Light-Duty Vehicle Compliance and Enforcement

Allen Lyons
April 2015
Mexico City
LEVI Structure and Overview  
(Certification Process - Manufacturer)

- Group vehicles into
  - Durability groups (DG)
  - Engine families/Test groups (EF/TG)
  - Evaporative families (EvpF)
- Conduct durability testing per durability groups and evaporative families to determine deterioration factors (DF) ~ 9-15 months before production
  - Durability data vehicle (DDV) undergoing useful life (UL) service/mileage accumulation
    - Whole vehicle, or
    - Bench aging of critical components (e.g., catalyst, oxygen sensor, fuel injectors, purge valve, canister)
- Conduct certification exhaust & evaporative testing
  - Emission data vehicle (EDV) with ~4000 miles accumulated ~ 2-6 months before production
    - Apply DFs to EDV test results to determine UL cert emission levels (CEL)
    - All certification emission limits (CELs) must not exceed applicable emission standard
LEVI Structure and Overview (Certification Process - Manufacturer)

- Submit an application to ARB per Test Group
  - On-Board Diagnostic II (OBD II) – to Advanced Engineering Section, ECARS
  - Vehicle and emission data – to Certification section, ARB
    - Since 2007 cert applications submitted electronically to ARB Electronic Documents Management System (EDMS)

- Application information
  - Description of DG, TG, EvpF, engine, emission control systems (ECS), EDV test results, DFs and CELs
  - Description of AECD (auxiliary emission control devices)
  - Description of adjustable parameters and anti-tampering method used
  - Label samples
    - VECI (Vehicle Emission Control Information) – affixed in engine compartment
    - EP (Environmental Performance) – affixed on vehicle window
      - Smog and global warming scores
  - Emission warranty statement and warranted parts list
  - Description of vehicle make/models covered
  - Production specs for fuel tank fill pipe and openings
LEV III Structure and Overview (Certification Process - Manufacturer)

- Compliance statements
  - Vehicle was tested and in compliance with standards
  - No increase in toxic or noxious emissions and causing no unsafe conditions to operator or vehicle
  - Production vehicles being in all material respects the same as described in application
  - High altitude emission compliance
  - Compliance with Inspection & Maintenance (I/M) standards
- Update cert application
  - For production running changes (RC) and field fixes (FF)
- Submit Part II application
  - Preliminary - January of calendar year corresponding to model year
    - Part numbers
    - Calibration info
    - Test parameters for production models
  - Final - January of calendar year after corresponding model year
    - Changes since submission of preliminary Part II application
Compliance and Enforcement (Warranty)

- Emission control component warranty established by section §43205 of the California Health and Safety Code
- Basic warranty for 3 years or 50,000 miles, whichever comes first
  - Covers any emission control component that would cause the vehicle to fail smog check
- Extended warranty for 7 years or 70,000 miles, whichever comes first, for high cost components
  - Covers any emission component that would cause the vehicle to fail smog check
  - Cost adjusted yearly by the nationwide Consumer Price Index
    - Each year ARB issues a Manufacturers’ Advisory Correspondence listing the cost limit
  - Cost limit for 2015 is $590
LEV III Structure and Overview
(Certification Process - ARB)

• Conduct meetings with manufacturers before cert applications
  • Annual cert preview program (CPP)
    • Product offerings, test and cert plans, carry-over/carry-across proposals*
    • Select vehicles for 50 °F testing
    • May select vehicles for confirmatory testing at ARB or US EPA
  • Topical – e.g., AECD*, alternative/modified test fuels* and/or durability/emissions procedures*, anti-tampering methods* for adjustable parameters
    • *Require ARB approval
• Upon receipt of cert application
  • Conduct preliminary review for completeness – Notify manufacturer within 30 days
  • Conduct formal review of complete application – Notify manufacturer if explanation, clarification and/or supplemental info is needed
  • Draft EO (Executive Order) if all requirements are met, including OBDII, VECI & EP labels, warranty statement.
    • (If not, draft cert denial letter. Rare event because ARB goal is to work with manufacturer for compliance and certification.)
  • EO undergoes review by cert engineer, section manager, branch chief, and division chief
LEV III Structure and Overview
(Certification Process – ARB)

