

**OCCUPATIONAL SAFETY
AND HEALTH STANDARDS BOARD**

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SECOND NOTICE OF PROPOSED MODIFICATIONS TO
CALIFORNIA CODE OF REGULATIONS
TITLE 8: Division 1, Chapter 4, Subchapter 4, Article 2,
Sections 1504 and 1591 and New Appendix A of the Construction Safety Orders

Vehicle Exhaust Retrofits

Pursuant to Government Code Section 11346.8(c), the Occupational Safety and Health Standards Board (Standards Board) gives notice of the opportunity to submit written comments on the above-named standards in which further modifications are being considered as a result of public comments and/or Board staff evaluation.

On February 17, 2011, the Occupational Safety and Health Standards Board held a Public Hearing to consider revisions to Title 8, Division 1, Chapter 4, Subchapter 4, Article 2, Section 1504, Article 10, Section 1591, New Appendix A; and Article 11, Section 1597 of the Construction Safety Orders; and Subchapter 7, Article 25, Section 3663; and Article 93, New Section 4925.1 of the General Industry Safety Orders; and Subchapter 17, Article 17, Section 7016 of the Mine Safety Orders. The Standards Board received comments on the proposed amendments and the proposal was modified as a result of these comments. On April 5, 2011, a 15-Day Notice of the proposed modifications was issued.

In response to comments on the proposed modifications, further modifications are now proposed for Section 1504; Section 1591– subsections (m)(4), (m)(5), and (m)(6); and Section 1591 – New Appendix A. A copy of the regulations with the further modifications clearly indicated is attached for your information. In addition, a summary of all comments regarding this proposal and responses is included.

Any written comments on these further modifications must be received by 5:00 p.m. on **July 20, 2011** at the Occupational Safety and Health Standards Board's Office, 2520 Venture Oaks Way, Suite 350, Sacramento, California 95833 or submitted by fax at (916) 274-5743 or e-mailed at oshsb@dir.ca.gov. This proposal will be scheduled for adoption at a future Business Meeting of the Occupational Safety and Health Standards Board.

The Occupational Safety and Health Standards Board's rulemaking file on the proposed action is open to public inspection Monday through Friday, from 8:00 a.m. to 4:30 p.m. at the Standards Board's Office, 2520 Venture Oaks Way, Suite 350, Sacramento, California.

Inquiries concerning the proposed modifications may be directed to the Executive Officer, Marley Hart at (916) 274-5721.

OCCUPATIONAL SAFETY AND HEALTH
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Marley Hart, Executive Officer

Date: June 30, 2011

Proposed Further Modifications To Second 15-Day Notice

(Further modifications for new language are shown in *italicized*, **bold**, and double underscored and deleted language are shown in *italicized*, **bold**, and double striked-out)

Proposed Modifications To First 15-Day Notice

(Modifications for new language are shown in **bold** and double underscored and deleted language are shown in **bold** and double striked-out)

STANDARDS PRESENTATION
TO
CALIFORNIA OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD

PROPOSED STATE STANDARD,
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Amend Sections 1504, 1591, and 1597, ~~3663, and 7016~~; and add new Appendix A to follow Section 1591 and new Section ~~4925.1~~, as follows:

Subchapter 4. Construction Safety Orders

* * *

Article 2. Definitions

* * *

§1504. Definitions.

(a) The following definitions shall apply in the application of these Orders.

* * *

Excavation, Trenches, Earthwork.

* * *

(G) Shaft. An excavation under the earth's surface in which the depth, is much greater than its cross-sectional dimensions such as those formed to serve as wells, cesspools, certain foundation footings, and under streets, railroads, buildings, etc.

Exhaust Retrofit. ~~Modifications made to a vehicle's existing exhaust system to install an air pollution emission device, including the air pollution control device and all modified sections of the vehicle's exhaust pipes.~~ An emission control system device installed on a vehicle after the vehicle's manufacture, including, but not limited to, modified or added sections of the vehicle's exhaust pipes exhaust pipe that connects the emission control device to the engine.

Exit. Exit is a continuous and unobstructed means of egress to a public way, and shall include intervening doors, doorways, corridors, exterior exit balconies, ramps, stairways, smoke-proof enclosures, horizontal exits, exit passageways, exit courts, and yards.

* * *

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

Article 10. Haulage and Earth Moving

* * *

§1591. Haulage Vehicles, Equipment-Construction and Maintenance.

* * *

(m) Exhaust retrofits, If an exhaust retrofit is installed on a vehicle, it shall be installed and maintained in accordance with the following:

(1) An exhaust retrofit shall not reduce the capacity, structural integrity, or safe performance of a vehicle.

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(2) An exhaust retrofit shall not reduce ~~the operator's~~ an employee's ability to access or egress a vehicle safely.

(3) An exhaust retrofit shall be located or effectively shielded such that it does not increase the risk of a fire due to accidental contact with hydraulic fluid or fuel spilled during transfer or sprayed from a broken hose, pipe, or container.

(4) An exhaust retrofit shall be located or effectively shielded such that it does not increase the risk of ~~the operator, during performance of normal duties,~~ an employee contacting exhaust system surfaces having a temperature of 140 degrees F (60 degrees C) or higher. Heat shielding is not required on an exhaust retrofit located under the hood of a vehicle if space limitations make shielding impracticable.

