

TECHNICAL NOTES

US Department of Agriculture

Natural Resources Conservation Service

TN – Air Quality – CA – 02

April 2014

Engine Family and Tier-Certified Emissions Standards CPS 372-Combustion System Improvement

The US Environmental Protection Agency (EPA) developed a standard naming convention as a means to clearly identify engines as meeting the appropriate emission standards for the model years produced. The “*Engine Family Name*” assists with verifying the applicable emissions certifications for emissions controlled engines and selecting the appropriate emission factors for calculating emissions.

In California, engines grouped within an engine family and listed on a State of California Air Resources Board (ARB) Executive Order will comply with both EPA and ARB emission standards. As such, an ARB Executive Order is the main source of information available for determining whether an engine aligns with CPS 372 criteria and specifications.

Tier-certified Emission Standards on Nonroad Compression-Ignition Engines

Pursuant to the 1990 Clean Air Act amendments, EPA adopted the first federal standards in 1994 that applied to new nonroad compression-ignition (diesel) engines. The *Tier-certified emission standards* were adopted in regulation to provide manufacturers with a mechanism for designing and developing emission control strategies over time to reduce diesel exhaust emissions.

In 1996, the Tier 1 emission standards commenced as the first phase-in level for new nonroad diesel engines by targeting oxides of nitrogen (NO_x) emission reductions. The Clean Air Act preempted states from controlling emissions from new diesel engines rated less than 175 horsepower (130 kilowatts) and powering farm or construction equipment, placing the sole authority on EPA to establish emission standards. Though the ARB relies on EPA to regulate these diesel engines, ARB approved their Tier 1 emission standards in California on large off-road compression-ignition engines rated at least 175 horsepower. A *Statement of Principles* was signed with EPA, ARB and several engine manufacturers that eventually carried into final regulation and adoption of the Tier 2 and Tier 3 emission standards.

In 2000, ARB adopted the federal emission standards to match its off-road diesel engine program. Phase-in of Tier 2 began in 2001 by utilizing emission control technologies similar to the 1991 on-highway (on-road) heavy-duty engine standards for reducing NO_x, hydrocarbon (HC) and particulate matter (PM) emissions. Tier 2 was to be completely phased-in by 2006. Tier 3 followed in 2005 by further reducing NO_x and HC emissions and scheduled for full phase-in by 2008. All emission standards include durability requirements to ensure compliance with the emission standards throughout the useful engine life.

In 2004, EPA and ARB integrated engine technologies with diesel fuel controls. Because the higher diesel fuel sulfur content damaged newer emissions control technologies, ultra-low sulfur diesel fuel was introduced by reducing fuel sulfur content by 99 percent. This led towards the Tier 4 emission standards establishing a phase-in period from 2008 through 2015, applying substantial NO_x, HC, carbon monoxide (CO), and PM emission reductions. The final Tier 4 standards will decrease diesel exhaust emissions by more than 90 percent.

Overall, nonroad or off-road diesel engines manufactured in the model years listed in Table 1 are not equipped with Tier-certified emissions control technologies. These engines are often referred to as *uncontrolled*, *Tier 0*, or *non-Tier* engines and will not have an engine family name assigned to them.

Table 1
Model Year of Uncontrolled Nonroad Compression-ignition Engines

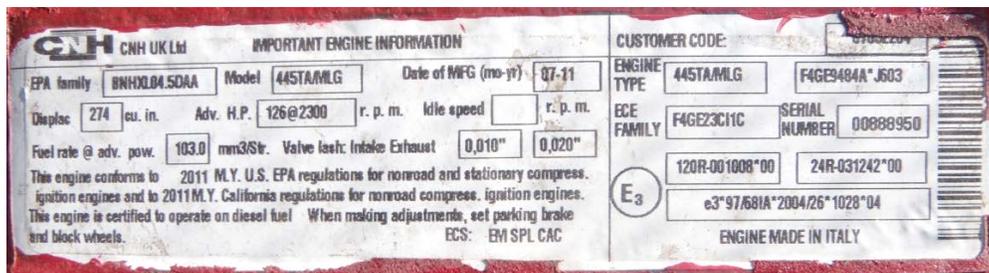
Engine HP	Model Year
Greater than 750	1999 and earlier
25-49	1998 and earlier
50-99	1997 and earlier
100-174	1996 and earlier
175-750	1995 and earlier

For California, the Tier-certified emission standards apply to new off-road diesel engines of any size used in construction, agriculture, and industrial equipment. These include stationary engines mounted on structures or foundations; portable engines mounted on skids, trailers, or vehicles; and mobile engines that self-propel off-road vehicles or equipment.

