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Executive Office of Energy & Environmental Affairs

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## 2021 Annual Report

### Massachusetts Vehicle Check Inspection and Maintenance Program

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## **2021 Annual Report**

### **Massachusetts Enhanced Inspection and Maintenance Program**

#### **1 EXECUTIVE SUMMARY**

This Annual Report is required by the U.S. Environmental Protection Agency (EPA) under 40 CFR 51.366. This regulation requires that annual reports cover four categories of information:<sup>1</sup>

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

2021 was the thirteenth full year of operation of Massachusetts Vehicle Check, the Commonwealth's enhanced Inspection and Maintenance (I&M) Program.

The Massachusetts Department of Environmental Protection (MassDEP) and the Massachusetts Department of Transportation's Registry of Motor Vehicles Division (RMV) jointly administer the Massachusetts Vehicle Check Program. In November 2016, the Commonwealth contracted with Applus Technologies to manage and implement the program starting on October 1, 2017. This contract continues the same program design established October 1, 2008 and adds new features to assist with program oversight that are described in the biennial reports. The Massachusetts Vehicle Check is a comprehensive vehicle emissions and safety testing program including:

- Inspections provided by a decentralized network of inspection stations;
- Stations and inspectors licensed by the Commonwealth;
- Annual safety tests;
- Commercial vehicle safety inspections that meet U.S. Department of Transportation requirements, so these vehicles only need one comprehensive check;
- An annual On-Board Diagnostic (OBD) emissions test for vehicles that are equipped with OBD systems (vehicles 15 or more years old are exempt);
- An annual opacity test for emissions for diesel vehicles model year 1984 and newer greater than 10,000 lbs. gross vehicle weight rating (GVWR) that are not equipped with OBD;
- A safety test and any applicable emissions test upon transfer of ownership;
- A requirement that vehicles that fail their initial emissions test be repaired and pass a re-test within 60 days;
- Waiver eligibility, for a one-year waiver of the emissions standards, for certain vehicles that fail their emissions test after being repaired by a state-registered repairer;

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

- An “economic hardship” extension for vehicles that failed their emissions test and require replacement of a major (and expensive) component to pass, giving the vehicle owner one year to finance repairs or replace the vehicle;
- Ten Motorist Assistance Centers (MACs) located across the state to provide information to motorists, technical assistance to repair technicians, help with getting vehicles “ready” for testing after emissions repairs, vehicle evaluations for repair waivers and economic hardship extensions, and vehicle testing quality assurance;
- Market-based fees for commercial vehicle inspections; and
- An inspection fee of \$35 for non-commercial vehicles. The fee was increased from \$29 to \$35 on July 1, 2014, the first increase since 1999.

The Agencies amended the program’s implementing regulations (MassDEP at 310 CMR 60.02, and RMV at 540 CMR 4.00-4.09) to incorporate these changes in September 2008, and the enhanced program started operation on October 1, 2008. A revision to the Massachusetts State Implementation Plan (SIP), reflecting the changes to MassDEP and RMV regulations, was submitted to EPA in June 2009, with a minor revision in November, 2009. The regulatory changes received EPA approval effective March 26, 2013.

This report covers the period between January 1, 2021 and December 31, 2021.

## **1.1 Major Findings**

### ***Emissions Tests Conducted***

In 2021, an annual emissions test was required for the majority of the fleet. The following non-diesel<sup>2</sup> vehicles required an OBD test:

- Vehicles with model year 2007 weighing 8,500 lbs. GVWR or less,
- Model year 2008 and newer vehicles weighing 14,000 lbs. GVWR or less.

The following diesel vehicles required an OBD test:

- Model year 2007 and newer vehicles weighing 14,000 lbs. GVWR or less.

Heavy-duty diesel vehicles (weighing over 10,000 lbs. GVWR) with model year 1984 or newer that were not subject to the OBD test required an opacity test.

An emissions test was also required when a vehicle meeting any of the above requirements changed ownership or had its registration transferred to Massachusetts from another state.

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<sup>2</sup> A diesel vehicle is defined as a vehicle powered by an engine using a compression ignition thermodynamic cycle. Non-diesel vehicles are typically fueled with gasoline, including hybrids, but may also be powered by alternative fuels such as natural gas.

In 2021, there were approximately 5.51 million vehicles registered in Massachusetts. From January 1, 2021 through December 31, 2021, the I&M Program conducted 3,743,577<sup>3</sup> emissions tests, including initial tests and retests. 3,606,392 unique vehicles (65% of the Massachusetts fleet) received an initial emissions test in 2021. Of these vehicles, 3,488,981 were non-diesel fueled (e.g., gasoline, natural gas, etc.) and 117,411 were diesel fueled.

### ***Motorist Compliance and Enforcement***

Of the 3,488,981 non-diesel vehicles complying with program's testing requirements and receiving an initial OBD test in 2021, 138,942 (4.0%) failed their initial test. Of the 36,407 diesel vehicles receiving an initial OBD test, 4,852 (13.3%) failed their initial test. Of the 81,004 diesel vehicles receiving an initial opacity test, 1,257 (1.6%) failed their initial test.

