California Air Resources Board (ARB)

Regulation for Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards

Frequently Asked Questions

Opacity Monitoring

Opacity Monitoring

1) Must all cargo handling equipment (CHE) at California ports and intermodal rail yards be opacity tested?

Answer – All equipment subject to the CHE regulation's engine performance requirements in subsection (e) must be opacity tested with two exceptions. New engines are exempt until January 1st of the year that is the model year plus four (i.e., 2014 model year engines are exempt until January 1, 2018). Additionally, engines for which the owner/operator has applied for, and received, approval from ARB to use an alternative method of compliance are also exempt.

2) Under what circumstances may a CHE owner/operator use an alternative method of compliance?

Answer – The use of an alternative method of compliance requires ARB approval. A CHE owner/operator must demonstrate to ARB staff that opacity testing is not feasible due to the engine/equipment configuration and provide an alternative method of compliance. ARB staff will evaluate the alternative compliance method to determine if the alternative method will be able to detect increases in soot exhaust indicating the need for engine maintenance and repair. If ARB staff finds that the alternative method will be effective, they may approve its use.

3) Who do I contact to request approval of an alternative method of compliance for opacity testing?

Answer – Please contact the ARB staff listed for Implementation and Reporting on the following website: http://www.arb.ca.gov/ports/cargo/contact.htm.

4) How often must equipment be tested?

Answer – The CHE regulation requires that equipment be tested annually. Equipment is to be tested for opacity within 12 months of the previous test. If, for example, an opacity test is conducted on April 1st of one year, the next year's test would have to be completed by April 1st of that next year.

5) Will CHE owners/operators with large fleets need to have all of their equipment opacity tested at the same time?

Answer – No. CHE owners/operators with fleets of five or more pieces of equipment can test their fleet in four phases with 25 percent of the number of engines tested in each phase. The initial phased compliance dates are provided below:

- 25 percent of engines by October 26, 2015
- Additional 25 percent of engines by January 24, 2016
- Additional 25 percent of engines by April 28, 2016
- Final 25 percent of engines by July 27, 2016

CHE owners/operators with one to four pieces of equipment are similarly allowed to test their equipment in phases. They are required to test one piece of equipment by the first compliance date of October 26, 2015, and one by each of the following compliance dates listed above.

6) Do new engines need to be monitoring annually for exhaust opacity?

Answer – Equipment powered by an engine less than four years old is exempt from the opacity testing requirement until January 1st of the calendar year that is four years after the model year of the engine. For example: a 2014 model year engine will be exempt from the CHE regulation opacity monitoring requirements until January 1, 2018.

7) How should opacity be measured?

Answer – Opacity should be measured using the preconditioning and test phases specified in the Society of Automotive Engineers (SAE) snap acceleration smoke test procedure for heavy-duty powered vehicles (SAE J1667, February 1996). See the ARB website for more information: http://www.arb.ca.gov/enf/hdvip/hdvip.htm#smoke_test

8) How do I measure the exhaust opacity if my engine was certified with an original engine manufacturer (OEM) filter?

Answer – An engine certified with an OEM aftertreatment device, such as a filter, must be tested as certified, with the OEM filter intact and the opacity measured at the exhaust of the OEM aftertreatment device. This is reiterated in CHE Regulation subsections 2479(e)(2)(A)5. and 2479(e)(3)(A)3. Typically, Tier 4 off-road or 2007 model year or later on-road engines are certified with OEM aftertreatment. Measuring opacity at the exhaust of the OEM aftertreatment device will be consistent with specifying the opacity limit based on the particulate matter (PM) standard the engine was certified to.

9) What are the opacity limits for engines?

Answer – The opacity limits that must be met are determined based on the PM emissions standard that the engine was originally certified to. See regulation subsections 2479(e)(2)(A)5.e. and 2479(e)(3)(A)3.e. for the opacity requirements for different PM emissions standards. The following table provides a summary of these requirements.

Table 1 Opacity Limits

U.S. EPA PM Emissions Standard (g/bhp-hr)	Percent Opacity Not to Be Exceeded
> 0.4	55
0.31 ≤ to ≤ 0.4	45
0.21 ≤ to ≤ 0.3	35
0.11 ≤ to ≤ 0.2	25
0.05 ≤ to ≤ 0.1	15
< 0.05	5

10) How do I measure the exhaust opacity if my engine is retrofitted with a verified diesel emission control strategy (VDECS)?

Answer – CHE Regulation subsections 2479(e)(2)(A)5. and 2479(e)(3)(A)3. specify that the exhaust opacity of an engine retrofitted with a VDECS must be measured with the VDECS removed, such as when the VDECS is removed for cleaning or other maintenance. An instrumentation port upstream of the VDECS could alternately be used for measuring opacity, if approved by ARB. Measuring opacity upstream of the VDECS evaluates the condition of the engine and the possible need for engine repair or maintenance. The CHE Regulation does not require an opacity test at the exhaust of the VDECS.

11) Are there any additional opacity requirements for an engine retrofitted with a VDECS?

Answer – Yes, the ARB Verification Regulation subsection 2706(t)(1) requires the VDECS manufacturer to set an engine exhaust opacity limit to ensure that an engine is compatible with the VDECS. Consequently, the engine exhaust opacity measured for a retrofitted engine must meet the lower of the two opacity limits: the CHE regulation limit and the VDECS manufacturer's limit.

12) How do I determine the PM emissions standard that the engine was originally certified to?