Engine Family Name

The engine manufacturer will group and assign engine models and types into families using the EPA standard naming convention, described by a 12 character alpha-numeric code. ARB uses the same engine family convention for off-road compression-ignition engines (see Table 2).

The following photograph is from an engine label affixed to an off-road diesel engine powering a 2011 New Holland tractor, identifying the engine family name as BNHXL04.5DAA.



USDA NRCS Photo

BNHXL04.5DAA

- **Character 1:** Represents the engine model-year emission standards.
The currently used codes are listed in Table 2, skipping the letters I, O, Q, U and Z. For this engine family name example, the “B” corresponds to a 2011 model-year engine emission standard.
- **Characters 2-4:** Represents the manufacturer’s code.
EPA assigns a three-character code for each engine manufacturer. In this example, the “NHX” refers to *CNH UK Ltd*, which is confirmed by the engine label and ARB Executive Order under this engine family name. Please note, however, a manufacture may apply similar codes to describe different manufacturer names. For example, “NHX” could also refer to “New Holland” (see Table 2)
- **Character 5:** The family-type code.
Table 2 describes each family-type code for different types of engines. The “L” designates this family-type as a nonroad compression-ignition engine. All nonroad or off-road diesel-powered engines will have this “L” designation in the family name - anything else will describe a different type of family.
- **Characters 6-9:** The engine displacement in liters or cubic inches. A decimal point will indicate liters.
For this example, the 04.5 reports the engine displacement as 4.5 liters.
- **Characters 10-12:** These are *sequence characters*, which are any combination of characters providing unique identification to minimize possible confusion with other engine families.
For this example, the unique sequence is “DAA”.

The engine label describes the following:

- The engine family name as BNHXL04.5DAA
- The engine manufacturer is CNH UK Ltd.
- The engine model number as 445TA/MLG
- The engine type as 445TA/MLG
- The engine manufactured date is July 2011 (07-11)
- The engine serial number is 00888950
- This engine complies with EPA and California regulations for 2011 nonroad compression-ignition (off-road diesel) engines.

Notes:

- Table 2 summarizes the EPA Engine Family Format for all sorts of reciprocating internal combustion engines. Prior to 1996, there were no family names for Tier 0 nonroad compression-ignition (off-road diesel) engines.
- Typically, only the first character of the engine family name should change from one year to next to account for the new model year. However, manufacturers may shift an engine to another engine family from one model year to the next, or modify an engine family name to reflect changes in engine manufacturer name or other factors. Knowing the engine model or engine type of the subject engine can often confirm such changes from one model year to the next.

Table 2
EPA Engine Family Format

Example Family Name:	BNHXL04.5DAA
Model Year:	2011
Manufacturer:	CNH UK Ltd.
Family Type:	“L” – Nonroad compression-ignition family
Displacement:	4.5 Liters (274 cubic inches)
Sequence:	DAA

Columns	Description
1	Model Year
2-4	Manufacturer Code
5	Family Type
6-9	Displacement (liters or cubic inches)
10-12	Sequence Characters

Code	Model Year
A	1980
B	1981
C	1982
D	1983
E	1984
F	1985
G	1986
H	1987
J	1988
K	1989
L	1990
M	1990
N	1992
P	1993
R	1994
S	1995
T	1996
V	1997
W	1998
X	1999
Y	2000
1	2001
2	2002
3	2003
4	2004
5	2005
6	2006
7	2007
8	2008
9	2009
A	2010
B	2011
C	2012
D	2013
E	2014
F	2015
G	2016
H	2017
J	2018
K	2019
L	2020
M	2021
N	2022
P	2023
R	2024
S	2025
T	2026
V	2027
W	2028
X	2029
Y	2030