Of all non-diesel vehicles tested, 21,834 (0.6%) did not comply with program requirements and pass a subsequent retest or receive a waiver or hardship extension. Seven waivers from the requirement that failing vehicles pass an emissions re-test were granted in 2021 (less than 0.01% of vehicles failing initial emissions tests), along with 26 economic hardship extensions (less than 0.1% of vehicles failing initial emissions tests). Of all diesel vehicles receiving an OBD test, 1,300 (3.6%) did not pass a subsequent retest.

Vehicles failing to receive safety inspections or emissions tests when required are subject to enforcement by RMV as well as state and local law enforcement agencies.

### ***Station and Inspector Oversight***

In 2021, RMV performed 6,807 site audits to determine if program inspectors were correctly performing all safety and emissions tests and if the station's physical conditions continued to meet program requirements. All stations operating throughout the year received at least one visit. Based on the results of the site audits and other data, RMV held 426 hearings for stations and issued 421 adverse actions against stations (e.g., warning letters, license revocations or license suspensions).

In 2021, 6,696 licensed inspectors performed at least one test. Based on the results of the site audits and other data, RMV held 405 hearings for inspectors, and issued 421 adverse actions against inspectors (e.g., warnings, license revocations or license suspensions).

MassDEP and the Attorney General's Office complement RMV enforcement actions where there is substantial or repeat noncompliance by a station or inspector. In 2021 MassDEP and the Attorney General's Office have one on-going case where the station and inspectors performed improper diesel opacity and commercial safety inspections.

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<sup>3</sup> The 3,606,392 emissions tests reflect one initial test for the year for each vehicle, even though some vehicles go through the emissions test cycle more than once because of off-cycle tests at change of ownership.

### ***2021 Program Changes***

There were no significant changes to the program in 2021. Beginning on October 1, 2017, several new measures were implemented to aid with program oversight. A digital image of the inspector is now automatically captured when the inspector logs into the workstation to perform an inspection. This helps verify the identity of the inspector. Also, the inspector is now required to take the following 4 images of the vehicle being inspected using a handheld digital camera: 1) front of the vehicle, 2) rear of the vehicle, 3) vehicle identification number (VIN) tag, and 4) odometer reading. These images help verify the identity of the vehicle being inspected and its mileage. These images all become part of the inspection record.

Beginning in February 2018 the workstation software began to record video of the inspection from one of three inspection bay cameras installed at stations. The other two inspection bay cameras capture several still images throughout the inspection from different views. At the completion of each inspection, the video and images are uploaded to the Vehicle Inspection Database (VID) and become part of the inspection record. Beginning in March 2018 the program implemented a test interruption procedure in the software that automatically stops an inspection when certain anomalies are found (described in section 5.2 Digital Audits.) When the interrupt occurs, the inspector must communicate with a program representative to determine if the action or change is valid in order to proceed. If it is not valid, the inspection is aborted, and the inspector must begin the inspection again. The Agencies continue to pursue additional test interruptions to improve inspection oversight and program compliance.

## **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)

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: 2021 Detailed Emissions Test Data
- Attachment C: 2021 Test Data by Station

## 2 THE MASSACHUSETTS I&M PROGRAM

### 2.1 Why Does Massachusetts Have an I&M Program?

The Clean Air Act requires I&M programs in areas in the U.S. most impacted by ozone and carbon monoxide pollution, as well as in states that are part of the Ozone Transport Region (OTR). As a result of having areas designated nonattainment for the 1997 8-hour ozone NAAQS and by virtue of its inclusion in the OTR, Massachusetts has implemented a statewide enhanced I&M program. Massachusetts has since attained the 1997 ozone NAAQS (and was designated as unclassifiable/attainment for the current 2015 ozone NAAQS). To maintain the air quality improvements that have been made, Massachusetts must continue to implement a variety of federally mandated programs,<sup>4</sup> including the I&M program. EPA sets minimum standards for I&M programs.<sup>5</sup>

The Massachusetts I&M Program (currently known as “Massachusetts Vehicle Check”) was authorized by the Legislature by Chapter 210 of the Acts of 1997 and is jointly administered by MassDEP and RMV. The program’s goals are to implement a comprehensive test that provides the emission reductions needed for the Massachusetts SIP, provide convenience to motorists, ensure vehicle safety, and work 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 November 2016, the Commonwealth contracted with Applus Technologies to supply inspection equipment and operate the Massachusetts I&M Program starting October 1, 2017. This report describes the program in 2021.

### 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;
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In 2021, there were approximately 5.51 million vehicles required to receive an annual inspection in the Massachusetts fleet. All registered vehicles except non-commercial trailers and camp trailers must receive a safety inspection every year, and the vast majority must also receive an emissions test every year. In addition, vehicles are required to receive a safety and an emissions inspection within seven days of transfer of ownership, or within seven days of their initial Massachusetts registration when transferring registration from another state.

In 2021, non-diesel<sup>6</sup> vehicles were exempted from the emissions inspection if they were:

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<sup>4</sup> These programs are established in legally binding and federally enforceable “State Implementation Plans” or “SIPs.”

<sup>5</sup> 40 CFR Part 51, Subpart S (§51.350 et seq.)

<sup>6</sup>Non-diesel vehicles are typically fueled with gasoline, including hybrids, but may also be powered by alternative fuels such as natural gas.



