

### Appendix 3: Provisions for determination of diesel vehicle and diesel engine deterioration factors, Ki factors, and evolution coefficients

1. Each engine family shall have its own exhaust emission deterioration factors. The deterioration factors of said engine family shall be multiplied or added in the gaseous or particulate matter emissions test data for new vehicles (including new vehicle configuration test, quality control test, and new vehicle random test), as the basis for determining whether the engine family complies with the Emissions Standards. Before comparing with the Emissions Standards, the test values shall be calculated to one more decimal place of the emission standard values and then rounded. The rounded values shall not exceed the Emission Standards.

For diesel vehicles using the NEDC or WLTC or WHTC driving cycle for the test and equipped with periodically regenerating system, the test results shall further include Ki factors.

The engine family test results being calculated using deterioration factors or Ki factors in accordance with this Appendix must comply with Article 5 of the Emissions Standards.

2. The deterioration factors shall be determined in either of the following manners:

#### 2.1 Adopting a vehicle on-road or an engine bench durability test

##### 2.1.1 Conducting the durability test:

2.1.1.1 The exhaust emissions deterioration factors shall be determined by the durability test results. The applicant shall provide diesel vehicle (or engine) mileage accumulation driving cycle and durability test plan to the inspection organization for confirmation, and then the durability test may be conducted only upon approval of the central competent authority.

2.1.1.2 The minimum contents of the durability test plan shall include:

- (1) Execution unit (including proof of capability to conduct the test).
- (2) Test vehicle (or engine).
- (3) Test procedures
- (4) Test schedule.
- (5) Test equipment.
- (6) Repair and maintenance items.
- (7) Test fuel.

2.1.1.3 If the assigned multiplicative deterioration factor by vehicle or engine manufacturer is less than 1, it shall be deemed as equal to 1.

- 2.1.1.4 After completing the Durability Test Plan, the applicant shall submit it to the inspection organization for confirmation, and the deterioration factors may be adopted only upon approval of the competent authority.
    - 2.1.2 Using deterioration factors recorded in the US, EU or UK Certificate of Conformity:
      - 2.1.2.1 For engine family (heavy-duty buses and trucks) or vehicle configuration (light-duty commercial or passenger vehicles) with the US, EU or UK issued Certificate of Conformity, the applicant shall submit the relevant deterioration factors information that is recorded in the certificate for approval.
      - 2.1.2.2 For engine family (heavy-duty buses and trucks) or vehicle configuration (light-duty commercial or passenger vehicles) without a US, EU or UK issued Certificate of Conformity, the applicant shall provide declaration documents by the original engine or vehicle manufacturer to declare that said engine family or vehicle configuration is covered in the same durability family as recorded in the obtained Certificate of Conformity, and according to the provisions of EU Regulation (EC) No 715/2007 or No 595/2009 and related directives, the declaration and proof documents of the same durability family, in order to adopt the deterioration factors that are recorded in the Certificate of Conformity.
  - 2.2 Provisions of adopting the assigned deterioration factors are stipulated as follows:
    - 2.2.1 For engine family (heavy-duty buses and trucks) or vehicle configuration (light-duty commercial or passenger vehicles) without a US, EU or UK issued Certificate of Conformity, the applicant shall provide the declaration documents by the original engine or vehicle manufacturer to declare that said engine family or vehicle configuration adopts the designated deterioration factors required by this Appendix. The same shall be submitted to the inspection organization for confirmation, and then the designated deterioration factors may be adopted only upon approval of the central competent authority.
    - 2.2.2 For engine family (heavy-duty buses and trucks) or vehicle configuration (light-duty commercial or passenger vehicles) with a US, EU or UK issued Certificate of Conformity, the applicant shall submit such Certificate to adopt the designated deterioration factors recorded in the Certificate.
    - 2.2.3 In the case of an application for import of new diesel vehicles

and diesel vehicles which are used overseas for less than one year old (calculated from the date of production to the date of on-ship importation) not based on the engine family, or the application filed by the association of importers, the designated deterioration factors shall be adopted. For a vehicle older than one year, no deterioration factor is needed for the test.