• EO is signed by ECARS Division Chief (or designees)
  • Specifying the model year, Test Group, Evaporative Family, emission standards (and in-use standards if different than cert standards), vehicle make/models, and any conditions deemed necessary. Valid for only the specified model year.
  • Posted at [http://www.arb.ca.gov/msprog/onroad/cert/cert.php](http://www.arb.ca.gov/msprog/onroad/cert/cert.php)
Executive Order - Certification

http://www.arb.ca.gov/msprog/onroad/cert/cert.php
BE IT FURTHER RESOLVED:
The exhaust and evaporative emission standards and the certification emission levels for the listed vehicles are as listed on the Attachment. Compliance with the 50° Fahrenheit testing requirement may have been met based on the manufacturer's submitted compliance plan in lieu of testing. Any debit in the manufacturer's NMOG+NOx Fleet Average (PC or LDT or MDPV) or "Vehicle Equivalent Credit" (MDV) compliance plan shall be equalized as required.

BE IT FURTHER RESOLVED:
For the listed vehicle models, the manufacturer has attested to compliance with Title 13, California Code of Regulations, (13 CCR) Sections 1965 [on-board diagnostic, full or partial compliance], 2035 et seq. [emission control labels], 1968.2 [on-board diagnostic, full or partial compliance], 2235 [fuel tank fill pipes and openings] (gasoline and alcohol fueled vehicles only), and "High-Altitude Requirements" and "Inspection and Maintenance Emission Standards" (California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for PC, LDT and MDV).

BE IT FURTHER RESOLVED:
The test group listed in this Executive Order is certified conditionally on the manufacturer providing data to demonstrate compliance with California's greenhouse gas fleet average emission standard (CA GHG Standard) specified in Title 13, California Code of Regulations, (13 CCR) Section 1961.1 and the incorporated California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, amended December 8, 2012 (CA Test Procedures). The manufacturer has elected, under 13 CCR Section 1961.1(a)(1)/(A)/(ii) and under Section E.2.5.1(ii) of the CA Test Procedures, to demonstrate compliance with the CA GHG Standard by demonstrating compliance with the National greenhouse gas program (National GHG Program). Therefore, the test group listed in this Executive Order is certified conditionally further on the manufacturer complying with the requirements specified in said provisions in 13 CCR, and Sections E.2.5.1(ii) and H.4.5(b) and H.4.5(c) of the CA Test Procedures (among other things, concerning data and information submission, timing, and format as specified by the Executive Officer). Failure to comply with the certification requirements to demonstrate compliance with CA GHG Standard by demonstrating compliance with the National GHG Program under said provisions in 13 CCR and CA Test Procedures may be cause for the Executive Officer to revoke the Executive Order. Vehicles in the revoked Executive Order shall be deemed uncertified and subject to penalties authorized under California law. Notwithstanding the requirement herein, a manufacturer that becomes, after MY2009, a large-volume manufacturer, as defined in 13 CCR Section 1900, is not required to comply with the CA GHG Standard until the beginning of the fourth model-year from becoming a large-volume manufacturer. Additionally, notwithstanding the requirement herein, a small-volume manufacturer, independent low-volume manufacturer, or intermediate volume-manufacturer, as defined in 13 CCR Section 1900, is not required to comply with CA GHG Standard during model-years (MY) 2012 through 2015.

Vehicles certified under this Executive Order shall conform to all applicable California emission regulations.

The Bureau of Automotive Repair will be notified by copy of this Executive Order.

Executed at El Monte, California on this 6 day of October 2014.

Annette Hebert, Chief
Emissions Compliance, Automotive Regulations and Science Division
**ATTACHMENT**

**EXHAUST AND EVAPORATIVE EMISSION STANDARDS AND CERTIFICATION LEVELS**

**EXHAUST EMISSION STANDARDS AND CERTIFICATION LEVELS (FTP, HWFET, 60°F, 20°F)**

<table>
<thead>
<tr>
<th>FUEL TYPE</th>
<th>FTP@50K</th>
<th>FTP@UL</th>
<th>50°F @4K</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMOG+NOx (g/ml)</td>
<td>CERT</td>
<td>STD</td>
<td>CERT</td>
</tr>
<tr>
<td>CO (g/ml)</td>
<td>CERT</td>
<td>STD</td>
<td>CERT</td>
</tr>
<tr>
<td>NOx (g/ml)</td>
<td>CERT</td>
<td>STD</td>
<td>CERT</td>
</tr>
<tr>
<td>HCHO (mg/ml)</td>
<td>CERT</td>
<td>STD</td>
<td>CERT</td>
</tr>
<tr>
<td>PM (g/ml)</td>
<td>CERT</td>
<td>STD</td>
<td>CERT</td>
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</tbody>
</table>