Code	Manufacturer
VPX	AB Volvo Penta
SID	Agco Sisu Power Inc.
6AX	American Jawa Ltd
X6X	Atlantis Diesel Engines
AMY	Atlas Machinery
X9X	Case Corporation
CPX	Caterpillar Inc.
CXG	China Xingyue Group
CRX	Chrysler
CZH	Chongqing Zonghen General Power
X9X	CNH Engine Corp., Inc.
NHX	CNH UK Ltd.
CEX	Cummins Engine Company
DCL	Daeddong Industrial Co.
DWX	Daewoo Heavy Industries Co. Ltd
DHX	Daihatsu Motor Co., Ltd.
MBX	Daimler-Benz AG
MBX	DaimlerChrysler AG
DDX	Detroit Diesel Corporation
DZX	Deutz Corporation
DIC	Doosan Infracore Co., Ltd.
ETE	Eicher Tractors
AEL	Escorts Ltd.
FMX	Ford Motor Company
FPX	FPT Industrial S.p.A.
GNX	Generac Power Systems
GMX	General Motors Corporation
HER	Hercules Engine Company
HMX	Hino Motors, Ltd.
HYX	Hyundai Motor Company
H3X	IHI Shibaura Machinery Corp.
NVX	International Truck & Engine Corp
ICL	Iseki Matsuyama Mfg Co., Ltd.
H3X	Ishikawajima-Shibaura Machinery Co
SZX	Isuzu Motors Limited
VEX	Iveco N.V.
VEX	Iveco S.p.A.
JCB	JCB Power Systems Ltd.
JCG	Jiangsu Changfa Group
JDG	Jiangsu Jiangdong Group Co. Ltd.
JDX	John Deere Power Systems
KMX	Kia Motors Corporation
KOE	Kirloskar Oil Engines Ltd.
KHX	Kohler Company
KLX	Komatsu, Ltd.
KBX	Kubota Corporation
KMC	Kukje Machinery Company, Ltd.
LHA	Liebherr Machines Bulle SA
LHA	Liebherr Werk Nenzing Ltd.
L5X	Lister-Petter
LBD	Lombardini F.i.M.S.p.A.56
LBD	Lombardini A Kohler Company

Code	Manufacturer
LGC	LS Mtron, Ltd.
MML	Mahindra & Mahindra Ltd.
MCT	Mahindra (China) Tractor Co., Ltd.
MNX	MAN Nutzfahrzeuge
TKX	Mazda Motor Corporation
MBX	Mercedes-Benz, AG
BSM	Minsk Motor Plant
MFT	Mitsubishi Fuso Truck & Bus Corp.
MTX	Mitsubishi Motors Corporation
MVX	Mitsubishi Heavy Industries, Ltd.
HZX	Motorenfabrik Hatz GmbH & Co.KG
MUX	MTU
MDD	MTU Detroit Diesel, Inc.
MWM	MWM Motores Diesel Ltda.
NVX	Navistar International Trans. Corp.
NHX	New Holland
NDX	Nissan Diesel Motor Co., Ltd.
PKX	Perkins Engine
PEX	Peugeot Citroen Moteurs
R3X	Renault VI
TUS	S.C. “TRACTORUL UTB” S.A.
FGX	Same Deutz Fahr Group S.p.A.
SAX	Scania A.B.
Y9X	Scania A.B.
9YX	Scania CV AB
SID	Sisu Diesel Inc.
MDD	Tognum America, Inc.
TAL	Toyoda Autmatic Loom Works Ltd.
TIE	Toyota Industrial Equipment MFG., Inc.
NDX	UD Trucks Corporation
V5X	VM Motori S.p.A.
VWX	Volkswagen
VSX	Volvo Construction Equipment Components AB
WMY	Wall Machinery Inc.
X7X	Westerbeke Corporation
WPX	Wis-Con Total Power
YDX	Yanmar Diesel Engine Co.

Code	Family Type
A	California only medium-duty family
E	Evaporative family
R	Evaporative/Refueling family
H	Heavy-duty engine family
T	Light-duty truck family
V	Light-duty vehicle family
M	Marine engine family
C	Motorcycle family
L	Nonroad compression-ignition family
N	Nonstandard family type
S	Small nonroad spark-ignition family

*The engine manufacturer list, their associated codes, and other information in this table are subject to change per EPA or ARB guidelines
Sources: EPA 1999; ARB 2009 & 2013*

Certificate of Conformity

EPA certifies engine classes as conforming to applicable emission standards and technology requirements by issuing a *Certificate of Conformity*.