- Light-duty vehicles older than model year 2007,
- Medium-duty vehicles older than model year 2008, or
- Heavy-duty vehicles

Diesel vehicles were exempted from the emissions inspection in 2021 if they were:

- Light-duty vehicles older than model year 2007,
- Medium-duty vehicles with a gross vehicle weight rating (GVWR) of 10,000 lbs. or less and older than model year 2007, or
- Heavy-duty vehicles with a GVWR of more than 10,000 lbs. and older than model year 1984.

Also exempted were vehicles of any type that were less than one year old and still registered to the original owner.

### 2.3 Inspection Stations

40 CFR 51.366 (b) <sup>7</sup> (1): The number of inspection stations and lanes: (i) Operating throughout the year; and (ii) Operating for only part of the year;
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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 2021, 1,554 stations conducted emissions tests (OBD and/or diesel opacity) throughout the year, and another 223 conducted tests during part of the year. There were 1,617 “workstations” or sets of inspection equipment used for testing emissions throughout 2021, and 184 workstations used for testing emissions during part of the year. A small number of inspection stations have more than one workstation. In Massachusetts, the number of workstations is equivalent to the number of lanes in a centralized testing program. Table 1 shows the numbers of workstations and stations testing emissions throughout the year and for part of the year.

At any given time, some of the workstations and stations are not operating, due to factors such as station renovation, or change of ownership or location. Table 1 also shows that 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.

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<sup>7</sup>For 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.

**Table 1: Number of Stations and Workstations Testing Emissions in 2021**

	Workstations	Stations
Testing All Year	1,617	1,554
Testing for Part of Year	184	223
Total During Year	1,801	1,777
Testing in December	1,743	1,694

Table 2 shows the breakdown of fleet and public stations.

**Table 2: Public and Fleet Stations in 2021**

	Public	Fleet	Total Stations
Testing All Year	1,470	84	1,554
Testing for Part of Year	162	61	223
Total During Year	1,632	145	1,777
Testing in December	1,566	128	1,694

In Tables 1 and 2, a station or workstation must have conducted emissions inspections in each month in 2021 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 2021 there were 6,881 trained and licensed inspectors certified to conduct emission tests (see Table 3). In 2021 6,663 inspectors conducted at least one emissions test and 6,696 inspectors tested at least one vehicle for safety or safety plus emissions.

**Table 3: Number of Inspectors  
January 1, 2021 through December 31, 2021**

	#Inspectors
Inspectors Trained And Licensed on December 31, 2021	6,881
Inspectors Who Inspected at Least One Vehicle in 2021	6,696
Inspectors Who Tested Emissions in 2021	6,663

## **2.5 Emissions Tests Administered**

The Massachusetts I&M Program uses the vehicle's OBD system for emissions testing of most vehicles. These systems include 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. The Massachusetts I&M Program started testing all non-diesel vehicles equipped with modern OBD systems (i.e., OBD II) based on the data in those systems on June 14, 2004. The program that started on October 1, 2008 continued using OBD tests for non-diesel vehicles and added OBD testing for diesel vehicles that are equipped with these systems.

Massachusetts has used a snap acceleration opacity test for heavy-duty diesel vehicles since 2001 (except between August 2008 and October 2009, when the program contractor was preparing, testing, and installing new diesel testing equipment and related software).

### 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;

Table 4 summarizes the overall compliance rate for 2021, which compares the total number of unique vehicles receiving an I&M test (including safety-only tests) to the number of unique registered vehicles that were estimated to be due for an inspection during this period (registered vehicles that do not require an inspection include non-commercial trailers and camp trailers).

**Table 4: 2021 Overall Testing Compliance Rates**

	Vehicle Count Compliance %	
Average Number of Vehicles Estimated to be due for an Inspection in 2021	5,510,325	
Unique Vehicles Tested in 2021 (Safety Only or Safety and Emissions Tests)	4,646,136	84.3%

Some categories of vehicles included in this count, such as campers and state and municipal vehicles, include motor vehicles that require an inspection and trailers which do not. Inclusion of these trailers in the vehicles estimated to be due for an inspection will understate compliance for this evaluation since it results in overestimating the number of vehicles due for an inspection. A compliance rate specifically for emissions tests in this period is not available, since the program does not track the number of registered vehicles that are exempt from the emissions testing requirement (e.g., those that are less than one year old, or are non-diesel and are older than model year 2007).

Of the 138,942 non-diesel vehicles that failed their initial OBD test, 21,834 (15.7% of the failing vehicles, and 0.6% of all non-diesel vehicles tested) did not pass a subsequent retest or receive a waiver or economic hardship extension. (The re-test would be considered a “final test” as per EPA’s requirement noted above.) Of the 36,407 diesel vehicles receiving an OBD test, 1,300 (3.6% of all diesels OBD tested) did not pass a subsequent retest or receive a waiver or economic hardship extension. Seven waivers from the requirement that failing vehicles pass an emissions re-test were granted in 2021 (less than 0.01% of vehicles failing initial emissions tests) along with 26 economic hardship extensions (less than 0.1% of vehicles failing initial emissions tests).