<table>
<thead>
<tr>
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<th>HWFET @50K</th>
<th>HWFET @ UL</th>
<th>20°F @ 50K</th>
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</thead>
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<tr>
<td>NMOG+NOx (g/ml)</td>
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<td>STD</td>
<td>CERT</td>
</tr>
<tr>
<td>CO (g/ml)</td>
<td>CERT</td>
<td>STD</td>
<td>CERT</td>
</tr>
</tbody>
</table>

**SFTP EXHAUST EMISSION STANDARDS AND CERTIFICATION LEVELS**

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<thead>
<tr>
<th>FUEL TYPE</th>
<th>US06</th>
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<th>COMPOSITE</th>
<th>whole vehicle evaporation emission standards and certification levels</th>
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<tr>
<td>NMOG+NOx (g/ml)</td>
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<td>STD</td>
<td>CERT</td>
<td>STD</td>
</tr>
<tr>
<td>CO (g/ml)</td>
<td>CERT</td>
<td>STD</td>
<td>CERT</td>
<td>STD</td>
</tr>
<tr>
<td>PM (mg/ml)</td>
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<td>STD</td>
<td>CERT</td>
<td>STD</td>
</tr>
</tbody>
</table>

**WHOLE VEHICLE EVAPORATIVE EMISSION STANDARDS AND CERTIFICATION LEVELS**

<table>
<thead>
<tr>
<th>FUEL TYPE</th>
<th>3DHS (g/test) @ UL</th>
<th>2DHS (g/test) @ UL</th>
<th>RL (g/ml) @ UL</th>
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</thead>
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<tr>
<td>CERT</td>
<td>STD</td>
<td>FEL</td>
<td>CERT</td>
</tr>
<tr>
<td>FPMXR016GABC</td>
<td>GASOLINE - TIER 2 UNLEADED</td>
<td>0.33</td>
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<tr>
<td>FPMXR0235NBC</td>
<td>GASOLINE - TIER 2 UNLEADED</td>
<td>0.29</td>
<td>0.90</td>
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<td>EVAPORATIVE FAMILY</td>
<td>ORVR (g/gallon) @ UL</td>
<td>FUEL TYPE</td>
<td>30HS RIG TEST (g/test) @ UL</td>
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<tr>
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</tr>
<tr>
<td></td>
<td></td>
<td>FUEL TYPE</td>
<td>CERT</td>
</tr>
<tr>
<td>FF8XR0160ABC</td>
<td>0.05</td>
<td>GASOLINE - TIER 2</td>
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</tbody>
</table>

*not applicable; @: pounds; UL: useful life; PC: passenger car; LDT: light-duty truck; LDT1: LDT<8000#GVWR,0-3750#LVW; LDT2: LDT<8000#GVWR,3751-7500#LVW; LDT3: LDT 6001-8500#GVWR,3751-7500#ALW; LDT4: LDT 6001-8500#GVWR,8501-8500#ALW; MDV: medium-duty vehicle; MDV4: MDV 8501-10000#GVWR; MDV5: MDV 10001-14000#GVWR; MDPV: medium-duty passenger vehicle; ECS: emission control system; CERT: certification; STD: standard; FEL: family emission limit; GVWR: gross vehicle weight rating; LWW: loaded vehicle weight; ALWW: adjusted LWW; LEV: low emission vehicle; ULEV: ultra LEV; SULEV: super ULEV; ZEV: zero-emission vehicle; PZEV: partial ZEV; AT PZEV: advanced technology PZEV; TZEV: transitional ZEV; TWC/DOC: 3-way/oxidizing catalyst; ADSTWC: adsorbing TWC; HAC: HC adsorbing catalyst; WJ: warm-up catalyst; NAC: NOx adsorption catalyst; SCR-U or SCR-C or SCR-N or SCR-C-NH3: selective catalytic reduction-urea/ammonia; NH3OC: ammonia oxidation catalyst; CT/PTX: continuous/periodic trap oxidizer; DPF: diesel particulate filter (active); GPF: PM filter for spark-ignited engine; HO2S/02S: heated/oxygen sensor; WR-HO2S or AFS: wide range/linear/heated-air-fuel ratio sensor; NOX: NOx sensor; PMS: PM sensor; RQX: reductant quality sensor; NH3: ammonia sensor; EGR: exhaust gas recirculation; EGRC: EGR cooler; AIR: air; AIR/AIR: secondary air injection (belt driven)/electric driven; PAIR: pulsed AIR; SF/MI: sequential/multiport fuel injection; DFI/FI: direct/indirect fuel injection; TC/SC: turbo/supercharger; CAC: charge air cooler; F/P: full/partial with fines on-board diagnostic; DOR: direct ozone reducing; HCT: hydrocarbon trap; BCAN: bleed carbon canister; prefix 2: parallel; (2) suffix: series; CN/G/LNG: compressed/liquefied natural gas; LPG: liquefied petroleum gas; E85: 85% ethanol (15% gasoline) fuel; E10: 10% ethanol (90% gasoline) fuel; A: automatic (with lockup); M: manual transmission; SA: semi-automatic transmission; CV: continuously variable transmission; SCV: selectable continuously variable transmission; AMT: automated manual transmission; AMS: automated manual-selectable transmission; OT: other transmission