~~(5) Before a vehicle equipped with an exhaust retrofit is placed in use, the effect of the retrofit on the operator's visibility shall be evaluated in accordance with the Visibility Testing Procedures (visibility test) in Appendix A of this Section, and the retrofit shall pass the visibility test, in accordance with Section B of Appendix A.~~

~~(6) Where subsection (m)(5) requires visibility testing be conducted on a vehicle, the employer shall maintain a written record of the visibility testing. The visibility testing record shall be readily available as long as the employer uses the vehicle. The record shall include the following information:~~

~~(A) Type of vehicle, manufacturer, and model number;~~

~~(B) Vehicle identification number;~~

~~(C) Manufacturer and model of the exhaust retrofit;~~

~~(D) If the exhaust stack is modified, diagrams and measurements showing the dimensions and location, with respect to the operator, of the modified exhaust stack and the OEM exhaust stack;~~

~~(E) The pass/fail results of the visibility test;~~

~~(F) The printed name, signature and contact information of the person conducting the visibility test; and~~

~~(G) The test date.~~

~~EXCEPTION: The employer is not required to maintain a record of the visibility testing conducted on a vehicle if all sections of the exhaust retrofit are completely inside the Original Equipment Manufacturer (OEM) engine compartment.~~

~~(5) An exhaust retrofit shall not reduce the driver's view of the ground surrounding the vehicle, as determined without the use of mirrors or cameras. Modifications or additions made to a vehicle to install a retrofit, such as expanding an engine compartment hood or adding a heat shield, shall be considered a part of the exhaust retrofit. An exhaust retrofit, excluding exhaust stacks which are the subject of subsection (6), shall not obstruct the driver's view of an area or object located 40 inches outside of the smallest rectangle that encompasses the perimeter of a vehicle, as determined in accordance with the following:~~

~~(A) A modification or addition made to a vehicle to install a retrofit, such as an expanded engine compartment hood or added heat shield, shall be considered part of the exhaust retrofit.~~

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(B) If a bucket or blade is attached to a vehicle, it shall be placed in the traveling position and shall be considered a part of the vehicle for the purpose of establishing the perimeter of the vehicle to the front and rear, but not to the sides.

(C) The driver's view shall be determined without the use of mirrors or cameras, and

(D) The driver's view shall represent the view that a driver would have under the following conditions:

1. The driver weighs at least 195 pounds and is less than 70 inches tall.

2. The driver is sitting upright in the driver's seat and is looking towards the exhaust retrofit, and

3. The driver's seat is positioned in the middle of its adjustable range.

NOTE: The Visibility Test Procedures in Non-Mandatory Appendix A constitute one method that may be used to demonstrate compliance with this subsection.

EXCEPTION No. 1: An exhaust retrofit may obstruct the driver's view to the rear of an excavator, provided that the excavator cab rotates so that the driver faces the direction of travel.

~~(6) If an exhaust stack is relocated, the new location shall not create a greater impairment to the driver's operational vision.~~ Exhaust stacks on exhaust retrofits, when compared to exhaust stacks on the vehicle as originally manufactured, shall comply with the following conditions:

(A) Retrofit exhaust stacks shall be located or effectively shielded such that the stacks do not increase the risk of an employee contacting stack surfaces having a temperature of 140 degrees F (60 degrees C) or higher;

(B) Retrofit exhaust stacks shall not reduce the driver's view of the outside edge of the blade or bucket on earthmoving equipment, as determined without the use of mirrors or cameras; and

(C) Retrofit exhaust stacks shall not reduce the driver's view to the front, sides, or rear of the vehicle, as determined without the use of mirrors or cameras. A retrofit exhaust stack reduces the driver's view if the area it obstructs from the driver's view is wider than the area obstructed by the original exhaust stack.

NOTE: Exhaust stack modifications that may reduce the driver's view include, but are not limited to, the following:

1. Increasing the diameter of an exhaust stack.

2. Moving an exhaust stack closer to the driver, and

3. Moving an exhaust stack from a location where it is hidden from the driver's view by a part of the vehicle, such as the cab frame, to a location where it obstructs the driver's view.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

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~~*New Appendix A and New Figures 1 – 11 have been deleted in its entirety:*~~

~~*Add New Appendix A and New Figures 1 – 11 as follows:*~~

~~Appendix A to Section 1591~~

~~Visibility Testing Procedures (Mandatory)~~

~~***~~

~~Figures 1 – 11~~

~~***~~

Add New Appendix A and New Figures 1 – 3 as follows:

Appendix A to Section 1591

Visibility Test Procedures (Non-Mandatory)

A. General Requirements.

1. Scope and Application. These test procedures may be used to determine compliance with Section 1591(m)(5).

2. Definitions.

a) Exhaust Retrofit. An emission control device installed on a vehicle after the vehicle's manufacture, including, but not limited to, modified or added sections of exhaust pipe that connect the emission control device to the engine. For the purpose of these test procedures, an exhaust retrofit does not include an exhaust stack. A modification or addition made to a vehicle to install an exhaust retrofit, such as an expanded engine compartment hood or added heat shield, shall be considered part of an exhaust retrofit.

3. All sections of the exhaust retrofit shall be evaluated in accordance with the test procedures in Section B. A retrofit passes the visibility test, if all sections of the retrofit meet the criteria for passing the visibility test in subsections B.1.b or B.2.d. It is not necessary for all sections of the exhaust retrofit to pass the same test criteria, but all sections must pass at least one of the test criteria.

B. Visibility Test Procedures and Criteria.

1. Determine which sections of an exhaust retrofit are inside the Original Equipment Manufacturer (OEM) engine compartment as follows:

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- a) Determine the location of the retrofit section with respect to the OEM engine compartment.
- b) The retrofit section passes the visibility test if the section is located inside the boundary of the OEM engine compartment.
2. Evaluate retrofit sections outside the OEM engine compartment as follows:
- a) Position the vehicle as instructed in Section D.
- b) Draw a rectangular boundary line on the ground 40 inches outside of the smallest rectangle that encompasses the perimeter of the vehicle. If a bucket or blade is attached to a vehicle, it shall be placed in the traveling position and shall be considered a part of the vehicle when drawing the boundary line to the front and rear of the vehicle, but not to the sides.
- c) Position a camera as instructed in Section G and photograph the exhaust retrofit from the driver's view.
- d) The retrofit section passes the visibility test if photographs taken in accordance with subsection B.2.c. demonstrate that it meets one of the following test criteria:
- (i) The retrofit section is below the driver's view to the edge of the vehicle (see Figure 1), or
- (ii) The retrofit section does not block the driver's view of the rectangular boundary line drawn according to subsection B.2.b.

C. Test Records.

1. Create a written record for each vehicle that passes the visibility test, unless all sections of the exhaust retrofit(s) are inside the OEM engine compartment. The record shall include the following information:
- a) Type of vehicle, manufacturer, and model number;
- b) Vehicle identification number;
- c) Manufacturer and model of the exhaust retrofit;
- d) The picture(s) demonstrating that the exhaust retrofit passes the visibility test criteria;
- e) A statement to the effect that the vehicle was evaluated in accordance with the visibility test procedures and met the requirements for passing the test;
- f) The printed name and signature of the person conducting the visibility test along with that person's contact information; and
- g) The test date.