2.2.4 The designated deterioration factors are defined as follows:

2.2.4.1 For a vehicle using the US FTP-75 driving cycle or engine using the FTP Transient cycle for the test, the designated deterioration factors are:

- (1) For a light-duty commercial or passenger vehicle:  
Carbon monoxide: 1.2; Hydrocarbons: 1.0; Nitrogen Oxides: 1.0; Particulate Matter: 1.5, all of said deterioration factors are multiplicative.
- (2) Application for Heavy-Duty Bus or Truck Certificate of Conformity:
  - a. Without after-treatment system (see Table 1 of this Appendix).
  - b. With after-treatment system (see Table 2 of this Appendix).

2.2.4.2 For vehicles or engines using the EU relevant cycles for the test, the designated deterioration factors are:

- (1) For a light-duty commercial or passenger vehicle:  
Carbon Monoxide: 1.6; Sum of Hydrocarbons and Nitrogen Oxides: 1.5; Nitrogen Oxides: 1.3; Particulate Matter (PM): 1.1; Particulate Number (PN): 1.1, all of said deterioration factors are multiplicative.
- (2) Application for Heavy-Duty Bus or Truck Certificate of Conformity:

Test cycle	CO	HC	NOx	NH <sub>3</sub>	PM	PN
WHTC	1.3	1.3	1.15	1.0	1.05	1.0
WHSC	1.3	1.3	1.15	1.0	1.05	1.0
Note: all the above listed deterioration factors are multiplicative.						

2.2.5 The specific vehicle or engine of an engine family being identified by the central competent authority as unable to obtain its deterioration factors in accordance with the provisions of designated deterioration factors, the same shall not apply to that vehicle configuration or engine family.

3. The purpose of the durability test is to measure the emissions test results after the accumulated time period or mileages for the test vehicle or engine to derive the deterioration factors for each pollutant. The required aging or

mileage for the durability test within the gross vehicle weight rating is in accordance with Article 5 of the Emission Standards.

4. For a test engine or vehicle using the EU NEDC or WLTC or WHTC driving cycle for type approval tests, and equipped with periodically regenerating systems, the test results shall be multiplied by or have added into them the deterioration factors of that engine family, and further be multiplied by or have added into them the regeneration factor  $K_i$  to check whether they comply with Article 5 of the Emission Standards.

4.1 Periodically regenerating system: means a catalytic converter, particulate filter or an anti-pollution device that requires at least one periodical regeneration process under normal vehicle operation, namely with driving mileage within 4,000 km or within 100 hours of starting operation of the engine.

Notwithstanding, if regeneration of an anti-pollution device occurs at least once during an execution of the Type I test and preparation for tests, or in the WHTC test cycle, it will be considered as a continuously regenerating system.

- 4.2 The regeneration coefficients shall be determined in either of the following manners:

4.2.1 Carry out the regeneration coefficient test procedure:

4.2.1.1 In the case of the regeneration coefficient test procedures for the test engine or vehicle, the applicant shall submit the Regeneration Coefficient Test Plan to the inspection organization for confirmation, and then the regeneration coefficient test plan may be executed only upon approval of the central competent authority. The regeneration coefficient test procedure shall be conducted in accordance with provisions of Regulation (EC) No 715/2007 or No. 595/2009 and the subsequent related directives (include Annex 13 to the UN/ECE Regulation No 83, or Regulation No. 49).

4.2.1.2 After completing the regeneration coefficient test, the applicant shall submit the test result to the inspection organization for confirmation, and then the regeneration coefficients for that vehicle configuration may be adopted only upon approval of the central competent authority.

4.2.2 Adopt the regeneration coefficients recorded in the EU or UK Certificate of Conformity:

4.2.2.1 For a vehicle configuration granted the Certificate of Conformity issued by any EU member state or the UK according to EU or UN/ECE regulations, the applicant shall submit the documents required for obtaining the regeneration coefficient certification from the EU, and

then is allowed to adopt the regeneration coefficients recorded in the supporting documents.

