



Air Resources Board



Alan C. Lloyd, Ph.D.
Chairman

9528 Telstar Avenue • P.O. Box 8001 • El Monte, California 91731 • www.arb.ca.gov

Gray Davis
Governor

May 17, 1999

MANUFACTURERS ADVISORY CORRESPONDENCE No. MAC 99-04

TO: ALL MANUFACTURERS OF
- ON-ROAD MEDIUM-DUTY DIESEL ENGINES AND VEHICLES
- ON-ROAD HEAVY-DUTY DIESEL ENGINES AND VEHICLES
- OFF-ROAD HEAVY-DUTY DIESEL ENGINES AND EQUIPMENT
- SMALL OFF-ROAD DIESEL ENGINES AND EQUIPMENT
ALL MANUFACTURERS OF DIESEL INJECTION PUMPS
ALL OTHER INTERESTED PARTIES

SUBJECT: Tamper-Resistance Requirements for Diesel
Injection Pumps

Diesel engine manufacturers are solely responsible for demonstrating at certification that their engines have acceptable tamper-resistance measures for all emission-related adjustable parameters to assure that the adjustable settings remain as originally intended for the useful life of the certified engines. For the most part, emission-related adjustable parameters for diesel engines are associated with the diesel injection pump.

The attached Manufacturers Advisory Correspondence (MAC) provides the Air Resources Board (ARB)'s guidance for either the engine manufacturer or the diesel injection pump manufacturer to obtain ARB's approval of the tamper-resistance methods before ARB certifies such engines. The engine manufacturer alone must obtain approval of all other tamper-resistance methods for engine-based emission-related adjustable parameters, such as the turbocharger wastegate adjustment, or the speed adjustment on constant-speed engines.

If you have any questions or comments, please contact Duc Nguyen, Manager, Certification Section, at (626) 575-6844.

Sincerely,

R. B. Summerfield, Chief
Mobile Source Operations Division

Attachment

California Environmental Protection Agency

State of California
Air Resources Board

Manufacturers Advisory Correspondence No. MAC 99-04

SUBJECT: Tamper-Resistance Requirements for Diesel Injection
Pumps

APPLICABILITY: -On-Road Medium-Duty Diesel Engines and Vehicles
-On-Road Heavy-Duty Diesel Engines and Vehicles
-Off-Road Heavy-Duty Diesel Engines and Equipment
-Small Off-Road Equipment Diesel Engines

- REFERENCES:
1. "California Exhaust Emission Standards and Test Procedures for 1985 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles" last amended June 4, 1997 and incorporated by reference in Title 13, California Code of Regulations, Section 1956.8.
 2. "California Exhaust Emission Standards and Test Procedures for New 1996 and Later Heavy-Duty Off-Road Diesel Engines," promulgated July 12, 1993, and incorporated by reference in Title 13, California Code of Regulations, Section 2423.
 3. "California Exhaust Emission Standards and Test Procedures for 1995 and Later Small Off-Road Engines" last amended March 23, 1999, and incorporated by reference in Title 13, California Code of Regulations, Section 2403.
 4. Title 40, Code of Federal Regulations, Section 86-090-22(e).
 5. The Society of Automotive Engineering (SAE) Recommended Practice J2317, "Tamper Resistance for Adjustable Parameters on Diesel Fuel Injection Pumps," issued August 1996.

BACKGROUND AND DISCUSSION:

The Air Resources Board (ARB)'s regulations (13 CCR 1956.8(b), 13 CCR 2423(c)(1), and 13 CCR 2403(c)) require diesel engine manufacturers seeking to sell engines in California to first certify, using the Test Procedures incorporated by reference in these regulations and referenced above, that their engines meet

California's emission standards. As part of the certification process, the Test Procedures require manufacturers to demonstrate the use of acceptable tamper-resistance methods to assure that emission-related adjustable parameters for such engines remain as originally intended for the useful life of the certified engines. These Test Procedures either incorporate, adapt and modify, or pre-date the federal test procedures found at Title 40, Code of Federal Regulations, Part 86, section 86.090-22 (40 CFR 6.090-22). See Reference 1 (heavy-duty on-road) at p. 14, incorporating 40 CFR 86.090-22 in full; Reference 2 (heavy-duty off-road) at Part I, sections 8(b)(1)(ii) and 9(d), which are adapted and modified from federal procedures (see Reference 2 cover page); and Reference 3 (small off-road) at Part I, sections 14(b)(iii) and 18(d), which pre-dated and are substantially similar to the federal procedures.