D. Vehicle Position.

1. Park the vehicle on an area of compacted earth or paved surface with a gradient of no more than 3% in any direction.
2. Turn off the vehicle engine, set the parking brake, and block the tires. Position attachments, such as buckets and blades, in the traveling position and block them in place. The bucket or blade may be lowered to the ground instead of being blocked in the traveling position, provided that this lowered position does not affect the visibility test results.

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E. Seat Reference Point.

1. Locate and mark the seat reference point, as follows:

- a) If the seat pan has a tilt feature, adjust the seat pan so that it is as level as possible.**
- b) If the seat can be adjusted forward and backward, adjust the seat so that it is midway between the maximum forward and maximum rearward position.**
- c) If the seat height can be adjusted, adjust the seat height so that it is midway between the minimum and maximum height.**
- d) If the compression of the seat cushion is adjustable (air suspension seats), adjust the seat compression so that it is midway between its maximum and minimum range.**
- e) Use a carpenter's square to locate the seat reference point, as follows (see Figure 2):**
 - (i) Rest the edge of one arm of the carpenter's square on the seat cushion such that it is level and bisects the seat from left to right.**
 - (ii) Position the other arm of the carpenter's square such that it is vertical and its edge touches the most forward part of the seat backrest.**
- f) Mark a point on the center line of the seat 4 inches in front of the most forward part of the backrest. This point is the seat reference point.**

F. Camera Lens Height.

1. The camera lens height represents the eye level of the average height and weight driver when sitting in the driver's seat. For seats that do not sink or compress when occupied, the camera lens height is 30 inches above the seat reference point on the unoccupied seat. If a seat sinks or compresses when occupied, such as an air suspension seat or a seat with a cushion, the average driver's eye level, when sitting in the seat, will be lower than 30 inches above the seat reference point on the unoccupied seat, in which case seat compression is to be determined by following these steps:

- a) Select a person weighing at least 195 pounds to represent the driver. The driver shall sit on a hard bench or similar surface that does not compress when sat on. Measure and record the distance from the seat surface to the top of the driver's head. This distance is represented by distance D1 in Figure 3.**
- b) With the driver seated upright in the driver's seat (with the seat adjusted as described in Section E.) measure and record the distance from the top of the driver's head to an overhead reference point directly above. This distance is represented by distance D2 in Figure 2. If an overhead reference point, such as a cab ceiling or a roll bar, is not available, construct an overhead reference point out of plastic pipe or other material.**
- c) With the seat unoccupied and adjusted as provided in Section E, measure the distance from the overhead reference point to the seat reference point. This distance is represented by distance D3 in Figure 3.**
- d) Calculate seat compression as follows:**
Seat compression = D1 + D2 - D3, as illustrated in Figure 3.
- 2. Calculate the camera lens height as follows:**

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Camera lens height = 30 inches minus the seat compression.

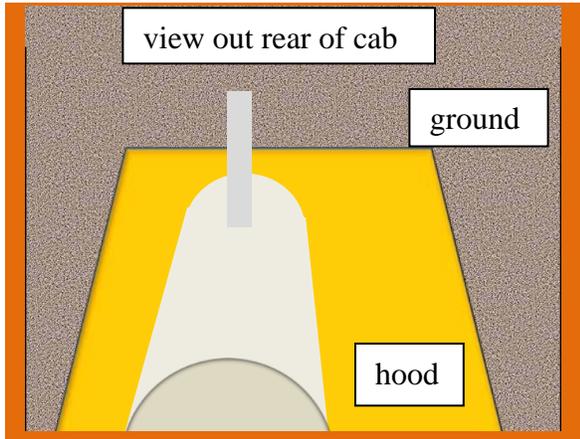
G. Camera Lens Position.

1. The camera lens position represents the eye position of an average height and weight driver. Position the camera lens such that:

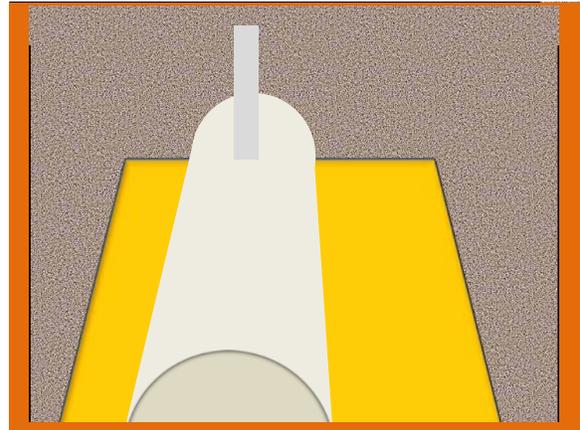
- a) It is directly above the seat reference point,**
- b) The distance between the center of the lens and the seat reference point is equal to the camera lens height calculated in subsection F.2, and**
- c) It points directly towards the retrofit.**