Engine family names are updated annually on a model-year basis. Emissions testing are performed on a similar group of engines to determine compliance with the applicable emission standards. The manufacturer submits the emissions tests results with the application to EPA for their review and approval. Once approved, the engine family name is stamped or printed onto a nameplate or label affixed to the engine, which makes the engine family name easily identifiable in the field. The manufacturer will then introduce the engines listed under the family name into commerce according to certified specifications. The manufacturer may submit application amendments to EPA if needed. Anti-tampering regulations are established to avoid modifications that would otherwise conflict with the emissions certification.

Though the certificate language may vary depending on the certification type, the Certificate of Conformity typically will not identify the Tier-level certification information with the engine family name. EPA does post on-line spreadsheets listing by model year the appropriate engine data and characteristics, including engine model and family names. Because these spreadsheets are cumbersome, it is recommended to seek this information only if an ARB Executive Order is not available or does not exist. The EPA certified engine spreadsheets are available on-line at: <http://www.epa.gov/oms/certdata.htm#nrci>

ARB Executive Orders

In California, ARB certifies the engine categories by issuing Executive Orders. ARB maintains an engine emissions certification database on-line at: <http://www.arb.ca.gov/msprog/offroad/cert/cert.php>.

Manufacturers concurrently submit applications and source test results to the ARB for review and approval. Once approved, the ARB issues an Executive Order corresponding to the engine family by identifying the engine models or series associated with the engine family, reporting the useful life in hours, providing the applicable Tier-level certification, identifying the emissions control technologies, and specifying the emission standards and certification values for each target pollutant. Like the Certificate of Conformity, the ARB Executive Order is valid for one model-year of production.

For CPS 372 purposes, the ARB Executive Order is the primary source for determining and verifying the appropriate Tier-level certification of an off-road compression-ignition engine. The Executive Order will report the engine certified emissions and the emissions standards for each pollutant, which is useful for verification purposes.

The ARB Executive Order corresponding to BNHXL04.5DAA is U-R-008-0103 (Figure 1). The first page provides the following information:

- The engine manufacturer, which for this example is CNH UK Limited.
- The Executive Order resolves that the compression-ignition engines and the emission control systems produced by the manufacturer are certified for use in nonroad equipment. Note that the “L” in the family name designates a nonroad engine family type.
- The production model-year. The Executive Order specifies 2011, which matches the engine label (July 2011).
- The engine family name. In this case, it is BNHXL04.5DAA
- Engine displacement. The 04.5 in the engine family name refers to 4.5 liter engine displacement.
- The fuel type is diesel. This should conform to engine warranties.
- The useful life in hours. Most Executive Orders will list the useful life as 8,000 hours; however, a manufacturer may report a different useful life hours that is typically less.
- Special design features and emission control systems associated with this engine family.
- Typical equipment application. Note that the subject equipment type may not necessarily be included on the Executive Order description.
- The rated power class reported in kilowatts (kW). To convert to horsepower, multiply kW by 1.34. In this example, the rated power class is 100 to 174 brake-horsepower.
- The emission standard category. This engine meets Tier 3 emission standards.
- The next several rows and columns report the emissions.
 - The rows list codes labeled as “STD” (emissions standard) and “CERT” (certified emissions from testing). Another code not listed in this example, but used often is “FEL” (family emissions limit – see discussion below). This is an emission level declared by the manufacturer for use in any averaging, banking, and trading program and in lieu of an emission standard for certification. It serves as the applicable emission standard for determining compliance of any engine within the engine family.
 - The columns list the pollutants in grams/kilowatt-hour and the percent opacity values (i.e. visible emissions) for certification purposes. The individual pollutants are described as:
 - HC: hydrocarbons
 - NOx: oxides of nitrogen
 - NMHC+NOx: non-methane hydrocarbons plus oxides of nitrogen
 - CO: carbon monoxide
 - PM: particulate matter

Executive orders are multiple page documents. The subsequent pages will identify the engine model summary and individual engine characteristics, including the engine models and their measured horsepower, fuel rates and torque. From our example, engine model 445TA/MLG is listed in the Executive Order (Figure 1).