The 23,134 vehicles (non-diesel and diesel) that did not pass a subsequent retest or receive a waiver or economic hardship extension are considered to be an estimate of vehicles that have No Known Outcome. This estimate contains vehicles whose registrations expired or were cancelled or that were scrapped or sold out of state after failing an initial OBD test. Vehicles failing to receive or pass safety inspections or

emissions tests when required are subject to enforcement by RMV as well as state and local law enforcement agencies.

In May 2020 EPA released new guidance (“Guidance on Vehicle Inspection and Maintenance (I/M) Test Data Statistics as Part of Annual I/M Reporting Requirements”) that clarifies how the “No Known Outcome” analysis should be performed. The guidance states: “a vehicle may be tracked up to four months beyond its compliance deadline in determining whether it is a no known final outcome vehicle.” In the Massachusetts program, a vehicle that fails its initial emissions test is allowed 60 days for repairs during which time the vehicle is still considered in compliance. As a result, the Agencies used an overall compliance period of 60 days + 4 months from the date of the initial failure to determine whether a vehicle has a known outcome.

The guidance also states: “I/M program agencies are encouraged to use registration/title audits, residency verifications, third-party vehicle history data and other means to determine if a vehicle has legitimately been moved/sold outside the I/M program area(s) or has been scrapped. Such vehicles should not be included in the no known final outcome vehicle tally.” The Agencies are still working on methods to track vehicles that fall in these categories. Until that occurs, these are considered vehicles with no known outcome.

### **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;

In 2021, RMV completed a scan of their ATLAS vehicle registration database each month from January through December. These registration reviews examine the testing status of each registered vehicle estimated to be due for an inspection to determine compliance with testing requirements. The results of these reviews are summarized in Table 5, below. A vehicle was considered non-compliant if 1) the most recent passing inspection had expired, 2) it failed its inspection more than 60 days ago, or 3) it was a newly registered vehicle and not inspected within 7 days.

The number of vehicles estimated to be due for an inspection includes categories of vehicles such as campers and state and municipal vehicles, which include motor vehicles that require an inspection and trailers which do not. Inclusion of these trailers in the vehicles estimated to be due for an inspection will tend to overstate compliance for this evaluation since it results in overestimating the number of compliant vehicles. Also, registration reviews only capture compliance status at a particular moment in time. A vehicle that was tested seven weeks late in 2021 would ultimately have been in

compliance but would have been counted as out-of-compliance on two registration reviews, resulting in an overestimate of non-compliance.

**Table 5: 2021 RMV Registration Reviews**

Date	Vehicles Estimated to be due for an Inspection	Number Non-Compliant	Percent In Compliance
1/20/2021	5,593,342	301,653	94.6%
2/20/2021	5,548,169	314,845	94.3%
3/20/2021	5,541,712	325,597	94.1%
4/20/2021	5,539,231	337,110	93.9%
5/20/2021	5,540,367	345,881	93.8%
6/20/2021	5,533,673	352,759	93.6%
7/20/2021	5,517,840	362,655	93.4%
8/20/2021	5,505,499	375,115	93.2%
9/20/2021	5,490,224	392,185	92.9%
10/20/2021	5,475,965	413,098	92.5%
11/20/2021	5,409,989	480,032	91.1%
12/20/2021	5,427,891	498,091	90.8%
<b>Average</b>	<b>5,510,325</b>	<b>374,918</b>	<b>93.2%</b>

### 3.3 Parking Lot Audits

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.

In 2021, RMV did not conduct any audits of vehicle stickers at Massachusetts parking lots due to the COVID pandemic. RMV plans to resume parking lots audits in 2022.

### 3.4 Other 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;

RMV conducted registration file audits, as described in Section 3.2. No other compliance surveys were conducted in 2021.

RMV recognizes the need to have a registration enforcement program to enhance its efforts to ensure that motorists comply with the requirements of the Massachusetts I&M Program. Much of 2020 and 2021 was spent focusing on providing core services during the COVID pandemic. Initial meetings regarding registration enforcement were held

with the ATLAS team in 2020 and it was determined that registration enforcement development was more complex than anticipated. The first stage of registration enforcement will focus on registration renewal denial for vehicles that do not have a valid inspection. Once a schedule is set, stakeholder communication will begin.

### **3.5 Motorist Time Extensions**

40 CFR 51.366 (d) (1) (v): The number of time extensions and other exemptions granted to motorists;
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Massachusetts offers an economic hardship repair extension for non-commercial vehicles that do not pass their initial emissions test and a re-test. Motorists are eligible for this extension if they meet all of the following criteria:

- the cost of repairing or replacing a single component to correct a diagnostic trouble code (DTC) for the component is more than 1.5 times the repair expenditure limit applicable for the model year of the vehicle:
  - \$1,425 for vehicles five model years old or newer;
  - \$1,275 for vehicles over five but not exceeding 10 model years old; and
  - \$1,125 for vehicles over 10 model years old.
- the vehicle does not qualify for a waiver;
- the economic hardship repair extension is not for an emissions inspection or re-inspection associated with initial registration or transfer of ownership;
- MassDEP or its designee agrees with the findings of the registered repair technician regarding the cause of the failure, and the appropriateness and reasonableness of the repair estimate;
- the motorist has used all relevant warranty coverage including recalls to repair the vehicle;
- all safety inspection requirements are met;
- the vehicle is registered with RMV as a private passenger motor vehicle or auto home; and
- the emission control system is present and there is no evidence of tampering.