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PASS



FAIL

Figure 1

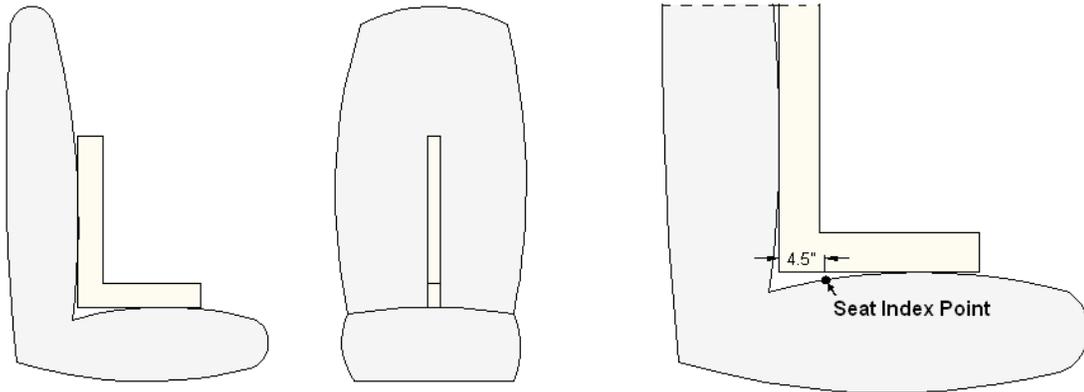


Figure 2

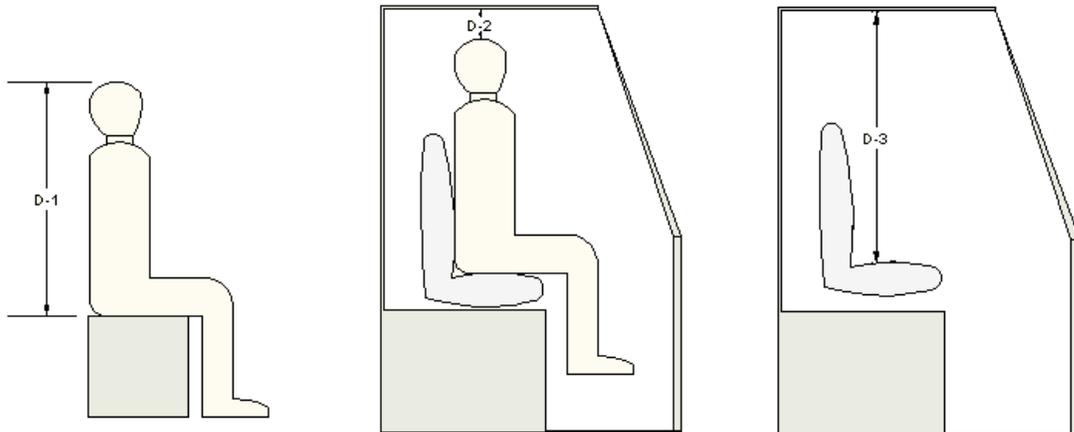


Figure 3

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Article 11. Vehicles, Traffic Control, Flaggers, Barricades, and Warning Signs

* * *

§1597. Jobsite Vehicles.

Jobsite vehicles as defined in Section 1504 of these Orders, which are utilized on jobsites exclusively and are, therefore, excluded from the provisions of applicable traffic and vehicular codes shall be equipped and operated in the following manner:

* * *

(l) Exhaust retrofits. ~~Modifications made to a vehicle's existing exhaust system to install an air pollution control device, including the air pollution control device and all modified sections of the vehicle's exhaust pipes, shall comply~~ If an exhaust retrofit is installed on a vehicle, it shall be installed and maintained in accordance with Section 1591(m).

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

~~Subchapter 7. General Industry Safety Orders~~

~~* * *~~

~~Group 4. General Mobile Equipment and Auxiliaries~~

~~* * *~~

~~Article 25. Industrial Trucks, Tractors, Haulage Vehicles, and Earthmoving Equipment~~

~~* * *~~

~~§3663. Maintenance of Industrial Trucks.~~

~~* * *~~

~~(g) Industrial trucks shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer, nor shall they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts, except as provided in subsections (h) and (i) of this Section. Additional counterweighting of fork trucks shall not be done unless approved by the truck manufacturer.~~

~~* * *~~

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~~(i) Exhaust retrofits. Modifications made to an industrial truck's existing exhaust system to install an air pollution control device, including the air pollution control device and all modified sections of the vehicle's exhaust pipes, shall comply with Section 1591(m).~~

~~NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.~~

~~***~~

~~Group 13. Cranes and Other Hoisting Equipment~~

~~***~~

~~Article 93. Boom Type Mobile Cranes~~

~~***~~

~~§4925.1. Exhaust Retrofits.~~

~~Modifications made to a mobile crane's existing exhaust system to install an air pollution control device, including the air pollution control device and all modified sections of the vehicle's exhaust pipes, shall comply with Section 1591(m).~~

~~NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.~~

~~***~~

~~Subchapter 17. Mine Safety Orders~~

~~***~~

~~Article 17. Loading, Hauling, and Dumping~~

~~***~~

~~§7016. Haulage Vehicle, Construction and Maintenance.~~

~~***~~

~~(m) Exhaust retrofits. Modifications made to a vehicle's existing exhaust system to install an air pollution control device, including the air pollution control device and all modified sections of the vehicle's exhaust pipes, shall comply with Section 1591(m).~~

~~NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code~~

**SUMMARY AND RESPONSES
TO
COMMENTS**

**SUMMARY AND RESPONSES TO COMMENTS RESULTING FROM
THE FIRST 15-DAY NOTICE OF PROPOSED MODIFICATIONS**

Mr. Gary Cross, Attorney, Representing the Industrial Truck Association, by email sent April 25, 2011.

GC1: Mr. Cross stated that the Industrial Truck Association agrees with the proposed modification.

Response: The Board thanks Mr. Cross for his comments.

Mr. Dave Harrison, Director of Safety, Operating Engineers, Local Union No. 3, by email sent April 22, 2011.

DH1: Mr. Harrison stated that he supports the proposal except for modified Section 1591(m)(6) which he believes needs to be more specific to prevent relocating an exhaust stack from an area out of the operator's direct line of sight to an area in the operator's direct sight, therefore, creating an impairment to the driver's operational vision.

Response: Proposed Section 1591(m)(6), as modified in the First 15-Day Notice, stated that if an exhaust stack is relocated, the new location shall not create a greater impairment to the driver's operational vision. To improve clarity, proposed subsection (m)(6) was further modified to provide that retrofit exhaust stacks must comply with the conditions in proposed new subsections (m)(6)(A) through (m)(6)(C). Subsection (m)(6)(B) would prohibit retrofit exhaust stacks that reduce the driver's view of the outside edge of the blade or bucket on earthmoving equipment. Subsection (m)(6)(C) would prohibit retrofit exhaust stacks that reduce the driver's view to the front, sides, or rear of the vehicle; and it would clarify that a retrofit exhaust stack reduces the driver's view if the area it obstructs from the driver's view is wider than the area obstructed by the original exhaust stack. In addition, a "note" was added following subsection (m)(6)(C) that provides three examples of conditions where relocating an exhaust stack may reduce the driver's view, including moving an exhaust stack from a location where it is hidden from the driver's view by a part of the vehicle to a location where it obstructs the driver's view. A provision that specifically prohibited "relocating an exhaust stack from an area out of the operator's direct line of sight to an area in the operator's direct sight" would not provide sufficient clarity in regards to determining when an exhaust stack is located in, or out of, the operator's direct line of sight. It would also create confusion in that most original equipment manufacturers exhaust stacks on front engine mounted earthmoving vehicles are located directly in front of the driver.