For this example, it’s been confirmed that the 2011 model-year off-road diesel engine is certified in California as complying with the 2011 Tier 3 emission standards. From this information, the emissions and emission reductions can be calculated by applying the Tier 3 emission factors and methodologies according to the CPS 372-Specification.

Figure 1: ARB Executive Order U-R-008-0103

	CNH UK LIMITED	EXECUTIVE ORDER U-R-008-0103 New Off-Road Compression-Ignition Engines
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Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	DISPLACEMENT (liters)	FUEL TYPE	USEFUL LIFE (hours)
2011	BNHXL04.5DAA	4.5	Diesel	8000
SPECIAL FEATURES & EMISSION CONTROL SYSTEMS			TYPICAL EQUIPMENT APPLICATION	
Mechanical Diesel Injection, Turbocharger, Charge Air Cooler, and Smoke Puff Limiter			Loader, Tractor, and Generator Set	

The engine models and codes are attached.

The following are the exhaust certification standards (STD) and certification levels (CERT) for hydrocarbon (HC), oxides of nitrogen (NO_x), or non-methane hydrocarbon plus oxides of nitrogen (NMHC+NO_x), carbon monoxide (CO), and particulate matter (PM) in grams per kilowatt-hour (g/kw-hr), and the opacity-of-smoke certification standards and certification levels in percent (%) during acceleration (Accel), lugging (Lug), and the peak value from either mode (Peak) for this engine family (Title 13, California Code of Regulations, (13 CCR) Section 2423):

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			HC	NO _x	NMHC+NO _x	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW < 130	Tier 3	STD	N/A	N/A	4.0	5.0	0.30	20	15	50
		CERT	--	--	3.9	1.1	0.21	9	5	21

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 26 day of October 2010.



Annette Hebert, Chief
Mobile Source Operations Division

Engine Model Summary Template

u-r-008-0103
Attachment
10/13/2010

Engine Family	1.Engine Code	2.Engine Model	3.BHP@RPM (SAE Gross)	4.Fuel Rate: mm/stroke @ peak HP (for diesel only)	5.Fuel Rate: (bs/hr) @ peak HP (for diesels only)	6.Torque @ RPM (SEA Gross)	7.Fuel Rate: mm/stroke@peak torque	8.Fuel Rate: (lbs/hr)@peak torque	9.Emission Control Device Per SAE J1930
BNHXL04.5DAA	445TA/MLF	F4GE9484D*J	125 @ 2200	97	N/A	387 @ 1250	125.5	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLJ	F4GE9484B*J	110 @ 2200	88	N/A	336 @ 1400	110	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLE	F4GE9484J*J F4GE9484J*J	118 @ 2200	96	N/A	380 @ 1250	125	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLM	F4GE9484G*J F4GE9484G*J	110 @ 2200	88	N/A	376 @ 1250	120	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLL	F4GE9484H*J	113 @ 2000	99	N/A	365 @ 1200	120	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLH	F4GE9484E*J	121 @ 2000	106	N/A	387 @ 1200	125	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLG	F4GE9484A*J	126 @ 2300	103	N/A	369 @ 1300	123	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLA	F4CE9484C*J	111 @ 2300	88	N/A	328 @ 1300	107	N/A	DDI TC CAC SPL
BNHXL04.5DAA	445TA/MLN	F4CE9484L*J	105 @ 2300	85	N/A	313 @ 1300	104	N/A	DDI TC CAC SPL

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Source: <http://www.arb.ca.gov/msprog/offroad/cert/eo/2011/ofci/u-r-008-0103.pdf>

Family Emission Limit (FEL)

The Family Emission Limit (FEL) is an emission value declared by the manufacturer to serve in lieu of an emission standard for certification purposes and for the averaging, banking, and trading program. It works as the applicable emission standard for determining compliance of any engine within the engine family.

The manufacturer may generate emission credits representing the amount of emission reductions or exceedances of the emission standards that may be banked for use in future model year averaging or trading as allowed by EPA. Averaging refers to the exchange of emission credits among engine families within a given manufacturer's product line. Trading is the exchange of emission credits between manufacturers.

