UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 4 2007

OFFICE OF
AIR AND RADIATION

CISD-07-05 (LDV-LDT-ICI-MDPV-HDV)

Dear Manufacturer:

SUBJECT: Manufacturer Guidance on Compliance Demonstration with the Emissions Durability Procedures and Regulations

On January 17, 2006, the Environmental Protection Agency (EPA) published a final rulemaking entitled "Emission Durability Procedures and Component Durability Procedures for New Light-Duty Vehicles, Light-Duty Trucks and Heavy-Duty Vehicles; Final Rule and Proposed Rule." This final rulemaking contains procedures to be used by manufacturers of light-duty vehicles, light-duty trucks, and some heavy-duty vehicles to demonstrate, for purposes of emission certification, that new motor vehicles will comply with EPA emission standards throughout their useful lives. Specifically, this action defined procedures to be used by manufacturers to demonstrate that their durability programs meet the following durability objective:

> *"The durability program must predict an expected in-use emission deterioration rate and emission level that effectively represents a significant majority of the distribution of emission levels and deterioration in actual use over the full and intermediate useful life of candidate in-use vehicles of each vehicle design which uses the durability program."* (40 CFR 86.1823-08)

In addition, EPA outlined provisions for a standardized road cycle (SRC) and standardized bench cycle (SBC) that could be used to simulate advanced vehicle aging on a whole vehicle or on emissions control components on an aging bench.

This letter provides further guidance on compliance demonstration with the emissions durability requirements. Specifically, this letter discusses the level of information and documentation necessary for EPA review and approval of your emissions durability package, clarification on the equivalency factor (EF) regulatory language, determination of the EF with some sample calculations, launching of a new durability webpage, and requests for durability meetings with EPA under the new durability process. In addition, an example of the demonstration criteria that may be used by EPA for review and approval of your emissions durability package is attached for your convenience.

If you have any questions regarding this letter or the emissions durability process please contact Mr. Arvon L. Mitcham at (734) 214-4522 or Mr. Linc Wehrly at (734) 214-4286 of my staff.

Sincerely,

Karl J. Simon
Acting Director
Compliance and Innovative Strategies Division

Enclosure

Enclosure to CISD-07-05

Emissions Durability Package and Information for EPA Review and Approval

As mentioned above, EPA outlined provisions in the emissions durability final rule for a standardized road and bench cycle (i.e., the SRC and SBC, respectively) that could be used to simulate vehicle aging. However, the final rule also allows you to use alternative methods, with EPA review and approval. The main purpose of the review and approval process is to ensure that the alternative durability procedures accurately capture and replicate the deterioration of your in-use vehicle fleet.

Manufacturers using a customized Standard Road Cycle (customized SRC) or customized Standard Bench Cycle (customized SBC), and/or an alternative road cycle (ARC) or alternative bench cycle (ABC), are required to obtain pre-certification approval of their emissions durability procedures (40 CFR 86.1823-08 (e)). To obtain this approval, you should first provide EPA with an informal overview presentation of your emissions durability procedures and followed by submission of a formal durability package and request for EPA approval. You may use discretion regarding the level of detail in the informal overview presentation but the formal emissions durability package must include required elements to ensure that EPA is able to determine whether your emissions durability procedures comply with the applicable regulations in 40 CFR 86.1823-08 (e).

Attached to this letter is an example of the demonstration criteria that may be used to evaluate your formal emissions durability package. You may use this attachment as a guideline to develop your formal emissions durability package for our review and approval. However, this should be considered as the minimum amount of information necessary to obtain our approval.

Therefore, you should supply sufficient supporting documentation, test information, emissions data and other information to support the contention that your durability programs will meet the required "durability objective," minimize the number of follow-up questions and information exchange, and ensure timely review and approval of your durability package. For example, you could include the raw data sheets for calculating the effective reference temperature (T_r) and the bench aging time (BAT) calculator, for both the customized SRC/ARC and the SRC, since the required BAT inputs (e.g., T_r, A-factor, R-factor, useful life mileage) are explicitly stated. In addition to the emissions durability procedures, manufacturers should also discuss and include the evaporative and on-board refueling and vapor recovery (ORVR) durability procedures that will be used.