**2015 MODEL YEAR: VEHICLE MODELS INFORMATION**

<table>
<thead>
<tr>
<th>MAKE</th>
<th>MODEL</th>
<th>VEH CLASS</th>
<th>ENGINE (L)</th>
<th>TRANS TYPE</th>
<th>EVAPORATIVE FAMILY</th>
<th>EXH</th>
<th>OBD</th>
<th>PZEV TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FORD</td>
<td>F150 PICKUP 2WD</td>
<td>LDT3</td>
<td>2.7</td>
<td>SA</td>
<td>FF8XR0160ABC</td>
<td>1</td>
<td>P</td>
<td>*</td>
</tr>
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<td>P</td>
<td>*</td>
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</tbody>
</table>
After Certification
- Review/approve manufacturer’s assembly functional check plans
- Process Running Change and Field Fixes requests
- Determine, at end of model year, compliance with fleet average standards (NMOG, VEC, GHG) and/or phase-in (e.g., LEV III) requirements using actual sales
  - Manufacturer initially demonstrated compliance with fleet average emission and phase-in requirements using projected sales during annual certification preview program using projected sales.
- Manufacturer submits current status re: credits/debits at end of model year sales.
- ARB certification staff audits manufacturer credit/debit status report.
Manufacturers are required to perform in-use testing at both low mileage and high mileage as defined in the tables. Number of vehicles to be tested depends on the manufacturer’s status (small volume or high volume manufacturer) or size of the test group.

Vehicles tested to determine compliance with FTP, Highway and USO6 emission standards.

Up to two USO6 cycles may be run to purge the catalyst of sulfur if the fuel sample from the vehicle as received exceeds 15 ppm sulfur.

Vehicles tested at low mileage must have a minimum odometer mileage of 10,000 miles.

Vehicles tested at high mileage must have a minimum odometer mileage of 105,000 miles.

### California Small Volume Manufacturers and Small Volume Test Groups

<table>
<thead>
<tr>
<th>California only test group annual sales¹</th>
<th>1-1,500</th>
<th>1,501-4,500</th>
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<tbody>
<tr>
<td>Low Mileage</td>
<td>Voluntary</td>
<td>0</td>
</tr>
<tr>
<td>High Mileage</td>
<td>Voluntary</td>
<td>2²</td>
</tr>
</tbody>
</table>

¹ Total annual production of groups eligible for testing under small volume sampling plan is capped at a maximum of 4,500 California-only production volume per model year, per large volume manufacturer. All other remaining large volume manufacturers’ small volume test groups shall meet the requirements in the Table below.

² Particulate emissions must be measured for one vehicle per test group that certifies to the LEV III particulate standards.

### California Large Volume Manufacturers

<table>
<thead>
<tr>
<th>California only test groups - annual sales</th>
<th>4,500-15,000</th>
<th>15,001-25,000</th>
<th>&gt;25,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Mileage</td>
<td>2¹</td>
<td>3²</td>
<td>4²</td>
</tr>
<tr>
<td>High Mileage</td>
<td>4²</td>
<td>5³</td>
<td>6³</td>
</tr>
</tbody>
</table>

¹ Particulate emissions must be measured for one vehicle per test group that certifies to the LEV III particulate standards.

² Particulate emissions must be measured for two vehicles per test group that certifies to the LEV III particulate standards.