The types of emissions credits include:

- Positive Credits, emission reductions are below the standards;
- Negative Credits, emission exceedances above the standard;
- Projected Credits, based on the projected production and sales volume of an engine family;
- Actual Credits, actual production and sales volume as contained in the end-of-year reports submitted to EPA
- Reserved Credits, generated within a model year and waiting to be reported to EPA at the end of the model year; and,

ARB Executive Orders report the FEL values of those engine families participating in an averaging, banking or trading program by reporting whether the emissions are at, below or exceed the applicable emission standards (STD). Despite the engine family emissions certification value (CERT), the FEL values are the appropriate emissions certification for the applicable model year engine family. An example is on Page 11 that shows the NO_x and PM FEL values exceeding the emission standards.

Flexibility Provision

Several engine family names may be referred to as *flexibility* engines. These are newly manufactured engines that meet earlier Tier-certification technologies and emission standards. This provision provides manufacturers with additional lead time for redesigning their engines and equipment.

The engine label may identify a current manufactured model-year, but identify an earlier model-year engine family name. The label will include a statement that the engine complies with ARB emission requirements under *13 CCR 2423(d)* and is installed and sold under the flexibility provisions in state law. In some respect, the engine model-year code in the engine family name corresponds toward the emissions-year standards than the year the engine was manufactured, as these are newly produced engines equipped with earlier model-year emissions technology.

The ARB off-road certification database provides the Executive Orders for approved flexibility engines. These are issued for current model-year engines and will identify the family names

approved under the Executive Order. It is necessary to review both the regular Executive Order to determine the Tier-level emissions certification and the Flexible Engine Executive Order to determine EPA and ARB approval for the applicable model year.

From the example, the manufacturer applied the flexibility provisions to their 2012 and 2013 model-year engines by equipping them with the 2011 Tier 3-certified emissions technology. For 2013 model-year engines, ARB issued Executive Order U-R-105-0255 (U-R-015-0243 for 2012) to include BNHXL04.5DAA along with other prior-year engine family names (Figures 2 and 3).

Figure 2: ARB Executive Order U-R-015-0255, Page 1

California Environmental Protection Agency Air Resources Board	FPT INDUSTRIAL S.p.A.	EXECUTIVE ORDER U-R-015-0255 New Off-Road Compression-Ignition Engines
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Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment under the flexibility program provisions. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	FLEXIBILITY PROGRAM ENGINE FAMILY NAME(S)
2013	See Attachment(s)

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2423, subpart (d).

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 12th day of March 2013.

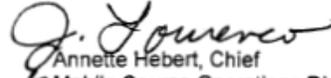

 Annette Hebert, Chief
 Mobile Source Operations Division

Figure 3: ARB Executive Order U-R-015-0255, Page 2



U-R-015-0255
Attachment pg 1/1
2/26/2013

Engines and Transmissions



Non-Flex Certification Engine Information			Flex Engine Information
Model Year	Executive Order	Engine Family	Power Category
2010	U-R-015-0193-1	AVEXL12.9TCD	225 ≤ kW < 450
2010	U-R-015-0191	AVEXL12.9IGR	130 ≤ kW < 560
2010	U-R-015-0188	AVEXL08.7TR3	130 ≤ kW < 560
2010	U-R-015-0190	AVEXL010.3TR3	130 ≤ kW < 560
2012	U-R-015-0230	CFPXL03.2TAJ	56 ≤ kW < 75
2011	U-R-015-0216	BVEXL03.2TAJ	56 ≤ kW < 75
2011	U-R-015-0205	BVEXL03.2TCE	56 ≤ kW < 75
2012	U-R-015-0228	CFPXL03.2SCE	56 ≤ kW < 75
2012	U-R-015-0231	CFPXL03.2TCI	56 ≤ kW < 75
2012	U-R-015-0229	CFPXL03.2SCI	56 ≤ kW < 75
2011	U-R-015-0206	BVEXL04.5DAA	75 ≤ kW < 130
2011	U-R-008-0103	BNHXL04.5DAA	75 ≤ kW < 130
2011	U-R-015-0207	BVEXL04.5DAB	56 ≤ kW < 75
2011	U-R-008-0104	BNHXL04.5DAB	56 ≤ kW < 75
2011	U-R-015-0209	BVEXL04.5DCB	56 ≤ kW < 75
2011	U-R-008-0106	BNHXL04.5DCB	56 ≤ kW < 75
2011	U-R-015-0210	BVEXL04.5DTD	56 ≤ kW < 75
2011	U-R-008-0107	BNHXL04.5DTD	56 ≤ kW < 75
2011	U-R-015-0211	BVEXL06.7DAA	75 ≤ kW < 130
2011	U-R-008-0108	BNHXL06.7DAA	75 ≤ kW < 130
2011	U-R-008-0111	BNHXL06.7DCA	75 ≤ kW < 130
2011	U-R-015-0218	BVEXL06.7DCA	75 ≤ kW < 130
2011	U-R-008-0112-1	BNHXL06.7DCB	130 ≤ kW < 225
2011	U-R-015-0217-1	BVEXL06.7DCB	130 ≤ kW < 225
2010	U-R-015-0186	AVEXL06.7DGB	130 ≤ kW < 225
2010	U-R-015-0187	AVEXL06.7DGS	130 ≤ kW < 225
2011	U-R-015-0212	BVEXL06.7DCC	75 ≤ kW < 130
2011	U-R-008-0109	BNHXL06.7DCC	75 ≤ kW < 130
2011	U-R-008-0110	BNHXL06.7DCD	56 ≤ kW < 75
2011	U-R-015-0213	BVEXL06.7DCD	56 ≤ kW < 75
2010	U-R-015-0194	AVEXL20.1DSL	kW > 560
2011	U-R-015-0208-1	BVEXL04.5DCA	75 ≤ kW < 130
2011	U-R-015-0208-1	BNHXL04.5DCA	75 ≤ kW < 130