The Board thanks Mr. Harrison for his comments.

Mr. Bruce Wick, Director of Risk Management, California Professional Association of Specialty Contractors (CALPASC), by email sent April 25, 2011.

BW1: Mr. Wick stated that he supports the modified proposal noticed April 5, 2011. Mr. Wick requested that the Board clearly define in the Final Statement of Reasons (FSOR) what is meant

by “greater impairment” in modified Section 1591(m)(6). He suggested that the FSOR should show several clear examples of “greater impairment” when exhaust stacks are relocated, such as:

1. Moving an exhaust stack closer to the operator will typically increase the masking effect.
2. Moving an exhaust stack from one quadrant of a vehicle where the operator rarely looks, to a quadrant where the operator is continually looking, would be a “greater impairment”.
3. Moving an exhaust stack from a spot on the vehicle where the stack is out of the operator’s view due to the structural parts of the cab, to a spot within the operator’s view through the cab windows, would be a “greater impairment”.

Mr. Wick states that there are more examples, but these types of specifics would help define this important phrase.

Response: See response to DH1 in addition to the following. The language suggested by Mr. Wick, “moving an exhaust stack from one quadrant of a vehicle where the operator rarely looks, to a quadrant where the operator is continually looking” does not provide sufficient clarity to use as an example of an exhaust stack relocation that does not comply with a provision that prevents reducing the driver’s view.

The Board thanks Mr. Wick for his comments.

Mr. Joseph Kubsh, Executive Director, Manufacturers of Emission Controls Association, by email sent April 25, 2011.

JK1: Mr. Kubsh states that the Board has failed to demonstrate the necessity of establishing a separate set of visibility standards for exhaust retrofit devices, beyond those that already exist (Section 1591(b)) for any installation of equipment or accessories to construction equipment. He also states that the Board has failed to consistently treat the visibility impacts caused by all modifications to construction equipment such as the installation of third-party, aftermarket accessories. He asserts that regulations must be consistent in their requirements and not set different standards to accessories based on their perceived functionality.

Response: See response to JK4.

JK2: Mr. Kubsh states that he is concerned that the Board simply eliminated the Visibility Testing Procedures in Appendix A to Section 1591 without any justification beyond one stakeholder’s comment that it was “too complex” and “allowed an unsafe level of masking” when in fact it was more restrictive with respect to blocked visibility than the ISO 5006 visibility standard. He also states that complexity should not be the reason for not establishing fair, balanced, performance based safety regulations.

Response: See response to JG1 in addition to the following. The Board disagrees with Mr. Kubsh’s assertion that the only justification for modifying the proposal to eliminate the visibility test procedure and standard in Appendix A was because of one stakeholder’s comment that it was “too complex” and “allowed an unsafe level of masking”. The comments that the Board received from stakeholders in response to the 45-Day Notice demonstrated consensus among employer and employee representatives that the proposed visibility test was too complex and the visibility standard would allow an unsafe level of masking. However, the Board recognizes that a test procedure would provide guidance and a method employers could choose to use to determine compliance with the proposed visibility provisions. Therefore, the Second 15-Day Notice of

proposed modifications includes a visibility test procedure in non-mandatory Appendix A. The non-mandatory test procedure is not as complex as the mandatory test procedure proposed in the First 45-Day Notice.

JK3: Mr. Kubsh notes that the petitioners for Petition 507 were concerned that a huge increase of diesel exhaust retrofit installations would increase the number of workplace accidents due to potential blocked visibility caused by above hood installation of retrofit devices. He also notes that on December 17, 2010, the ARB amended their regulation to no longer require retrofits on 100,000 in-use off-road construction vehicles, but rather allowing retrofits to be used as a compliance option. He states that, to his knowledge, no accidents have ever been attributed to the presence of exhaust retrofits on construction vehicles despite tens of thousands of retrofit installations in, and outside of, California. Mr. Kubsh asserts that the Board has not provided any data or evidence in their report that would suggest that diesel retrofits have been found to increase the number of accidents due to visibility impairment. He further states that the staff report references OSHA accident reports where a contributing factor to these accidents was obstructed visibility by a part of the vehicle. He asserts that none of these accidents were caused by the installation of an exhaust retrofit device.

Response: See response to JK4 in addition to the following. The Board report referenced accident reports that demonstrate that every year California workers are killed or seriously injured as a result of being struck by haulage or earthmoving vehicles and that in many of these accidents the victim is working in an area where the driver's view is obstructed by the vehicle. The amended ARB regulation is expected to result in the installation of several thousand retrofits. Retrofits have been installed in a manner that prevents a driver from being able to see an employee working near a vehicle, which increases the risk of an employee being struck and seriously injured or killed; therefore, a visibility standard is needed to provide guidance on the installation of exhaust retrofits.

JK4: Mr. Kubsh notes that Section 1591(b) of Title 8 addresses the installation of equipment and accessories on haulage vehicles and requires that they do not block operator visibility to the front and sides. He states that retrofits represent a class of add-on accessories just like the many other add-on accessories that vehicle owners may choose to install on their equipment. He asserts that there are hundreds of third-party add-on accessories that are installed on vehicles for which the vehicle was not originally designed but were developed to increase the functionality of the equipment. He suggests that operator training can compensate for restricted visibility. He requests that if the Board believes Section 1591(b) should be amended to include visibility impairment to the rear of the vehicle, then the same requirement should apply consistently to all third-party or aftermarket parts. He asserts that this was part of the original petition, and has been supported by all stakeholders throughout the process. He states that the report fails to justify why a visibility standard specific to exhaust retrofits is needed or why the installation of exhaust retrofits should be treated differently from the installation of other aftermarket parts on off-road equipment. He claims that consistency has been overlooked in the proposed regulation.

