

**STATEMENT OF THE  
MANUFACTURERS OF EMISSION CONTROLS ASSOCIATION  
TO THE OCCUPATIONAL SAFETY AND HEALTH STANDARDS BOARD  
REGARDING THE PROPOSED STATE STANDARD TITLE 8, VEHICLE EXHAUST  
RETROFITS**

*February 17, 2011*

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MECA would like to thank the OSHSB staff for their hard work and dedication in addressing the safe installation of retrofit devices on off-road construction and industrial vehicles and for presenting the proposed changes to Title 8 to the Occupational Safety and Health Standards Board. We believe that this proposal to amend Title 8, Sections 1504, 1591, 1597, 3663 and 7016 and to add Appendix A following Section 1591 and Section 4925.1 takes a significant step toward addressing the safety concerns raised by Petition 507. There are several aspects of the proposal that we believe deserve further consideration by the Board that address consistency. Our recommendations focus on consistency of the proposal with regard to the treatment of surface temperatures and visibility impacts associated with exhaust retrofits, OEM exhaust systems and third party add-on parts. MECA provides these recommendations in support of the overarching goal of safe exhaust retrofit installation on construction equipment and consistent regulations that will serve to ensure that modifying construction equipment with a retrofit, or any other add-on part, is done with consideration to the safe operation of the vehicle, the operators and workers on construction sites.

MECA is a non-profit association of the world's leading manufacturers of emission control technology for motor vehicles. Our members have over 30 years of experience, and a proven track record, in developing and manufacturing emission control technology for a wide variety of new diesel and gasoline on-road and off-road vehicles and equipment. A number of our members have extensive experience in the development, manufacture, and application of PM and NO<sub>x</sub> control retrofit technologies including most of the devices on ARB's Verified Diesel Emission Control System (VDECS) list. MECA members are committed to insure that retrofit devices on construction vehicles are installed in a safe and responsible manner.

MECA agrees that the proper integration of emission control technology on off-road vehicles and equipment must incorporate safety, durability and performance. Our industry takes the safe operation and installation of emission control devices very seriously. We recognize that in some cases, diesel retrofits offer the most cost effective option in meeting ARB's in-use, off-road regulations. Diesel retrofit filters also provide safe air quality in the cabins of construction vehicles and their vicinity for the benefit of operators and construction workers on the work site. A 2004 study conducted in the Northeastern United States at five construction sites measured air quality at the perimeter of the site and within the cabs of construction equipment. Analysis of measurement results found that construction workers were exposed to up to 16 times more PM<sub>2.5</sub> than the average ambient level outside the construction site and peak concentrations during active work may present acute health risks to workers and nearby residents. When averaged over 24 hours, in-cabin measurements of PM<sub>2.5</sub> were shown to exceed the National Ambient Air Quality

Standard (NAAQS) by 4-6 times. The study also found elevated levels of benzene, 1,3-butadiene, formaldehyde, acetaldehyde and heavy metals commonly found in diesel fuel and lubricants. The levels of some of these compounds exceeded the 8-hour exposure limit established by the American Conference of Governmental Industrial Hygienists or ACGIH.

The catalysts and filters that are components of Level 2 and Level 3 VDECS are designed to substantially remove pollutants and air toxics from diesel exhaust and in effect serve to reduce worker exposure to air toxics inside the cabins of vehicles, on construction sites, in buildings and other confined spaces. California's state standard Title 8, Section 1533, subchapter 4, specifies retrofit controls as a compliance option for internal combustion engine powered industrial trucks operated indoors. For large warehouse operations, retrofits on industrial trucks provide an effective, economical compliance option for protecting workers from exposure to harmful exhaust gases in compliance with Section 5141, subchapter 7 of OSHSB's General Industry Safety Orders and Section 1533, subchapter 4. The 50 vehicle study conducted by OSHSB and ARB concluded that some of the types of vehicles that are sometimes used in confined spaces and inside buildings may be challenging to retrofit within the guidelines of the visibility assessment procedure.