(*) if available

Source: <http://www.arb.ca.gov/msprog/offroad/cert/uo/2013/ofci/u-r-015-0255.pdf>

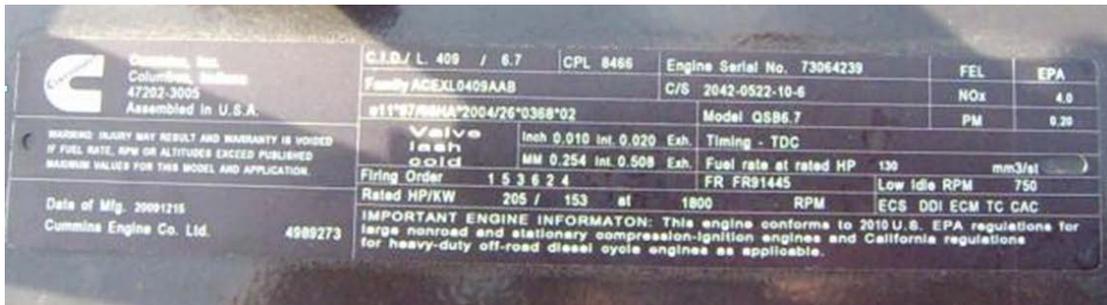
Additional Example Labels:

Cummins Engine Co.: ACEXL0409AAB - ARB Executive Order U-R-002-0516.

Engine Model QSB5.7; 2010 model-year; 409 cubic inches displacement (6.7 liters); Tier 3

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			HC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW < 130	Tier 3	STD	N/A	N/A	4.0	5.0	0.30	20	15	50
130 ≤ kW < 225	Tier 3	STD	N/A	N/A	4.0	3.5	0.20	20	15	50
		CERT	--	--	3.7	1.6	0.17	6	2	14

<http://www.arb.ca.gov/msprog/offroad/cert/eo/2010/ofci/u-r-002-0516.pdf>



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John Deere Power Systems: CJDXL06.8117 - ARB Executive Order U-R-004-0460

Engine Model 4045HP052A, B, C; 2012 model-year; 4.5 liter displacement; Interim Tier 4 Alternate NOx, noting the NOx and PM Family Emission Limit (FEL) values exceed the standard (STD).

RATED POWER CLASS	EMISSION STANDARD CATEGORY		EXHAUST (g/kw-hr)					OPACITY (%)		
			NMHC	NOx	NMHC+NOx	CO	PM	ACCEL	LUG	PEAK
75 ≤ kW < 130	Interim Tier 4 / ALT 20% NOx and PM	STD	0.19	3.4	N/A	5.0	0.02	20	15	50
		FEL	--	3.7	--	--	0.30	--	--	--
		CERT	0.15	3.3	--	1.5	0.25	13	3	25

<http://www.arb.ca.gov/msprog/offroad/cert/eo/2012/ofci/u-r-004-0460.pdf>



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