Response: Existing Section 1591(b) provides that equipment and accessories installed on haulage vehicles shall be so arranged as to avoid impairing the driver's operational vision to the front and sides. The Petitioners proposed to amend that Section to include the driver's vision to the rear. Retrofit manufacturers objected to that proposal and sought a conditional exemption for exhaust retrofits that would allow a retrofit to impair a limited amount of the driver's operational vision to the front, sides and rear, in conflict with existing Section 1591(b). Proposed Section

1591(m)(5), as modified in the Second 15-Day Notice, provides that an exhaust retrofit shall not block the driver's view of an area or object located 40 inches outside of the smallest rectangle that encompasses the perimeter of a vehicle. The modified proposal is based on the results of a study of 50 of the most common types of off-road diesel vehicles. Based on the study results, it is estimated that 70 percent of haulage and earthmoving vehicles could be retrofit in compliance with modified subsection (m)(5). When amendments to the Title 8 safety orders were first proposed, it was estimated that the proposed ARB rule could result in as many as 150,000 vehicle retrofits, hundreds of vehicles had already been retrofit, and the first deadline for retrofitting thousands of vehicles was imminent. Persons working in the area where the driver's view is obstructed by an exhaust retrofit are at risk of being struck by the vehicle; therefore a safety standard to address retrofit hazards is necessary. Although amendments to the ARB rule have greatly reduced the number of expected retrofits and delayed implementation dates, employers are currently seeking to retrofit vehicles to comply with the amended ARB standard; therefore a safety standard that addresses retrofits is currently needed. Unlike exhaust retrofits, other types of equipment and accessories are not expected to be added to thousands of haulage and earthmoving vehicles in response to regulatory requirements. Expanding the scope of the proposal to include all equipment and accessories would delay the adoption of a standard that addresses retrofit visibility hazards. It would require conducting a study, possibly similar to the joint ARB/CalOSHA retrofit visibility study, to determine a visibility standard that is reasonable and appropriate for different types of equipment and accessories that may be added to a vehicle. The feasibility issues are not the same for all equipment and accessories; therefore, it is likely that, in the end, different visibility standards would be necessary. The proposal, as modified in the Second 15-Day Notice, does not conflict with Section 1591(b). In addition, it is not reasonable to expect that operator training would effectively compensate for reducing a driver's view, as Mr. Kubsh suggested. It is widely recognized that engineering controls are more effective than administrative controls for protecting employees.

JK5: Mr. Kubsh states that off-road vehicle types inherently have varying levels of visibility; some have large blind spots, and vehicle manufacturers have incorporated safety devices such as mirrors, back-up alarms, motion sensors and cameras into their designs to assist with varying levels of visibility. He asserts that Board staff's arguments that mirrors or back-up cameras are not a safe, reliable substitute for an obstructed view; that mirrors may be missing, damaged or out of alignment; and that mirrors may be obstructed by vibration, dirt, fog, rain or snow; contradict Section 1593(d) which requires that before operating a haulage vehicle the equipment and accessories must be checked for proper operation. He states that numerous accident reports, including a referenced National Institute for Occupational Safety and Health (NIOSH) report, recommend the use of back-up cameras or mirrors. He states that mirrors are essential visibility aids; precluding the use of mirrors is contradictory to the goal of safety; and that mirrors should be allowed when assessing visibility around equipment.

Response: NIOSH studies show that OEM mirrors are not reliable in that there are large blind spots behind haulage and earthmoving vehicles where OEM mirrors are not effective.¹ The joint retrofit visibility study revealed that many retrofits installed behind the driver on the body of construction vehicles would obstruct the driver's direct view of areas that are not visible in OEM mirrors. The proposal does not preclude the use of mirrors when operating equipment and it does not conflict with Section 1593(d). Mr. Kubsh provided no evidence that vehicles with mirrors

¹ Construction Equipment Visibility, CDC-NIOSH, <http://www.cdc.gov/niosh/topics/highwayworkzones/BAD/default.html>

and an obstructed view to the rear are as safe as vehicles with mirrors and an unobstructed view to the rear. The proposal noticed for public hearing did not allow the use of mirrors or cameras when determining masking. The First 15-Day Notice did not modify that provision; therefore, comments requesting to modify that provision are outside the scope of the Second 15-Day Notice of Proposed Modifications.

JK6: Mr. Kubsh agrees that hot surfaces of retrofit devices should be adequately shielded to prevent burn hazards to operators but requested that the proposal make a distinction between employees working around the equipment and mechanics who must remove shielding and access the engine compartment for the purpose of making repairs. He asserts that the modified proposal is inconsistent in that it specifies a 140 degree F surface temperature for retrofits with no criteria as to the surface temperature of other hot surfaces found within the engine compartment of vehicles such as exhaust pipes, engine block, radiator, exhaust manifold, turbocharger housing etc. Mr. Kubsh believes that the regulation pertaining to thermal hazards should apply equally to retrofits as well as other hot surfaces found on vehicles. He states that an under hood installation of a retrofit is shielded by the hood from operator contact; on the other hand, mechanics are trained in the location of hot surfaces within an engine compartment and may have to remove cowling and heat shield to gain access for the purpose of repair. He requests that the surface temperature criteria of 140 degrees F should apply to those surfaces that may be contacted “during the performance of normal duties” as stated in the original proposal.

Response: Proposed subsection (m)(4), as proposed in the First 45-Day Notice, provides that an exhaust retrofit shall be located or effectively shielded such that it does not increase the risk of the operator, during performance of normal duties, contacting exhaust system surfaces having a temperature of 140 degrees F (60 degrees C) or higher. The proposal was modified in the First 15-Day Notice to replace “the operator, during performance of normal duties,” with “an employee”. That modification was necessary to protect all employees who perform work which exposes them to accidental contact with the hot surface of a retrofit. Not all objects under an engine hood are hot enough to cause a burn on contact. An exhaust retrofit introduces a burn hazard that an employee might not recognize. However, since there may not be enough space in an engine compartment to accommodate both an exhaust retrofit and shielding around the retrofit, and the hood of an engine compartment provides shielding; a modification to subsection (m)(4) is proposed in the Second 15-Day Notice. The proposed modification provides that heat shielding is not required on an exhaust retrofit located under the hood of a vehicle if space limitations make shielding impracticable.