For those manufacturers using the SRC and/or SBC for emissions durability, a formal package is not required for EPA approval. However, you must notify EPA in writing prior to your certification application that you are using the SRC and/or SBC. This documentation should be submitted separately to the appropriate staff and a copy included in your full certification application.

Equivalency Factors

Manufacturers using a customized SRC and/or SBC, and/or an ARC or ABC are also required to provide equivalency factors (EFs) that equate the alternative or customized road cycle to the EPA's SRC. The EF is used to compare the bench aging time for a customized SRC/ARC or ABC to the bench aging time for the EPA SRC, at the full useful life (FUL) mileage for a particular model. There has been some confusion regarding the EFs and this letter provides a general overview and the purpose of EFs, clarification of some of the EF regulatory language, and guidance on the method for calculating/determining EFs.

Equivalency Factor Overview and Purpose

The purpose and general process for determining the EF is stated in the following preamble language (71 FR 2818, January 17, 2006):

> *"The manufacturer must calculate an equivalency factor that equates the alternative or customized road cycle to the SRC run for full useful life mileage. The equivalency factor is used to determine how much in-use data the manufacturer must present in the analysis that the durability objective is expected to be achieved. The equivalency factor would also be made available to outside parties for their use to recreate aging conducted by the manufacturer during certification. For example, if the equivalency factor is 90% then the durability aging conducted by the manufacturer can be replicated by running the SRC for 90% of the useful life mileage or by bench aging using the SBC for the time calculated from the BAT equation using time-at-temperature data run on the SRC based on 90% of the useful life mileage."*

You must provide the EF as required in 40 CFR 86.1823-08 (e)(1)(iii)(B)(3):

> *"A separate equivalency factor may be determined for each test group, or test groups may be combined together (using good engineering judgment) to calculate a single equivalency factor."*

For a single EF covering several test groups, the rationale and details for grouping must be provided and deemed appropriate. EPA may issue later guidance on methods for determining and providing a single EF, if necessary.

Clarification of Equivalency Factor Regulatory Language

There has been some confusion expressed regarding the emissions durability regulatory language and the use of the bench aging time (BAT) equation and the catalyst temperature data or histograms. This letter addresses this confusion by clarifying how the BAT equation is used in combination with catalyst temperature histograms and how to interpret this regulatory language.

The following is the language in 40 CFR 86.1823-08 (e)(1)(iii)(B)(1):

"The equivalency factor may be determined by an evaluation of the SRC and the customized/alternative cycle using catalyst time-at-temperature data from both cycles and the BAT equation to calculate the required bench aging time of each cycle."

This language has been interpreted by some to imply that the equivalency factor can be determined by using the catalyst time-at-temperature from both cycles and also determined separately by using the BAT equation bench aging time from both cycles, with the word "and" underlined intentionally as a potential source of misinterpretation. More appropriately, the sentence should be interpreted as:

The equivalency factor may be determined by an evaluation of the SRC and the customized/alternative cycle using catalyst time-at-temperature data from both cycles ***[with]*** *the BAT equation to calculate the required bench aging time of each cycle. [Once the bench aging time is calculated, the equivalency factor may be determined.]*

This interpretation should clarify that the catalyst time-at-temperature data and the bench aging time from the BAT equation must be used in conjunction, not as two separate methods, to determine the equivalency factors.

Method for Calculating/Determining the Equivalency Factor(s)

For each test group or combination of test groups, the process of determining the equivalency factor is as follows:

- For Model Z that the manufacturer plans to certify, drive Model Z on the manufacturer's customized SRC/ARC and record the catalyst temperature histogram;

- For Model Z that the manufacturer plans to certify, drive Model Z on the EPA SRC and record the catalyst temperature histogram;

- Enter the customized SRC/ARC catalyst temperature histogram into EPA's BAT calculator to calculate the SBC effective reference temperature[1] (T_r, this value is necessary for calculating the equivalent bench aging time on the EPA SBC that simulates the applicable full useful life (FUL) deterioration for model Z);

- Enter T_r, the customized SRC/ARC catalyst temperature histogram, and the customized SRC/ARC useful life mileage into EPA's BAT calculator to calculate the SBC bench aging time in hours for the customized SRC/ARC;

- Enter T_r, the SRC catalyst temperature histogram, and the applicable SRC FUL mileage into EPA's BAT calculator to determine the SBC bench aging time in hours for the EPA SRC;

[1] For guidance on the effective reference temperature, T_r , See 40 CFR 86.1823-08(d)(4) [71 FR 2831, January 17, 2006]

- Calculate the EF for Model Z using the calculated SBC aging time for the customized SRC/ARC and the EPA SRC.