The regulatory amendments adopted in December by ARB removed all off-road retrofit mandates for fleets to comply with the regulations leaving the installation of VDECS as a voluntary option toward compliance. We believe that the proposed visibility method significantly limits this option to construction fleets for using retrofits on certain high cost vehicles and significantly increases the cost of compliance beyond the impact in the OSHSB staff report. The 50 vehicle analysis provides an excellent case study on the visibility impacts of retrofitting off-road vehicles. The study selected the 50 most popular vehicles in the California fleet. Of the roughly 150,000 off-road vehicles, the study captured 67% of the general vehicle types (105,000 vehicles) but the specific vehicle models in the study only represent 20,000 – 25,000 vehicles in the statewide fleet. That is only 17% of the vehicles. Because application engineering of a retrofit device is very specific to each vehicle configuration, we see this as a significant shortcoming of the study's ability to predict the number of vehicles that may be retrofitted without visibility impairment and ultimately the cost impact on the end users. Furthermore, the study never relied on detailed engineering of the complete exhaust piping and brackets that would be necessary to install the retrofit system on the vehicles. Actual measurements using the study method were only conducted on nine of the vehicles and these measurements were done using mock-ups of a DPF filter absent the necessary inlet and outlet exhaust piping. For these reasons we believe that the 67% successful retrofit feasibility projection is overly optimistic and the cost impacts of having to replace a larger population of equipment due to minor additional visibility impacts is under estimated in the proposal. OSHSB staff's cost impact analysis, included in the proposal, is a back of the envelope estimate that uses a single value of average fleet horsepower and average retrofit costs on a single replacement age of vehicles (18 year old vehicle replaced with a 10 year old vehicle). It will not be possible to replace the entire state-wide fleet with 10 year old equipment (as assumed by staff). We believe that the actual cost of equipment replacement versus retrofit installation for larger horsepower and specialized equipment will be significantly higher than the \$8,052 per vehicle suggested in the staff report. As such, OSHSB staff has likely underestimated the cost effectiveness of retrofits as a compliance option for ARB's

off-road regulations. ARB's cost analysis for their off-road fleet regulation provides a more rigorous analysis for determining replacement costs of off-road equipment.

Manufacturers have commented that the increase in the cost of an underhood or out of sight retrofit would be 25-30% higher than one mounted outside of the vehicle's engine compartment. This is due to the additional engineering required to design a system to fit in a smaller space envelope so it would create zero masking as defined by the study method. Manufacturers believe that the major portion of this cost increase is caused by trying to eliminate the last few inches of masking often caused by exhaust piping associated with the filter. Most of this cost increase could be alleviated by allowing some de minimus level of masking to account for the full system packaging. De minimus masking criteria are specified for motor vehicles in California's Vehicle Code, Section 26708. Although we realize that off-road vehicles are not subject to the Motor Vehicle Code, this example provides precedent to an acceptable finite level of masking in the windshield and rear window of on-road vehicles. MECA requests that the Board consider allowing for some additional de minimus level of visibility masking beyond that proposed in Appendix A. We recommend the use of the ISO 5006 guideline, of approximately 12 inches of additional masking, be added to the staff proposal to provide some additional flexibility in engineering an exhaust retrofit system installation.

Appendix A, subsection E(3)c of the regulation, specifies that the retrofit exhaust stack be positioned in the same location as the OEM exhaust pipe in relation to the operators 360° view toward the horizon. This appears to conflict with subsection B(3)d that allows flexibility on the stack location as long as it does not create additional masking relative to the OEM exhaust stack. We concur that the level of masking is more critical than the exact position since it is often necessary to relocate the exhaust stack to allow for the positioning of the retrofit. Furthermore, the masking can be equivalent whether the stack is on the right side of the vehicle or the left as long as the distance from the driver is the same. We request OSHSB to harmonize the language in these sections to allow flexibility in exhaust stack location within the limitation of no additional masking.

MECA believes that the proposal is inconsistent with respect to safe levels of masking, or blocked visibility, caused by exhaust retrofits or other aftermarket add-on parts installed on construction vehicles. Section 1591(b) requires that equipment and accessories installed on haulage vehicles should avoid impairing the driver's vision to the front and sides whereas exhaust retrofits are held to a 360° visibility criteria. Retrofit devices must demonstrate no blocked visibility above 5 feet at a 40 inch perimeter around the vehicle. The staff report offers no justification why retrofits are held to a higher visibility standard than other aftermarket parts that are installed on vehicles. MECA requests consideration by the Board that equivalency in masking (Section E(3)c and 1591(b)) be applied for exhaust retrofit and other add-on devices.

Off-road vehicle types inherently have varying levels of visibility even for OEM designs. For example, OEM equipment does not have identical visibility when comparing different equipment types or equipment of the same type made by different manufacturers. The reality is that operators perform their jobs with varying levels of visibility while operating construction equipment. The operator's field of view changes during the course of normal operation as

shovels and payloads are moved on the construction site or in warehouses. The 50 vehicle study, referenced in the staff report, concluded that a number of OEM configured vehicles failed the proposed visibility criteria. The staff report references accident reports in OSHA's Integrated Management Information System (IMIS) where a contributing factor to these accidents was obstructed visibility by a part of the vehicle. None of these accidents were caused by the installation of an exhaust retrofit device. The staff report fails to justify why a safety 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, or differently from the design of OEM configured equipment. If the visibility criteria were to be applied consistently, than a number of existing OEM designed vehicles would be unsafe to operate. If adopted, the proposal would create an inconsistency in regulatory law where a piece of equipment that failed the visibility test would be allowed to operate in a workplace as long as it does not have a retrofit installed. This creates a situation where retrofit equipment is held to a different visibility standard than OEM equipment or aftermarket add-on parts without justification. Original equipment designers rely on ISO 5006 as a guide when designing new vehicles. This standard has incorporated additional allowed masking, beyond the staff proposal, that accounts for safe visibility while providing some flexibility for the functional design of equipment.