Answer – The PM emissions standard that the engine was originally certified to is provided on the certification executive order for the engine family of the engine. The engine family is provided on the engine label. The certification executive order can be found on the ARB website: http://www.arb.ca.gov/msprog/offroad/cert/cert.php based on the engine family. The PM emissions standard is provided on the executive order along with the measured certification emissions.

13) Do I have to take my equipment out of service if the engine's opacity exceeds the limit for the engine?

Answer – Yes. Equipment powered by engines which fail the opacity test (measured opacity exceeds the opacity limit) must be taken out of service and repaired. A post-repair opacity test must be performed to determine if the measured opacity after repair is below the opacity limit. If the post-repair opacity measurement is greater than 5 percent higher than the opacity limit, the equipment must remain out of service. The equipment can only be returned to service if it can be repaired to no more than 5 percent greater than the designated limit.

14) What if the engine cannot be repaired to meet the opacity requirements?

Answer – If the post-repair opacity measurement is greater than 5 percent above the designated limit, then the equipment must remain out of service. The equipment can only be returned to service if it can be repaired so that the measured opacity is no more than 5 percent greater than the designated limit.

15) If a CHE owner/operator has a piece of equipment powered with an ARB certified U.S. EPA Tier 1 off-road engine without a PM emissions standard, is there an opacity limit that the engine must meet?

Answer – Yes. There is a group of engines that have a U.S. EPA Tier 1 off-road engine NOx emissions standard, but no certified PM emissions standard. Generally, these engines were manufactured between 2000 and 2003 in the 50 to 175 horsepower range. Since there is no certified PM emissions standard, ARB considers these engines non-certified to a PM emissions standard. Therefore, an opacity limit of 55 percent must be met as per CHE regulation subsections 2479(e)(2)(A)5.e.(i) and 2479(e)(3)(A)3.e.(i).

16) Do individuals conducting opacity testing need specific training?

Answer – Yes. Individuals conducting opacity tests must have completed training conducted by the California Council on Diesel Education and Technology

(CCDET) and obtained certification on the proper administration of the SAE J1667 test procedure.

The CCDET provides one-day training courses on opacity testing. A description of the CCDET courses can be found at the following website: http://www.arb.ca.gov/enf/hdvip/ccdet/ccdet.htm

CCDET contacts in northern and southern California and course dates are available at the following website: http://www.arb.ca.gov/enf/hdvip/ccdet/ccdet-schedule.htm

CCDET staff will also work with port terminal and intermodal rail yard owners/operators to arrange additional training sessions, either at the CCDET facilities or the port terminal or intermodal rail yard.

17) Can I hire someone to test my fleet?

Answer – Yes. There are qualified facilities that hold a current CCDET certification and may be contracted with to test your fleet on-site. A list of such facilities is maintained on the Heavy Duty Diesel Vehicle Enforcement webpage: http://www.arb.ca.gov/enf/hdvip/hdvip.htm#test_facilities. The contracted facility should be notified that the opacity limits required for your equipment are different than those for heavy duty diesel on-road vehicles and are specified in the CHE Regulation.

18) Are there specific performance characteristics the opacity meter must meet?

Answer – Yes. The opacity measurement equipment shall consist of a light extinction-type opacity meter that has an optical detection unit, a control/indicator unit, and a strip chart recorder. The opacity meter shall be calibrated according to the specifications in section 7 of the SAE J1667 procedure. A list of manufacturers and distributors of opacity meters is maintained on the Heavy Duty Diesel Vehicle Enforcement webpage: http://www.arb.ca.gov/enf/hdvip/hdvip.htm#list

19) Are there reporting requirements associated with the opacity monitoring program?

Answer – No. There are no reporting requirements associated with the opacity monitoring program but there are recordkeeping requirements. (See question 20 below.)

20) What are the recordkeeping requirements associated with the opacity monitoring program?

Answer – The recordkeeping requirements associated with the opacity monitoring program are set forth in subsection 2479(i)(1)(D) of the CHE regulation and summarized below. This information must be kept with the engine-specific maintenance records a terminal or intermodal rail yard operator keeps for their CHE and be available to ARB staff upon request. These records, listed below, must be kept for a period of 2 years.

a. Brand name and model of the opacity meter.
b. Dates of last calibration of the opacity meter and chart recorder (it is recommended that meters be calibrated at a minimum of once every 6 months).
c. Name of the smoke meter operator who conducted the test.
d. Name and address of the contracted smoke test facility or vehicle repair facility that conducted the test (if applicable).
e. Applicability of smoke opacity standard for the tested vehicle.
f. Engine serial number, vehicle's engine model, engine make, engine model year, and test date.
g. Initial smoke test opacity levels (for three successive test readings).
h. Indication of whether the vehicle passed or failed the initial smoke test.
i. For vehicles that failed the smoke test and that were repaired, the following information:
    1. Name of the mechanic
    2. Date of the repair
    3. A statement identifying the nature of the repairs made
    4. An itemized list of parts used in the repair
    5. Post-repair test date
    6. Post-repair smoke test opacity levels (for three successive test readings)
    7. Indication of whether the vehicle passed or failed the post-repair smoke test

A smoke opacity test printout that includes the above information provides the most accurate documentation for ARB Audits. Documentation that does not include the required information may be considered invalid.

21) What records will ARB staff require be available for review?

Answer – The following types of records are required to be available to ARB staff (or other authorized entity) to audit a CHE owner/operator's opacity monitoring program:

a. Maintenance records,
b. Repair records, and
c. Opacity test printouts.

22) How will ARB enforce?

Answer – ARB staff (or other authorized entity) will be conducting audits and will conduct opacity tests of equipment at terminals and intermodal rail yards.