An economic hardship repair extension is valid until the vehicle's next emissions inspection. This extension cannot be renewed or extended: at the end of the extension period, the vehicle must pass its emissions test.

In 2021, 26 economic hardship extensions were issued.

### **3.6 Waivers of Emission Standards**

A non-commercial vehicle that does not pass a re-test is eligible for a waiver of the emissions standards if the following criteria are satisfied:

- At least the following amount has been spent for a Registered Emissions Repair Technician to repair the vehicle’s emissions system (including labor and materials)<sup>8</sup>:
  - \$950 for a vehicle five model years old or newer
  - \$850 for a vehicle more than five but less than ten model years old
  - \$750 for a vehicle more than ten model years old
- The vehicle’s emissions-control system must be intact with no evidence of tampering;
- The vehicle must have passed its safety inspection within the previous 60 days; and
- The vehicle’s OBD system must connect successfully with the inspection station’s computer, must be “ready” for its re-test, and cannot be showing DTCs for engine misfire, catalytic converter efficiency failure, or energy storage for a hybrid vehicle.

To obtain a waiver, the motorist must bring the vehicle to a Motorist Assistance Center (MAC) for an evaluation of eligibility. If the MAC determines that the vehicle meets all the requirements for a waiver, the MAC provides a waiver authorization, which the motorist must bring to an inspection station to obtain a valid sticker.

A waiver is valid until the vehicle’s next emissions inspection.

In 2021, seven waivers were issued.

### 3.7 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;

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<sup>8</sup> Only the cost of repairs performed by a Registered Emissions Repair Technician qualifies for a waiver. Expenditures for repairs made by non-registered technicians are not eligible.



- 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 the vehicle information appearing on the vehicle's door label. In addition, the workstation uses a separate VIN decoder to pre-populate critical fields (model year, fuel type, and GVWR) that determine whether a vehicle receives an emissions test. Beginning in 2019, changes to these fields by inspectors caused a test interruption during normal business hours requiring the inspector to communicate with program personnel to determine if the changes are valid, preventing an improper test from occurring. Occurrences after hours are flagged by the software for investigation by the Agencies.

### **3.8 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;

In 2021, state and local police issued 77,030 inspection sticker motor-vehicle violations. Most of these violations were for expired stickers, but violations may lead to the discovery of sticker theft and counterfeiting. Sticker tracking efforts to detect theft and counterfeiting are discussed in section 5.1 and 5.4.3 of this report. Digital audits also detect theft and counterfeiting and are discussed in section 5.2.

## **4 PERFORMANCE OF EMISSIONS TEST EQUIPMENT**

The Massachusetts Vehicle Check program uses two methods to ensure that the emissions test equipment is operating properly:

- The workstations have been designed to run daily “self-checks” so that equipment with significant issues is identified (and repaired) as quickly as possible,
- After an OBD test fails due to communication problems with the vehicle, the OBD scan tool must pass its self-check described below to continue testing.

### **4.1 Test Equipment Self Checks**

Workstations have been designed to run several daily “self-checks” to ensure that they are operating properly. Every 24 hours, the workstation is programmed to require the inspector to perform equipment checks that ensure the functionality of the OBD scan tool, printer, barcode scanner, and, if equipped, diesel opacity meter. The self-checks include:

- A daily “loopback” check that tests the continuity of the OBD scan tool cable and pins in the Diagnostic Link Connector (DLC). If a loopback test fails, the workstation is locked out from performing OBD tests until a loopback check can be passed. Inspectors are also required to perform a loopback check prior to a vehicle failing its emissions test for failure to communicate with the workstation. This is to verify that the emissions test failure is not due to an equipment-related problem.
- A daily printer/barcode scanner check that tests print quality and the proper function of the barcode scanner. The workstation prints sample 1D and 2D barcodes and sample Vehicle Inspection Report (VIR) text. The inspector examines the quality of the printed sample and records a failure if the text is not legible. If the print quality is good, the inspector is then prompted to scan the 1D and 2D barcodes. If the workstation cannot read the barcodes, the workstation records a failure. Failure to read the barcodes can be caused by a faulty barcode scanner or poor print quality. If the printer/barcode scanner check fails, the workstation is locked out from performing all inspections until it can pass the check.
- For workstations equipped with diesel opacity meters, the three daily self-checks are electronic zero and span; accuracy at 37.5% opacity by extinguishing three of eight light pulses; and current draw of the sample fan. All three checks have tolerances which must be met to pass. If any of the three checks fails, the workstation is locked out from performing diesel opacity tests until all three checks pass.

All inspection stations were required to purchase new workstation equipment provided by Applus Technologies for program tests beginning on October 1, 2017. The new equipment includes a California Bureau of Automotive Repair (BAR) certified Data Acquisition Device (DAD) for performing OBD scans. This new scan tool includes a

more comprehensive daily self-check than the previous scan tool. For this reason, the Agencies have discontinued performing separate OBD test equipment audits beginning October 1, 2017. OBD data from covert vehicle audits are used to verify that the workstations are consistently and correctly reading OBD data from the vehicle.

