehicles that failed their initial emissions test).
- Of the vehicles that failed their initial test during 2006, 49,852 (or 26.3%) had neither passed a re-test nor obtained a waiver by March 31, 2007.
- Massachusetts started OBD II “Pass Fail” testing on June 15, 2004, for 1996 and newer OBD-equipped vehicles. For the OBDII test, the inspector downloads data from the vehicle's computer regarding its emission control system and those data are used to determine the emission test result.

Details of all 2006 emissions test results are included in Attachment B.

²⁸ The emissions failure rates only consider OBD and tailpipe results, and do not take into account visual or gas cap failures.

Figure 5 below shows 2006 emissions failure rates by model year for gasoline-fueled vehicles. As can be seen, the age of the vehicle has a significant impact on failure rate. The Massachusetts I&M program is not designed to achieve a specific overall failure rate or a specific failure rate for any particular test or type of vehicle.

Figure 5: 2006 Failure Rate by Model Year – Non-Diesel Initial Emissions Tests



6.2 Emission Reductions from Repaired Transient-Tested Vehicles in 2006

40 CFR 51.366 (a) (5): The average increase or decrease in tailpipe emission levels for HC, CO, and NOx (if applicable) after repairs by model year and vehicle type for vehicles receiving a mass emissions test.

EPA requires states to calculate emission reductions from vehicles that are repaired after failing a “transient” emissions test²⁹. Of the 40,155 vehicles that failed an initial transient test in 2006, 26,428 vehicles were successfully repaired and passed a subsequent transient test. Based on an examination of the emissions data for the initial failing transient test and the emissions data for the subsequent passing transient retests, these repairs were estimated to have reduced the emissions of those vehicles by an average of 73% for hydrocarbons, 79% for carbon monoxide and 59% for oxides of nitrogen.

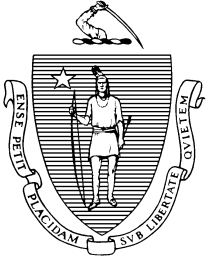
Section 5 of Attachment B describes the average change in emissions measured by the transient test after repairs, by model year and vehicle type.

²⁹ One of the three types of emissions tests used in Massachusetts, which measures specific pollutants in tailpipe exhaust from gasoline-fueled vehicles

6.3 Overall Conclusions about Program Operation During 2006

Several conclusions can be drawn from the program information reviewed for the 2006 Annual Report:

- Equipment audits indicate that the performance of the testing equipment has improved markedly over the last three years. The contractor consistently met the three reliability standards established by Contract Amendment No. 4 during 2006, and audit failure rate for almost all criteria are well below expected levels.
- Most vehicles that fail an initial emissions test are repaired successfully and pass a re-test, with significant improvements in emissions. The program continues to issue a very small number of waivers of the emission standards (165 in 2006), far below the commitment in Massachusetts' I&M SIP of limiting waivers to no more than 1% of vehicles that fail an initial emissions test.
- The portion of the fleet that is capable of using OBD II for emissions testing has continued to grow (up to 77.7% in 2006). OBD testing provides better oversight of vehicle emission systems and identifies many problems before they become significant sources of emissions.



COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Attachment A: Index of Report Pages Relevant to EPA Regulation Sections

Massachusetts Enhanced Emissions and Safety Test
Inspection and Maintenance Program

Attachment A: Index of Report Pages Relevant to EPA Regulation Sections

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