4.2.2.2 For light-duty diesel commercial or passenger vehicle without the Certificate of Conformity issued by any EU member state or the UK according to the EC or UN/ECE regulations, the applicant shall submit the same periodic regeneration system family (Ki family) vehicle's EU Certificate of Conformity from the original engine or vehicle manufacturer to prove that said engine family or vehicle configuration adopts the same regeneration coefficients in accordance with EU Regulation (EC) No 715/2007 and the subsequent related directives. The applicant shall also provide a declaration of the same periodic regeneration system family and proof documents to adopt the Ki factors recorded in that Certificate of Conformity.

4.2.3 The applicants for the light-duty diesel commercial or passenger vehicle Certificate of Conformity who file applications not based on the engine family, or file applications via the association of importers, are allowed to adopt the designated regeneration coefficients, which is 1.05 (multiplication).

4.3 A light-duty diesel commercial or passenger vehicle of the same engine family, which belongs to the same Ki family in accordance with the provisions of EU Regulation (EC) No 715/2007 and the subsequent directives, is allowed to use the same regeneration coefficients.

4.4 Use of regeneration coefficients: Multiplication or addition.

5. For a light-duty diesel commercial or passenger vehicle using the EU NEDC or WLTC driving cycle, before executing the new vehicle random test or quality control test, the vehicle configuration per engine family may adopt the evolution coefficients approved by the central competent authority, which, on the condition that the test vehicles have not yet gone through run-in (accumulation mileage less than 150 km), shall be multiplied by the evolution coefficients.

The evolution coefficient shall be determined by one of the following methods:

5.1 Carry out the on-road mileage accumulation test:

5.1.1 The evolution coefficients for exhaust emissions shall be determined based on the on-road mileage accumulation test. The applicant shall submit the Driving Cycle Test method and the plan required for the on-road mileage accumulation test of the light-duty diesel commercial or passenger vehicle. As a first step, the applicant shall submit the plan to the inspection

organization for confirmation, and then the on-road mileage accumulation test may be conducted only upon approval of the central competent authority.

5.1.2 The minimum contents of the on-road mileage accumulation test plan shall include the following items:

5.1.2.1 Execution unit (including proof of capability to conduct the test).

5.1.2.2 Test vehicle (or engine).

5.1.2.3 Test procedures

5.1.2.4 Test schedule.

5.1.2.5 Test equipment.

5.1.2.6 Repair and maintenance items.

5.1.2.7 Test fuel.

5.1.3 The emission values shall be measured at zero (accumulation mileage less than 150 km) and at required mileage (accumulation mileage less than 15,000 km) for each pollutant separately.

5.1.4 The calculation method of evolution coefficient per pollutant type: The emission value at the required accumulation mileage divided by the value at zero mileage for each pollutant. The evolution coefficient may be less than 1.

5.1.5 After completing the Accumulated On-road Mileage Plan, the applicant shall submit the plan to the inspection organization for confirmation, and then the on-road mileage accumulation test evolution coefficient may be adopted only upon approval of the central competent authority.

5.2 Adopting the evolution coefficients recognized by the EU or the UK: For a vehicle configuration with a Certificate of Conformity issued by EU or the UK, the applicant shall submit the application information about certification of evolution coefficients filed with the EU or the UK to the inspection organization for confirmation, and then the evolution coefficients recorded in the Certificate may be adopted only upon approval of the central competent authority.

(Table 1) without after-treatment system

Deterioration factors				
Durability test	CO	HC	NOx	PM
80,000 km	0.4	0.1	0.4	0.04
176,000 km	0.4	0.1	0.4	0.04
296,000 km	0.7	0.1	0.4	0.04
696,000 km	1.1	0.2	0.7	0.04

Note: all the above deterioration factors are additive.

(Unit: g/ brake horse power·hour)

(Table 2) with after-treatment system

Deterioration factors				
Durability test	CO	HC	NO <sub>x</sub>	PM
80,000 km	1.3	1.3	1.2	1.37
176,000 km	1.3	1.3	1.2	1.37
296,000 km	1.4	1.3	1.2	1.37
696,000 km	1.6	1.5	1.2	1.37

Note: all the above deterioration factors are multiplicative.

(Unit: g/ brake horse power·hour)