## 5 STATION AND INSPECTOR OVERSIGHT

The Massachusetts I&M Program uses overt, digital and covert audits to assess station and inspector performance. The results of each type of audit conducted in 2021 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;

RMV conducts regular site visits/performance audits to determine if the inspectors are correctly performing all tests and if the station's physical conditions continue to meet program requirements. RMV typically visits inspection stations at least three times during the year and performs additional visits to follow up on past problems or to investigate stations or inspectors based on consumer complaints or data analysis.

The Contractor maintains records of all inspections in a database to which MassDEP and RMV have access. RMV conducts monthly "digital audits" before visiting stations, to identify 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 emissions testing and inspection failure rates and vehicle characteristics recorded during the inspection that do not match the vehicle information in the registration database.

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 2021, RMV conducted 6,807 overt station visits/audits. All 1,777 stations and 1,801 workstations that conducted emissions inspections during this period received at least one audit.

## 5.2 Digital Audits

In addition to RMV's overt station visits/audits, in 2021 MassDEP continued an initiative that started in late 2008 to use digital audits of the inspection database to identify suspected improper emissions inspections, and in many cases, to determine that an improper inspection occurred. When the data indicated that an improper inspection most likely occurred, MassDEP staff visited the station to confirm the accuracy of digital audit findings and to gather more information about the unusual situations that had been identified. RMV staff participated in many of these station visits.

During 2021, the program continued to focus on data mining to identify fraudulent inspection practices. On a monthly basis, MassDEP reviews all potential violations for the entire network during the previous month.

These digital audits were an effective tool for identifying improper inspections, particularly cases in which stations were "clean scanning" by conducting OBD tests on different vehicles than the ones brought in for inspection and using the results from the fraudulent tests to issue stickers. In 2021, 3,769 suspect tests were identified through data mining of 4,646,136 inspections and flagged for evaluation. Of these, a total of 91 were potential violations referred to RMV staff. There were 74 inspector errors, 6 fraudulent tests, and 11 instances of the inspector and/or station inspecting outside their license class.

In addition to digital audits to identify fraudulent inspections, MassDEP increased the data mining for vehicles that appeared to be tampered based on their OBD results. These vehicles are flagged so that they automatically fail their next regular inspection and receive a referral to a MAC for further investigation. If the MAC determines the vehicle has been tampered, the motorist is required to return the vehicle to stock condition before it is allowed to be re-inspected. In 2021, 661 vehicles were flagged and referred to the MAC for suspected tampering.

Starting in 2020, workstation software was implemented that triggers a "test interruption" when certain anomalies are found, including:

- the vehicle is a kit car and may require a special inspection at a MAC to check for EPA kit car compliance;
- the inspector does not sign on the signature pad following a commercial safety inspection;
- the inspector changes VIN-decoded vehicle information, such as GVWR, that changes the type of safety test received (i.e., commercial vs. non-commercial); and
- the inspector changes VIN-decoded vehicle information, such as fuel type or GVWR, that changes the type of emissions test received (i.e., OBD vs. opacity) or makes the vehicle exempt from emissions testing.
- the vehicle's OBD data indicates the vehicle is different than the one entered by the inspector to begin the inspection.

In 2021 the following test interruption was added:

- the vehicle registration entered by the inspector is from a state other than Massachusetts, but the vehicle VIN and plate number match a registered vehicle in Massachusetts.

When a test interruption occurs, the test is automatically stopped and a contractor representative contacts the inspector by remote access to the workstation or phone to determine if proper inspection procedures are being followed. Improper tests are aborted and must be restarted by the inspector. Additional actions for test interruptions are planned for the future. In 2021 there were 1,670 test interruptions that were responded to by the contractor.

### 5.3 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 the Contractor. While RMV staff also conducts covert audits as part of their enforcement activities, the results of their covert audits are not included in the following tables.

In 2021 the Contractor performed 900 covert vehicle audits. Of these, none were scheduled in response to Agency requests and all 900 audits were selected randomly or targeted based on data analysis. Two stations received more than one covert audit in 2021, as summarized in Table 6.

**Table 6: 2021 Covert Vehicle Audits per Station**

Number of Audits Per Station	Count of Stations
1	896
2	2
3	0
Total Number of Stations Audited	898
Total Number of 2021 Audits	900

Beginning with the new program contract in 2017, inspection bay cameras were added to the program which allow for more effective covert visual audits. In 2021 the Contractor performed 2,000 covert visual audits. Each covert visual audit consists of the following:

- A review of 2 complete recent inspections (videos and images) to check for proper inspection procedures;
- A review of 10 previous inspections images to ensure the inspectors and vehicles inspected are properly identified; and
- A report detailing any deficiencies.

Some stations received more than one covert visual audit, as summarized in Table 7.

**Table 7: 2021 Covert Visual Audits per Station**

Number of Audits Per Station	Count of Stations
1	938
2	448
3	54
4	1
<b>Total Number of Stations Audited</b>	<b>1,441</b>
<b>Total Number of 2021 Audits</b>	<b>2,000</b>

For all covert visual audits in 2021, auditors verified that the inspector plugged into the correct vehicle when prompted for the OBD scan.

