

ON HIGHWAY ENGINE FAMILY BOXES

The engine family boxes shown below represent groupings of engine families with similar characteristics (i.e., the emissions standards that the engines were built to) for current and past model years. The boxes are categorized by urban bus or non-urban bus and emissions standards. All emissions standards are in units of g/bHP-hr. The number of engine families for each box were tabulated from an EPA engine certification database. Each box consists of six subcategories: 2 or 4 stroke technology and the different categories of engines (LHDDE, MHDDE, HHDDE). An example is shown below the engine family boxes.

These boxes serve as a guide to retrofit technology manufacturers who are interested in maximizing the number of engine families the retrofit device can be applied to, while minimizing the number of tests to demonstrate applicability. EPA/OTAQ staff shall determine the applicability of the retrofit device to the number of engine families on a case-by-case basis.

<p>PRE MY 1988**</p> <p style="text-align: center;">BOX OH-1</p>	<p>MY 1988- 1989</p> <p style="text-align: center;">BOX OH-2</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">10.7</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.6</td></tr> <tr><td>No. Of Families:</td><td style="text-align: center;">288</td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	10.7	PM:	0.6	No. Of Families:	288	<p>MY 1990</p> <p style="text-align: center;">BOX OH-3</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">6.0</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.6</td></tr> <tr><td>No. Of Families:</td><td style="text-align: center;">155</td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	6.0	PM:	0.6	No. Of Families:	155										
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<p>MY 1991- 1992</p> <p style="text-align: center;">BOX OH-4</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">5.0</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.25</td></tr> <tr><td>No. Of Families:</td><td style="text-align: center;">232</td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	5.0	PM:	0.25	No. Of Families:	232	<p>MY 1993 Non-Urban Bus</p> <p style="text-align: center;">BOX OH-5</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">5.0</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.25</td></tr> <tr><td>Approx. No. Of Families:</td><td style="text-align: center;">160</td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	5.0	PM:	0.25	Approx. No. Of Families:	160	<p>MY 1993 Urban Bus</p> <p style="text-align: center;">BOX OH-6</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">5.0</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.1</td></tr> <tr><td>No. Of Families:</td><td></td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	5.0	PM:	0.1	No. Of Families:	
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<p>MY 1994-1997 Non-Urban Bus</p> <p style="text-align: center;">BOX OH-7</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">5.0</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.1</td></tr> <tr><td>No. Of Families:</td><td style="text-align: center;">491</td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	5.0	PM:	0.1	No. Of Families:	491	<p>MY 1994-1995 Urban Bus</p> <p style="text-align: center;">BOX OH-8</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">5.0</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.07</td></tr> <tr><td>No. Of Families:</td><td style="text-align: center;">TBD*</td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	5.0	PM:	0.07	No. Of Families:	TBD*	<p>MY 1996-1997 Urban Bus</p> <p style="text-align: center;">BOX OH-9</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>HC:</td><td style="text-align: center;">1.3</td></tr> <tr><td>CO:</td><td style="text-align: center;">15.5</td></tr> <tr><td>NOx:</td><td style="text-align: center;">5.0</td></tr> <tr><td>PM:</td><td style="text-align: center;">0.05</td></tr> <tr><td>No. Of Families:</td><td style="text-align: center;">TBD*</td></tr> </table>	HC:	1.3	CO:	15.5	NOx:	5.0	PM:	0.05	No. Of Families:	TBD*
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MY 1998-2003 Non-Urban Bus	
BOX OH-10	
HC:	1.3
CO:	15.5
NOx:	4.0
PM:	0.1
No. Of Families:	673

MY 1998-2003 Urban Bus	
BOX OH-11	
HC:	1.3
CO:	15.5
NOx:	4.0
PM:	0.05
No. Of Families:	TBD*

MY 2004 - 2006 Urban Bus	
BOX OH-12	
NOx + NMHC:	2.5
CO:	15.5
PM:	0.05
No. Of Families:	TBD*

MY 2004-2006 Non-Urban Bus + MY 2002 – 2003 Non-Urban Bus "Consent Decree Pull-Ahead" Engines***	
BOX OH-13	
NOx + NMHC:	2.5
CO:	15.5
PM:	0.1
No. Of Families:	TBD*

MY 2007 Urban + Non-Urban Bus	
BOX OH-14	
NOx	0.2****
CO:	15.5
PM:	0.01
HC	0.14
No. Of Families:	TBD*

NOTES:

- * TBD = To be determined.
- ** EPA/OTAQ staff shall discuss with the retrofit manufacturer to determine the applicability of the retrofit device to non-regulated engine families also on a case-by-case basis.
- *** Applies to the following companies: Caterpillar, Cummins, Detroit Diesel, International, Mack, Volvo, Renault
- **** 50% Phase-in Standard – Engine manufacturers can certify up to 50% of their fleet to the old standard = 2.5 g/bHP-hr. Generally, most manufacturers opted to certify 100% of their fleets to 1.2 g/bHP-hr (half-way between 2.5g/bHP-hr and .2 g/bHP-hr)

ON HIGHWAY ENGINE FAMILY BOXES (Continued)

EXAMPLE OF ONE OF THE ABOVE ENGINE FAMILY BOXES

There are six sub-boxes for BOX OH-7:

MY 1994-1997 Non-Urban Bus LHDDE 2 STROKE

MY 1994-1997 Non-Urban Bus LHDDE 4 STROKE

MY 1994-1997 Non-Urban Bus MHDDE 2 STROKE

MY 1994-1997 Non-Urban Bus MHDDE 4 STROKE

MY 1994-1997 Non-Urban Bus HHDDE 2 STROKE

MY 1994-1997 Non-Urban Bus HHDDE 4 STROKE