The main inputs for calculating the bench aging time in hours are the effective reference temperature, T_r, the catalyst temperature histograms on the customized SRC/ARC and the SRC, and the useful life mileage for the customized SRC/ARC and the applicable FUL for the SRC. Below is how the inputs appear on the BAT calculator spreadsheet.

Example BAT Calculator Inputs

Miles represented in Histogram	58
Useful Life Miles	120,000
Reference Temp °C (T_r)	828
In-Use Correction Factor	1.10
Tier 2?	N
Catalyst Temp Sensititivy (R)	18500

Bench Aging Hours at Ref Temp	**1645.3**
Adjusted to include In-Use Factor	**1809.8**

One area of confusion has been what useful life mileage should be used in the BAT calculator for a customized SRC/ARC and the EPA SRC. For the EPA SRC, the applicable full useful life mileage (e.g., 120,000 miles or 150,000 miles) should always be used. For a customized SRC/ARC, the manufacturer should use the useful life mileage that achieves the durability objective. Further, if you know the exact miles on your customized SRC/ARC that equates to the applicable full useful life, which may be lower than the applicable useful life, you can use this mileage in the BAT calculator for the customized SRC/ARC. If you do not know the exact miles on your customized SRC/ARC that equates to the applicable full useful life, then you should use the applicable full useful life in the BAT calculator for the customized SRC/ARC (Note: The applicable full useful life used for the customized SRC/ARC and the EPA SRC should be the same).

Another area of confusion has been what the correct format for the equivalency factor equation is. As stated in the final rule, the EF is described as:[2]

> *"...the ratio of the aging time on the SRC divided by the aging time on the alternative cycle."*

However, in the proposed rulemaking,[3] the EF was described as:

> *"...the ratio of the aging time on the alternative cycle divided by the aging time on the SRC."*

[2] See 40 CFR 86.1823-08 (e)(iii)(B)(1) [71 FR 2831, January 17, 2006]
[3] See 69 FR 17532

Below is an example that should rectify the issue of the EF equation format in the final rule versus the proposed rule. The data in this example is for illustration purposes but is based on actual vehicle histogram data submitted by a manufacturer for durability approval purposes.

Assume that the applicable FUL is 120,000 miles for Model Z that a manufacturer plans to certify and that the manufacturer has collected the required histogram data on both the customized SRC/ARC and the EPA SRC for Model Z. This histogram data is plugged into the BAT calculator along with the other inputs to get the following bench aging time in hours for the customized SRC/ARC and the EPA SRC.

Customized SRC/ARC

Miles represented in Histogram	58
Useful Life Miles	120,000
Reference Temp °C (T_r)	828
In-Use Correction Factor	1.10
Tier 2?	N
Catalyst Temp Sensititivy (R)	18500

Bench Aging Hours at Ref Temp	**1645.3**
Adjusted to include In-Use Factor	**1809.8**

EPA SRC

Miles represented in Histogram	26
Useful Life Miles	120,000
Reference Temp °C (T_r)	828
In-Use Correction Factor	1.10
Tier 2?	N
Catalyst Temp Sensititivy (R)	18500

Bench Aging Hours at Ref Temp	**1201.7**
Adjusted to include In-Use Factor	**1321.9**

Based on this data, the manufacturer would use 1809.8 hours for the customized SRC/ARC and 1321.9 hours for the EPA SRC to calculate the equivalency factor.

Using the final rule format (e.g., SRC / customized SRC or ARC) the calculated equivalency factor is 0.730395 (1321.9 hours / 1809.8 hours). Multiplying the applicable FUL (120,000 miles) times the EF (0.730395) and plugging this new mileage (87,647 miles) into the BAT calculator for the EPA SRC, you get the new bench aging time in hours as follows:

Customized SRC/ARC

Miles represented in Histogram	58
Useful Life Miles	120,000
Reference Temp °C (T_r)	828
In-Use Correction Factor	1.10
Tier 2?	N
Catalyst Temp Sensititivy (R)	18500

Bench Aging Hours at Ref Temp	**1645.3**
Adjusted to include In-Use Factor	**1809.8**