Many of the emission-related adjustable parameters of diesel engines are those found on the diesel injection pumps. However, diesel engine manufacturers typically purchase the diesel injection pumps from various fuel pump manufacturers. Thus, the engine manufacturers have little influence on the design of tamper-resistance methods for those fuel pump-based parameters. The Engine Manufacturers Association (EMA), on behalf of its manufacturer members, has requested the ARB to work with diesel injection pump manufacturers regarding tamper-resistance measures for fuel pump-related adjustable parameters. Although all emission-related adjustable parameters are ultimately the engine manufacturers' responsibility at certification, the ARB agreed to separately assess any fuel pump-related tamper-resistance method requested by EMA. This approach has the potential for expediting the certification process.

For example, a diesel injection pump is typically used by many engine manufacturers. As an alternative to having each engine manufacturer seek separate approval of the tamper-resistance methods for the same fuel pump, engine manufacturers may reference ARB's tamper-resistance approval that was granted to the pump manufacturer. The individual engine manufacturers must still obtain ARB's approval for the tamper-resistance methods for all non-fuel pump-related adjustable parameters before ARB certifies such engine families.

The ARB and various diesel injection pump manufacturers have jointly identified four emission-related adjustable parameters typically found on diesel injection pumps. These pump parameters must be provided with acceptable tamper-resistance measures. These pump parameters are the fuel setting adjustment, fuel trimming adjustment, timing advance adjustment, and aneroid setting adjustment. Tamper-resistance measures are not required for the high and low idle engine speed adjustments because these adjustments are not expected to significantly affect emissions. Also, these idle engine speed adjustments are typically left open for final engine or equipment assembly.

The ARB has approved tamper-resistance measures for the fuel pump-related adjustable parameters based on the physical robustness of these measures and/or the inaccessibility of these adjustments when the pump is installed on an engine or a piece of equipment. The ARB also concurs with EMA that tamper-resistance measures are not necessary when a complete removal of the fuel pump is required before any pump adjustment can be made. The Society of Automotive Engineering (SAE) Recommended Practice J2317, "Tamper Resistance for Adjustable Parameters on Diesel Fuel Injection Pumps," issued in August 1996, provides a general description of various methods for imparting tamper resistance to diesel injection pumps. The ARB accepts these SAE J2317 methods in general. Because SAE J2317 Recommended Practice does not provide any specifications (e.g., screw or cap materials, dimensions, threads, adhesives, etc.) against which the ARB staff may evaluate the physical strength and fitness of these methods to resist attempts at defeating them, a pump manufacturer seeking approval must submit samples of their selected tamper-resistance methods, preferably as installed on a fuel pump, for evaluation by the ARB staff using criteria specified in the applicable Test Procedures.

To date, the ARB has evaluated and approved specific tamper-resistance methods for diesel injection pumps of the following fuel pump manufacturers: Bosch, Caterpillar, Lucas, Nippon-Denso, Stanadyne, and Zexel. The physical, material, and dimensional characteristics of these tamper-resistance measures are pump specific. Therefore, ARB's approval applies only to equipment that is identical to that submitted for approval.

POLICIES:

The tamper-resistance methods listed in the SAE J2317 Recommended Practice for diesel injection pumps are acceptable to the ARB. However, specific designs of these tamper-resistance methods implemented by each pump manufacturer must be evaluated and approved by the ARB based on material strength, physical characteristics and/or the need for special tools.

2. Though at time of certification the engine manufacturer must demonstrate the use of acceptable tamper-resistance methods to ensure the longevity of all emission-related adjustable parameters, either the engine manufacturer or the diesel injection pump manufacturer may separately request ARB's approval of the tamper-resistance methods associated with the pump. Samples of the proposed tamper-resistance methods must be submitted to the ARB, preferably as installed on a fuel pump.

3. The engine family application for certification submitted by the engine manufacturer must list all emission-related adjustable parameters including those associated with the diesel injection pump. For tamper-resistance methods associated with the diesel injection pump, the engine family application may reference ARB's approval that was granted to the pump manufacturer.
4. If inaccessibility to the adjustable parameters, or the need for a complete removal of the diesel injection pump from the engine prior to any adjustment of the pump, is claimed, the engine family application must fully describe these features.
5. All changes by either the fuel pump or engine manufacturer to the approved tamper-resistance methods of the diesel injection pump must be approved by the ARB. Samples with the proposed changes may be required for ARB's evaluation.
6. The following adjustments of the diesel injection pump must be provided with ARB-approved tamper-resistance methods: the fuel setting adjustment, fuel trimming adjustment, timing advance adjustment, and aneroid setting adjustment. If new types of emission-related adjustment are implemented by pump manufacturers, the ARB may require such new adjustment to be provided with ARB-approved tamper-resistance methods.
7. Engine manufacturers are solely responsible for initiating and obtaining approval of the tamper-resistance methods for all non-fuel pump-related adjustable parameters such as the turbocharger wastegate adjustment, or the speed adjustment on constant-speed engines.