Visibility is often impaired for the sake of expanded functionality of a machine by installing third-party aftermarket parts. Vehicle and equipment manufacturers have incorporated safeguards such as mirrors, back-up alarms, motion sensors and cameras into their designs to assist operators with the varying levels of visibility they experience while performing their task. OEM installed mirrors are important visibility aids that are installed on vehicles to facilitate safely maneuvering the vehicle. The majority of OEM construction vehicles are equipped with mirrors for that reason and many would fail the guidelines established by the ISO 5006 standard if it did not allow for the use of mirrors in assessing masking. Mirrors allow the operator to see blocked areas along the side of machines and are essential safety devices on dump trucks, scrapers, graders and other types of equipment which inherently have large blind spots. MECA believes that the use of mirrors should be allowed in the visibility method when assessing masking similar to the treatment of OEM installed mirrors in ISO 5006. The staff report declares that mirrors or back-up cameras are not a safe, reliable substitute for an unobstructed view. Equipment manufacturers have designed mirrors and cameras into vehicles to assist in their safe operation. The NIOSH Fatality Assessment and Control Evaluation (FACE) Program has recommended the use of back-up cameras or mirrors in a number of accident investigations involving workers being struck by construction equipment (Case Report 04MI107, 06MI096). To ignore a piece of safety equipment, such as an OEM installed mirror or camera, designed to preclude or mitigate a hazard appears contradictory to the fundamental goal of safety at the workplace. Furthermore, the mirror provision of Appendix A, subsection A.3, contradicts CARB's regulation for in-use, off-road diesel vehicles which states that a safety exemption "request will only be approved if the requesting party has made a thorough effort to find a safe method for installing and operating the VDECS, including considering the use of mirrors," etc.

We agree with staff's conclusion that hot surfaces of retrofit devices should be adequately shielded to prevent burn hazards to employees working with construction equipment. We believe that this should apply equally to retrofits as well as OEM exhausts. The proposed regulation is

inconsistent in that it specifies a 140° F surface temperature for retrofits with no criteria as to the surface temperature of an OEM installed exhaust system. Temperature measurements performed by some of our members show that the maximum temperature of engine-out exhaust gases are more than 100° C (200° F) hotter than the skin surface temperature of actively regenerated retrofits equipped with a fuel burner or electric heater. This is due to the shielding provided by the thermal insulation used around the retrofit filter element. We would be happy to share this temperature data with staff. We agree that thermal hazards must be addressed to prevent burns, however, in the interest of safety, this must be addressed consistently for all hot exhaust components.

The staff report justifies the necessity of Section 1591 m(3) to prevent an increase in fires caused by a release of hydraulic fluid or fuel contacting an exhaust retrofit. The reference to NIOSH workplace accident data does not provide any evidence that the fires that have occurred on construction vehicles were attributable to exhaust retrofit devices. This requirement does nothing to reduce the occurrence of engine fires caused by existing hot surfaces on OEM exhaust components such as turbocharger housings, engine exhaust manifolds and other engine parts but rather holds retrofits to a higher standard.

In closing we commend the Occupational Safety and Health Standards Board for setting necessary, consistent and clear standards for the state of California that provide a safe and healthy work environment for its workers, including those on construction and industrial sites. MECA believes that the proposed amendments to the Title 8 California Code of Regulations make substantial improvements to clarify existing language and incorporate additional provisions to insure that exhaust retrofits, installed on off-road vehicles, do not substantially increase the hazards that already exist with operating heavy equipment in close proximity to workers on the job site. We do believe that the proposal, as written, establishes a number of inconsistent and conflicting regulations for retrofit devices that are not required of OEM or other third-party aftermarket parts installed on construction equipment. We ask the Board to direct OSHSB staff to modify the proposal as part of the 15-day regulatory process to eliminate the inconsistencies and consider additional flexibilities in the level of allowed masking and the use of OEM installed mirrors in making masking determinations as suggested by ISO 5006. We thank the OSHSB staff for their hard work and dedication in bringing forth this proposal. Our industry is committed to do its part to insure the safe installation of diesel exhaust retrofit systems on off-road vehicles and equipment.

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