The Board thanks Mr. Kubsh for his comments.

Mr. James Goldstene, Executive Officer, California Air Resources Board, by letter dated April 25, 2011.

JG1: Mr. Goldstene stated that the proposed modifications would throw out over a year’s worth of joint agency engineering and field work, which developed a repeatable retrofit visibility test method and visibility standard based on sound engineering principles and strong stakeholder involvement. He also provided the following related comments.

- Staff work included dozens of visits to numerous fleets using varying types of off-road vehicles, and assessment of dozens of vehicles by retrofit installation experts.
- The test method and standard proposed by OSHSB staff at the February 17, 2011, Board meeting was the result of feedback from all parties, including the petitioners, construction

equipment and retrofit manufacturers, ARB staff, and was based on engineering principles used in similar standards for construction and earthmoving equipment.

- The proposed modifications are not based on any field work or engineering principles, nor do they contain any test method for determining whether a visibility impact exists and quantifying it (much less tested for repeatability, as was the previous proposal).

Response: See response to JG2 in addition to the following. A visibility test method was developed as part of the joint agency field study undertaken to identify a “deminimus” level of masking for a proposed visibility standard. The visibility test method required by proposed subsection (m)(5) and included in proposed Section 1591 - Appendix A allowed for a deminimus level of masking. Employee and employer stakeholders commented that the proposed visibility standard did not adequately protect employees and that the proposed test method was difficult to understand and impractical for employers to perform. In response to stakeholder comments, the First 15-Day Notice of proposed modifications replaced the prescriptive visibility standard and test method with a more protective performance oriented visibility standard in proposed subsection (m)(5). Further modifications are proposed to subsection (m)(5) which would provide that an exhaust retrofit shall not block the driver’s view of an area or object located 40 inches outside of the smallest rectangle that encompasses the perimeter of a vehicle. Based on the results of the field study of 50 common types of off-road diesel vehicles, it is estimated that approximately 70 percent of haulage and earthmoving vehicles can be retrofit in compliance with modified subsection (m)(5). This is approximately the same percentage of off-road diesel vehicles that could be retrofit in accordance with the visibility standard and test method initially proposed in the First 45-Day Notice. The modifications proposed in the Second 15-Day Notice also include a visibility test procedure in non-mandatory Appendix A. The proposed non-mandatory test procedure is less complex than the mandatory test procedure initially proposed in the First 45-Day Notice. Modified subsection (m)(5) and non-mandatory Appendix A are based on engineering principles used in similar standards for construction vehicles. Proposed new subsections (m)(5)(A) through (m)(5)(D) provide additional specificity to improve consistency and repeatability.

JG2: Mr. Goldstene stated that the proposed modifications would lead to higher compliance costs and greater emissions for fleets subject to the ARB’s In-Use Off-Road Diesel Regulation by removing a safe and cost-effective compliance solution for seemingly arbitrary reasons. He also provided the following related comments.

- ARB estimates that compared to the February 17, 2011, proposal, the proposed modifications will reduce the number of off-road vehicles that can be retrofit by one half, meaning up to 3,000 fewer vehicles would be retrofit.
- The proposed modifications will make retrofit installation more difficult and will increase uncertainty regarding compliance which will undermine double credit provision in the ARB regulation and result in fewer retrofit installations before 2014 and less emission benefits.
- ARB staff estimates businesses could face approximately \$17 million in additional costs, largely due to vehicles that could otherwise be safely retrofit being forced to be replaced.
- The proposed visibility standard is overly strict, would ban an exhaust retrofit that clearly could not obscure view of a worker on the ground, and fails to recognize the potential benefit of exhaust retrofits in limiting worker exposure to toxic diesel particulate matter.
- To comply with the California Environmental Quality Act (CEQA), an analysis should be performed to determine whether the proposed modifications may have a significant effect on the environment, including worker health.

- An economic analysis should be performed before adopting a proposal that is different from the proposal noticed for public hearing.

Response: The proposal noticed for the February 17, 2011, public hearing, provided a visibility standard and visibility test procedures that would apply to all types of off-road diesel vehicles. The February 17th proposal would prohibit a retrofit that blocks the driver's view of a five foot tall object 40 inches from the perimeter of a vehicle. It was estimated that approximately 70 percent of off-road diesel vehicles could be retrofit in compliance with that visibility standard. In response to comments that the proposal was not at least as effective as federal OSHA standards, did not adequately protect workers, and the mandatory test method was not practical, the proposal was modified in a First 15-Day Notice to limit the scope of the proposal to earthmoving, haulage and job-site vehicles, and replace the visibility standard and test method with a more restrictive performance based visibility standard that would prohibit a retrofit that reduces the driver's view of the ground surrounding a vehicle. In response to comments on the First 15-Day Notice, the proposal is being modified in a Second 15-Day Notice. Modified subsections (m)(5) and (m)(6), along with the modified visibility test procedures in non-mandatory Appendix A, improve consistency and reproducibility as requested by Mr. Goldstene. The modified visibility standard in the Second 15-Day Notice would prohibit a retrofit that obstructs the driver's view of an area or object located 40 inches outside of the smallest rectangle that encompasses the perimeter of a vehicle. It would also provide an exception for retrofits installed on the rear of excavators that turn to face the direction of travel. The modified test procedures in non-mandatory Appendix A provide guidance and reduce uncertainty regarding compliance, as requested by Mr. Goldstene. Based on the results of the joint ARB/CalOSHA visibility study of the 50 most common off-road vehicles, it is estimated that approximately 70 percent of earthmoving and haulage vehicles could be retrofit in compliance with the modified visibility standard, which is approximately the same number of vehicles that could be retrofit in compliance with the February 17th proposal. The modified proposal would allow two types of excavators to be retrofit that the February 17th proposal would not have allowed to be retrofit. It also would continue to allow a retrofit to be installed near the battery box on backhoe loaders in a location where it clearly could not obscure the driver's view of a worker on the ground. The modified proposal may prohibit installing a retrofit on the body of one model of scraper, one model of grader, and one model of crawler tractor that the February 17th proposal would have allowed to be retrofit.