5.3.1 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 OBD communication protocols. Four vehicles were used for covert audits in 2021, representing two OBD communication protocols:

- CAN-29 bit, and
- CAN-11 bit

In 2021, four covert auditors conducted covert vehicle audits.

5.3.1 Number of Covert Audits Conducted in 2021

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 8 summarizes the number of covert vehicle audits conducted during 2021 for each type of inspection station. Only public stations can receive covert vehicle audits because fleet stations only test vehicles that are part of the company’s fleet, making it impossible for the Contractor to present a covert (or “undercover”) vehicle for testing. Also, covert vehicle audits are not conducted at stations that inspect only heavy-duty vehicles.

**Table 8: Number of Inspection Stations and Covert Vehicle Audits in 2021**

	2021 # of Stations	2021 Covert Vehicle Audits		Stations NOT Receiving Covert Audits
		Audited Stations	# of Audits	
Fleet stations	84	0	0	84
Public stations	1,470	898	900	572
<b>All stations</b>	<b>1,554</b>	<b>898</b>	<b>900</b>	<b>656</b>

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. Most stations only have one workstation. As a result, covert vehicle audits statistics are only reported by station, not by workstation.

Table 9 summarizes the number of covert visual audits conducted during 2021 for each type of inspection station.

**Table 9: Number of Inspection Stations and Covert Visual Audits in 2021**

	2021 # of Stations	2021 Covert Visual Audits		Stations NOT Receiving Covert Audits
		Audited Stations	# of Audits	
Fleet stations	84	3	3	81
Public stations	1,470	1,438	1,997	32
<b>All stations</b>	<b>1,554</b>	<b>1,441</b>	<b>2,000</b>	<b>113</b>

### 5.3.2 Covert Vehicle Audit Overview

A “false pass” on a covert vehicle audit is an inspection that passes a vehicle that was set to fail its OBD test.

Covert vehicles are set to fail the OBD test in a variety of ways including:

- Malfunction Indicator Lamp (MIL) commanded on and DTCs being set,
- failing to communicate, and
- failing because the readiness monitors are not set.

In addition to these three types of OBD failures, the MIL bulb on the dashboard was made inoperable for some of the vehicles that were set to fail with DTCs set.

For most covert audits, the vehicles were also set to fail the safety test.



### 5.3.3 Covert Vehicle Audit Results by Type of OBD Failure

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

Since OBD tests are the only type of emissions test covered by the covert vehicle audit program, there were no audits set to fail two or more test types. For the 900 covert vehicle audits with OBD set to fail, there were zero false passes.

## 5.4 Station and Inspector Enforcement

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;

Based on the results of the site audits, covert audits, and other data, RMV held 426 hearings for stations and issued 421 adverse actions against stations (e.g., warning letters, license revocations, or license suspensions). The written violations in 2021 resulted in 237 station license suspensions or revocations.

Based on the results of the site audits, covert audits and other data, RMV held 405 hearings for inspectors, and issued 421 adverse actions against inspectors (e.g., warnings, license revocations, or license suspensions). The written violations in 2021 resulted in 255 inspector license suspensions or revocations.

### 5.4.2 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;

In 2021, there were no enforcement cases where fines were assessed.

### 5.4.3 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;

Inspection stations are responsible for the compliance documents (stickers) shipped to them. Failure to properly account for unused stickers may subject a station or inspector to enforcement action. The sticker accounting system is designed to track all stickers from the time they are delivered to the inspection stations to when they are placed on vehicles or are voided and collected by RMV Field Investigators.

In 2021, 5,613,900 stickers were issued to inspection stations, 5,024,589 stickers were placed on vehicles, and 556,251 unused or voided stickers were picked up and destroyed by RMV. Stations reported no stickers as stolen. Stations are required to file a police report for the stolen stickers and submit it to the Contractor in order to continue inspecting. The number of remaining stickers unaccounted for was 32,760. Please note: the inspection sticker is created by “on-demand” printing by the workstation sticker printer as inspections are completed and contains data specific to the vehicle such as VIN, license plate, and vehicle make. As such, there is little incentive to use a voided sticker for a different vehicle because it would be obvious from the sticker printing that the vehicle data did not match.

Table 10 summarizes the sticker accounting for 2021 stickers based on the data available.

**Table 10: 2021 Inspection Stickers**

	<b>Number of Stickers</b>
<b>Total Number Printed</b>	5,750,000
<b>Assigned to Station</b>	5,613,900
Total used (on vehicles)	-5,024,589
Collected and destroyed by RMV (as recorded by software)	-556,251
Used for software testing	-300
Missing compliance documents	32,760
Reported stolen	0
Remaining "unaccounted for"	32,760

## 6 EMISSIONS TEST RESULTS

### 6.1 Emissions Tests and the Massachusetts Fleet

The Massachusetts I&M Program administered OBD and opacity emissions tests during all of 2021.

In 2021, 138,942 (4.0%) of the 3,488,981 non-diesel (gasoline, natural gas, etc.) vehicles receiving initial OBD tests failed their initial tests. Of the 36,407 diesel vehicles receiving an initial OBD test, 4,852 (13.3%) failed their initial tests. Of 81,004 diesel vehicles receiving an initial opacity test, 1,257 (1.6%) failed their initial opacity tests. The Massachusetts Program requires that failing vehicles be repaired and re-tested within 60 days of failing their initial emissions test.