³ Particulate emissions must be measured for three vehicles per test group that certifies to the LEV III particulate standards.
Compliance and Enforcement (In-use Testing by ARB)

• Objectives
  o Force durable emission control designs
  o Catch and fix problems early in the field
• Process – Test Light- and Medium-Duty test groups and (Coming Soon) Heavy-Duty engine families
• Minimum 10 vehicle sampled at up to 75% useful life mileage
  — Properly maintained and used
• Noncompliance – subject to remedial action (Recall)
• Recall repairs enforced through vehicle registration at California Department of Motor Vehicles
• High capture rate (+90% vehicles repaired)
Compliance and Enforcement (In-Use Testing by ARB)

• Program began in 1983 - 5 engine families were tested

• High failure rate - program expanded in 1987

• ARB generally targets vehicles that certify close to the emission standard or that employ new technologies

• Dramatic drop in failure rate since inception of the program
In-Use Compliance History

Over 2 Million Vehicles Recalled

Select Test Candidates based on IUVP
Compliance and Enforcement  
(In-use Testing by ARB)

- Vehicles procured through private contractor
- Contractor administers 40 question telephone questionnaire to vehicle owner to establish vehicle maintenance history
- Vehicles must be properly maintained according to manufacturer’s recommendations
  - Oil changed at recommended intervals, etc.
- Some restorative maintenance allowed
- Vehicle owner is provided a rental vehicle and vehicle returned with full tank of fuel after testing
Compliance and Enforcement
(In-Use Testing by ARB)

- Emissions measured by testing under simulated driving conditions on a dynamometer
- Evaporative emissions are also measured for compliance with the applicable evaporative emission standard
- Emissions measured using same test procedures used to certify vehicles.
Compliance and Enforcement (In-use Testing by ARB)

- Non-Compliance Determined if:
  - Three or more of the same emission components are defective
  - Average emissions exceed applicable standards - Minimum of 10 vehicles sampled
Compliance and Enforcement  
(In-use Compliance Testing)

In this case the manufacturer failed the SULEV30 standard by 50%. The fix was determined by the manufacturer to consist of catalyst replacement.

<table>
<thead>
<tr>
<th>Part Replaced</th>
<th>Cost to Replace</th>
<th>Affected Vehicles</th>
<th>RECALL COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalyst (CA)</td>
<td>$550</td>
<td>13000</td>
<td>$7,150,000</td>
</tr>
<tr>
<td>Catalyst (U.S)</td>
<td>$550</td>
<td>130,000</td>
<td>$71,500,000</td>
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</tbody>
</table>
Compliance and Enforcement (Enforcement Measures)

- Notwithstanding the fact that the vehicles described in the application may comply with all other requirements of this subpart, the ARB may deny issuance of, suspend, or revoke a previously issued certificate of conformity if ARB finds any one of the following infractions to be substantial:
  - (1) The manufacturer submits false or incomplete information.
  - (2) The manufacturer denies an ARB enforcement officer or ARB authorized representative the opportunity to conduct authorized inspections.
  - (3) The manufacturer renders inaccurate any test data which it submits, or fails to make a good engineering judgment in accordance with §86.1851-01(c)(1).
  - (4) The manufacturer denies an ARB enforcement officer or ARB authorized representative reasonable assistance as required in §86.1849-01.
  - (5) The manufacturer fails to provide the records required in §86.1844-01 to ARB within the deadline set forth in the request for such information.
  - (6) The manufacturer fails to comply with all conditions under which the certificate of conformity was granted as specified in 86.1848-01.
  - (7) The manufacturer otherwise circumvents the intent of the Act or of this part.
Compliance and Enforcement
(Enforcement Measures)

• Besides subject to recall, manufacturers may be subject to monetary penalty if emission violation excessive
  o Generally negotiated between ARB and manufacturer

• Any business or person that sells vehicles not certified for sale in California is also subject to monetary penalties.
Compliance and Enforcement
(Summary)

• ARB staff issued 527 Executive Orders for light- and medium-duty vehicles in 2014
  o Original Executive Orders are superseded whenever a manufacturer makes a running change or field fix.

• Counting all on-road and off-road certifications, ARB staff issued 3,166 Executive Orders in 2014

• ARB typically tests 6 light-duty test groups per year for a total of 84 vehicles tested for in-use compliance

• ARB staff also conduct unannounced inspections of motor vehicle dealers to assure vehicles on lot are compliant with California requirements