The proposal noticed for public hearing concerned masking 5 feet above a 40 inch rectangular boundary. Those parameters were derived from the consensus standard, ISO 5006, and are discussed in the Initial Statement of Reasons. The proposal was modified in response to comments that it would not provide protection for workers kneeling 40 inches from a vehicle or workers standing closer than 40 inches from a vehicle. The proposal in the First 15-Day Notice would prohibit a retrofit that obstructed the driver's view of the ground surrounding a vehicle. Further modifications are proposed in response to comments that the proposal would prohibit a retrofit that would not prevent a driver from being able to see a worker standing or kneeling next to a vehicle. The proposal in the Second 15-Day Notice would prohibit a retrofit that obstructs the driver's view of an area or object 40 inches from the perimeter of a vehicle. The use of this perimeter distance promotes consistency and predictability in the application of the standard. The 5 foot height is not utilized in the interest of protecting employees kneeling or otherwise positioned near ground level. The Board believes that the use of the 40 inch perimeter combined with a line of sight directed to ground level, as opposed to a height of 5 feet, will enable drivers of most, if not all, earthmoving and haulage vehicles to see a person standing immediately next

to a vehicle. The NIOSH masking diagrams indicate that backhoe loaders are the only vehicles that create masking on the ground 40 inches from the vehicle near the engine compartment where a retrofit would be located. Therefore, to comply with the proposal, these vehicles would need to be retrofitted under the hood. The proposal does not require that retrofits be installed only under the hood because a performance standard is preferable to a specification standard, and such a requirement would prohibit retrofits on equipment, such as loaders, which can be retrofitted in other locations without obstructing the driver's view of a person standing or kneeling next to the vehicle.

Under the amended ARB standard, the installation of exhaust retrofits is only one of the options available to fleet owners to comply with target emission levels; therefore the modified proposal would not affect the emissions benefits that the ARB standard seeks to achieve when the ARB standard is fully implemented. The modified proposal only applies to haulage, earthmoving and job-site vehicles. It would permit approximately the same number of these types of vehicles to be retrofitted as the February 17th proposal; therefore, it would not negatively impact the emission benefits achieved by early compliance. ARB never suggested to the Board that a CEQA analysis was required for the initial proposal, and the Board's safety orders have historically never been regarded as the types of enactments that are subject to CEQA.

The cost impact provided in the Initial Statement of Reasons clearly stated that retrofits can be a cost effective compliance option, and that a visibility standard that limits the number of vehicles that can be retrofitted will increase compliance costs; nevertheless, representatives of fleet owners commented that they support a standard that prohibits retrofits that increase masking. The Department of Finance informed the OSHSB that the cost of the OSHSB proposal should be attributed to the ARB off-road diesel regulation. The Board does not expect the proposed modifications to result in any additional costs; however, if additional costs do occur, the Board estimates that those costs would be off-set by savings resulting from a decrease in accidents.

Vehicle drivers and nearby employees will benefit from the ARB off-road diesel regulation by being exposed to lower concentrations of diesel exhaust; however, this health benefit does not justify unnecessarily exposing employees to an increased risk of being struck by construction vehicles.

It is noted that this proposal as modified in accordance with a Second 15-Day Notice does not result in the establishment of inflexible safety orders. Consistent with the provisions of the Labor Code that govern this rulemaking, the Board's experience has demonstrated that alternative strategies can result in equally effective ways of ameliorating safety hazards. The Legislature, in Labor Code 143, has provided a variance process that allows employers to utilize an alternative strategy if the alternative results in a level of safety at least equivalent to the level of safety that would be achieved if the employer complied with the safety order. Labor Code Section 143 and the Board regulations establish the legal requirements and procedures for granting a variance. Those requirements and procedures constitute the mechanism that an employer could use if, for example, the employer wished to use an exhaust retrofit that created no more masking than a vehicle's original equipment. Labor Code Section 143, and related provisions of the Labor Code, require that variances be considered on a case-by-case basis and in light of all relevant facts disclosed during the variance proceeding.

JG3: Mr. Goldstene stated that the lack of an objective test method to evaluate visibility impacts creates uncertainty regarding appropriate installation practices and could result in less safe,

rather than safer installations of diesel exhaust retrofits. He also provided the following related comments.

- Visibility “impairment” is not easily defined as it depends on a number of factors, including the location of the retrofit and the height, weight, and eye position of the operator; and there are other complicating factors such as establishing the visibility impairment of the OEM equipment. As such, an objective test method is needed to consistently evaluate potential visibility impacts from retrofits.
- Without a test method, determining compliance with the visibility standard will be inconsistent, difficult to enforce, and fail to protect workers.
- ARB student assistants were able to perform the test method used in the joint visibility study; demonstrating that the method is not overly complex.

Response: See responses to JK2, JG2, and JG3.

JG4: Mr. Goldstene stated that the proposed modifications are biased in that they target only exhaust emission retrofits, and do not attempt to address visibility impacts of other types of vehicle retrofits or modifications (including aftermarket air cleaners, appurtenances, water coolers, tool boxes, et.) which can have even greater visibility impacts than exhaust emission retrofits. He also provided the following related comments.

- The Initial Statement of Reasons for the proposal did not adequately address why exhaust retrofits have been singled out, and did not support that modifications to equipment presents a hazard to operators that cannot adequately be addressed by additional operator training mirrors, cameras and/or updated field safety practices.
- If modifications to the profile of a vehicle create a hazard, then the proposal’s exemption for all modifications except for exhaust retrofits, which are not allowed to alter the visibility profile by even a millimeter, would create unsafe and untenable working conditions.
- Obviously OSHSB staff recognizes both the ability of operators to work with varying conditions as needed, and the ability to update operator practices to account for impacts on visibility, yet have not applied this reasoning to exhaust retrofits.

Response: See responses to JK4 and JK5 in addition to the following. The proposal, as modified in the Second 15-Day Notice, would not specifically exempt all modifications other than for exhaust retrofits, and it does not prohibit all exhaust retrofits that alter the visibility profile by even a millimeter. It does prohibit retrofits that increase the size of the area already masked by the vehicle’s perimeter.

The Board thanks Mr. Goldstene for his comments.