Table 11 summarizes the failure rates for initial OBD tests in Massachusetts in 2021:

**Table 11: 2021 Failure Rate for Initial Emissions Tests by Test Type and Fuel**

Test Type	Fuel	Failure Rate
Opacity	Diesel	1.6%
OBD	Non-Diesel	4.0%
OBD	Diesel	13.3%
All Initial OBD Tests		4.1%
All Initial Emissions Tests		4.0%

Of the initial emissions test failures, please note:

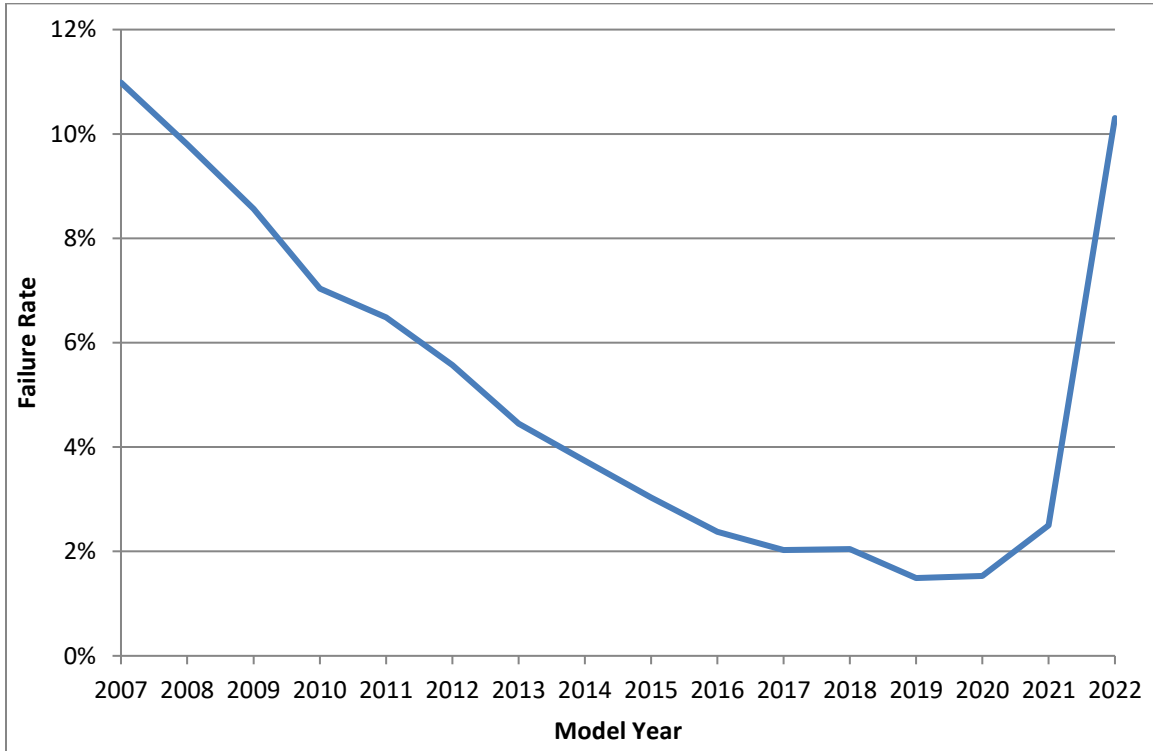
- Approximately 98.2% of retested vehicles passed the retest.
- 23,134 (16.1%) of the vehicles failed an initial OBD test and did not pass a retest, obtain a waiver, or receive a hardship extension. These are considered to have no known outcome.
- Seven waivers (less than 0.01% of vehicles failing initial emissions tests) and 26 hardship extensions were granted (less than 0.1% of the vehicles that failed their initial emissions test).

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

Figure 1 shows the initial OBD failure rates by model year. As can be seen, the age of the vehicle has a significant impact on failure rate. Please note that the spike in the failure rate for model year 2022 is based on a very small sample size (359). While this includes some new vehicles that have changed ownership within the first year, most of these failures were for readiness for new vehicles that inadvertently received an emissions test due to inspector error. 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 1: 2021 Failure Rates by Model Year – Initial OBD Tests Only**



## 6.2 Overall Conclusions about Program Operation During 2021

2021 was the thirteenth full year of operation for the enhanced Massachusetts I&M Program. The program is meeting its goals of a comprehensive test that maintains the emission reductions needed for the Massachusetts SIP, is convenient to motorists, ensures vehicle safety, and works well in local inspection shops.

Most vehicles that failed their initial emissions test were repaired successfully and passed their re-test. The program continues to issue a very small number of waivers, far below the commitment in the Massachusetts SIP to limit waivers to no more than 1% of vehicles that fail an initial emissions test.

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

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**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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## **Attachment B: Detailed 2021 Emissions Test Data**

**Massachusetts Enhanced Emissions and Safety Test  
Inspection and Maintenance Program**

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## **Attachment C: 2021 Test Data by Station**

**Massachusetts Enhanced Emissions and Safety Test  
Inspection and Maintenance Program**

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