EPA SRC

Miles represented in Histogram	26
Useful Life Miles	87,647
Reference Temp °C (T_r)	828
In-Use Correction Factor	1.10
Tier 2?	N
Catalyst Temp Sensititivy (R)	18500

Bench Aging Hours at Ref Temp	**877.7**
Adjusted to include In-Use Factor	**965.5**

Alternatively, we could have multiplied the SRC bench aging hours (1321.9 hours) times the EF (0.730395) to get 965.5 hours. However, notice that the bench aging hours for the customized SRC/ARC (1809.8 hours) and the EPA SRC (965.5 hours) are not equal using the final rule format. For the EF to be used as intended to allow replication of the customized SRC/ARC, the SRC bench aging hours calculated using the EF should equal the customized SRC/ARC bench aging hours, which they do not this equation format.

However, using the proposed rule format (e.g., customized SRC or ARC / SRC), the calculated EF would be 1.369122. Multiplying this EF times the applicable FUL, you would get a new mileage of 164,295 miles (120,000 miles FUL x 1.369122) and, plugging this mileage into the BAT calculator, you get the bench aging time in hours as follows:

Customized SRC/ARC

Miles represented in Histogram	58
Useful Life Miles	120,000
Reference Temp °C (T_r)	828
In-Use Correction Factor	1.10
Tier 2?	N
Catalyst Temp Sensititivy (R)	18500

Bench Aging Hours at Ref Temp	**1645.3**
Adjusted to include In-Use Factor	**1809.8**

EPA SRC

Miles represented in Histogram	26
Useful Life Miles	164,295
Reference Temp °C (T_r)	828
In-Use Correction Factor	1.10
Tier 2?	N
Catalyst Temp Sensititivy (R)	18500

Bench Aging Hours at Ref Temp	**1645.3**
Adjusted to include In-Use Factor	**1809.8**

Just as before, we could also multiply the EF times the SRC FUL bench aging hours to get 1809.8 hours (1321.9 hours x 1.369122). Notice now that the bench aging hours (e.g., 1809.8 hours) for the customized SRC/ARC and the EPA SRC are equal using the proposed rule format. Therefore, the proposed rule format for the EF equation, customized SRC/ARC (hours) divided by EPA SRC (hours), is the desired format. However, at this time, we believe it is useful to provide both the EPA SRC divided by customized SRC/ARC and customized SRC/ARC divided by EPA SRC data formats for your EFs.

You must provide equivalency factors for MY 2008 and beyond, even if you are seeking to carry-over approved durability procedures. Once your durability procedures have been approved in MY 2008 under the new durability program, you are allowed to carry-over the equivalency factors if there are no changes to the durability procedure and if the applicable test groups are carried over. If a new model is introduced, you must either demonstrate that the equivalency factor for an existing test group applies for that new model, using good engineering judgment, or generate an equivalency factor for that new model.

Finally, EPA plans on making the EFs available to the public via the web (see discussion below on EPA's new Durability webpage). In addition, you should also supply the applicable durability and test group(s), make and model name(s), applicable emission standards (e.g., Tier 2 Bin 5) and applicable full useful life with the EFs to allow proper matching of EFs and in-use vehicles. As the example above illustrates, this information should be sufficient to determine the amount of driving on the SRC or the amount of bench aging on the SBC necessary to meet the durability objective and replicate the aging on a manufacturer's customized SRC/ARC. All other materials and aspects related to your durability procedures claimed as CBI will be treated as required in the applicable regulations.[4]

Emissions Durability Overview Meetings for Review and Approval of Model Year 2008 and Beyond Durability Procedures

You may schedule a separate meeting or a portion of the certification preview meeting with your EPA certification representative to discuss your durability procedures and receive official approval for your model year (MY) 2008 and beyond durability procedures if you are using a customized standard road/bench cycle and/or an alternative road/bench cycle. Further,

[4] See 40 CFR Part 2, Subpart B, section 2.201 through 2.311.

you are required to receive official approval under the new durability rule for your MY 2008 durability procedures even if you received EPA approval of your model year (MY) 2008 durability procedures prior to the effective date of the final rule and/or you are carrying-over previously approved, pre-MY 2008 durability procedures.[5] Once your durability procedures have been approved in MY 2008 under the new durability program, you are allowed to carry-over your durability procedures, with EPA approval, to future model years.

New Durability Webpage

EPA has created a new durability webpage that can be found at www.epa.gov/otaq/regs/ld-hwy/durability. This webpage will continue to link to the Compliance Assurance Program (CAP) 2000 webpage but will provide more information specifically related to the implementation of the new emissions durability rule and the future component durability rule, once it is finalized. In addition, the EPA will use this webpage as a point of distribution for the list of equivalency factors in a particular model year. EPA will conduct semi-annual distribution of the equivalency factors with the first posting occurring after part two of the certification application has been submitted and the second posting occurring at the end of the model year. This ensures that equivalency factors are made available as soon vehicles are introduced into commerce.

[5] See 71 FR 2813, K. “Carryover” and 71 FR 2826, F. "Compliance Date and Carryover of Existing Durability Data.”

Alternative Durability Procedure – Example Demonstration Criteria

ALTERNATIVE AGING PROCEDURES

1)	Is the manufacturer using a Customized Standard Road Cycle (cust. SRC)?	Y/N
2)	Is the manufacturer using an Alternative Road Cycle (ARC)?	Y/N
3)	Is the manufacturer using an alternative bench cycle?	Y/N

IN-USE VEHICLE DATA

4)	Is a list of the individual test groups/vehicles/models for past model year test vehicles included?	Y/N
5) a)	Are the in-use FTP emissions data on past model year vehicles included?	Y/N
b)	Do the vehicles cover the breadth of the vehicles that the mfr intends to certify using this cycle?	Y/N
6) a)	How many in-use vehicles were tested?	
b)	Is the alternative cycle more or less severe than the standard road cycle?	More/Less
c)	Is the number of vehicles tested appropriate depending on the severity of the cycle?	Y/N
d)	Was the procurement conducted randomly?	Y/N
e)	Were the vehicles procured from actual customer use?	Y/N
f)	Were the vehicles tested in as-received condition?	Y/N
g)	Was any data removed from the data set?	Y/N

BENCH AGING TIME (BAT) INFORMATION FOR ALTERNATIVE BENCH AGING CYCLE

7)	Is the bench aging time equation included with all variables listed and defined?	Y/N
8)	Has EPA given prior approval for the given BAT equation?	Y/N or n/a
9)	Is a previously EPA-approved customized/alternative road cycle used to develop catalyst histograms for use in the BAT equation?	Y/N
10)	Is a different method to calculate bench aging time used?	Y/N

Upper/Lower Control Temperature

11)	Are the lower and upper control temperatures of the alternative bench cycle provided?	Y/N or n/a
12)	Are the lower and upper control temperatures equivalent to or greater than the SBC lower and upper control temperatures (800 and 890 degrees C +/-10 degrees C, respectively)?	Y/N or n/a

Alternative Durability Procedure – Example Demonstration Criteria (cont.)

	R-Factor	
13)	Is the R-factor included in the materials?	Y/N or n/a
14)	Is the R-factor used in EPA's BAT equation determined experimentally using EPA's standard procedures?	Y/N or n/a
	A-Factor	
15)	Is the A-factor included in the materials?	Y/N or n/a
16)	Was the A-factor used in EPA's BAT equation modified using good engineering judgment to ensure that the modified durability process will achieve the durability objective?	Y/N or n/a
	Fuel	
17)	Did the fuel that was used for bench aging contain additional compounds such as phosphorus, sulfur or lead?	Y/N

EQUIVALENCY FACTOR (EF) INFORMATION

18)		Is a list of applicable test groups, vehicles and models included for the certified model year?	Y/N
19)	a)	Is the EF or a list of EFs for each durability group supplied?	Y/N
	b)	Does the EF equal the ratio of the SRC aging time divided by the aging time of the alt. cycle?	Y/N
20)	a)	Is the manufacturer using a combined EF?	Y/N
	b)	If the manufacturer is using a combined EF, is the combined EF appropriate?	Y/N or n/a
21)	a)	Is a comparison of the relative stringency of the SRC and alternative cycle provided?	Y/N
	b)	Are any emissions or time-at-temperature data available from the SRC used in the stringency evaluation and EF development?	Y/N

ANALYSIS OF THE DURABILITY OBJECTIVE

22)	Does the analysis demonstrate that the durability objective is achieved for past model year vehicles and will be achieved for future model year vehicles?	Y/N