Commission Regulation (EU) No 582/2011 of 25 May 2011 implementing and amending Regulation (EC) No 595/2009 of the European Parliament and of the Council with respect to emissions from heavy duty vehicles (Euro VI) and amending Annexes I and III to Directive 2007/46/EC of the European Parliament and of the Council (Text with EEA relevance)

ANNEX X

ON-BOARD DIAGNOSTICS

1. INTRODUCTION

1.1. This Annex sets out the functional aspects of on-board diagnostic (OBD) systems for the control of emissions from engine systems which are covered by this Regulation.

2. GENERAL REQUIREMENTS

2.1. The general requirements, including the specific requirements for electronic system security, shall be those set out in Section 4 of Annex 9B to UN/ECE Regulation No 49 and those described in Section 2 of this Annex.

2.2. The reference to Driving cycle in Annex 9C to UN/ECE Regulation No 49 shall be read as reference to Driving cycle as defined in Article 2(36) of this Regulation.

2.3. **Additional provisions concerning monitoring requirements**

2.3.1. In addition to the monitoring requirements set out in Appendix 3 to Annex 9B to UN/ECE Regulation No 49 the monitoring requirements set out in Appendix 1 to this Annex shall apply.

2.3.1.1. The failure classification rules shall be the ones set out in Annex 9B to UN/ECE Regulation No 49. Failures detected by the additional monitors required by Appendix 1 shall not be classified as class C failures[(1)].

2.3.2. In the case where the control of reagent injection is performed by means of a closed-loop system, the monitoring requirements set out in Item 1 of Appendix 3 to Annex 9B to UN/ECE Regulation No 49 shall apply.

2.3.2.1. Failures detected according to the provisions of 2.3.2 shall not be classified as class C failures.

2.3.3. The monitoring requirements concerning particulate aftertreatment devices set out in Item 2(c) of Appendix 3 to Annex 9B to UN/ECE Regulation No 49 shall be understood and complemented as set out in points 2.3.3.1, 2.3.3.2 and 2.3.3.3.

2.3.3.1 The performance of the particulate aftertreatment device including the filtration and continuous regeneration processes shall be monitored against the OBD threshold limit specified in Table 1.

2.3.3.2. The periodic regeneration shall be monitored against the ability of the device to perform as designed (for example to perform regeneration within a manufacturer-specified time interval, to perform regeneration upon demand, etc.). This shall constitute one element of the component monitoring associated with the device.

2.3.3.3. Before the dates specified in Article 4(8) and in the case of a wall-flow diesel particulate filter (DPF), the manufacturer may choose to apply the performance monitoring requirements set out in Appendix 3 to this Annex instead of the requirements of Section 2.3.3.1, if he can demonstrate with technical documentation that in case of deterioration there is a positive correlation between the loss of filtration efficiency and the loss of pressure drop (delta pressure) across the DPF under the operating conditions of the engine specified in the test described in Appendix 3 to this Annex.

2.3.3.4. The Commission shall conduct a review of the monitoring requirements set out in point 2.3.3.1 by 31 December 2012. In case the technical non-feasibility of the respective requirements by the dates indicated in point 2.3.3.3 is demonstrated, the Commission shall make a proposal for amending these dates accordingly.

2.4. **Alternative approval**

2.4.1. If requested by the manufacturer, for vehicles of category M_1, M_2, N_1 and N_2 with a maximum permissible mass not exceeding 7,5 tonnes and M_3 Class I, Class II and Class A and Class B as defined in Annex I to Directive 2001/85/EC with a permissible mass not exceeding 7,5 tonnes, compliance with the requirements of Annex XI to Regulation (EC) No 692/2008 according to OBD standard Euro 6 as defined in Appendix 6 to Annex I to Regulation (EC) No 692/2008 shall be considered equivalent to the compliance with this Annex.

If such alternative approval is used, the information related to OBD systems in Sections 3.2.12.2.7.1 to 3.2.12.2.7.4 of Part 2 of Appendix 4 to Annex I is replaced by the information of Section 3.2.12.2.7 of Appendix 3 to Annex I to Regulation (EC) No 692/2008.

[[F1]The manufacturer may either apply the complete provisions of this Annex and Annex XIII to this Regulation or the complete provisions of Annexes XI and XVI to Regulation (EC) No 692/2008.**]**

Textual Amendments

F1 Substituted by Commission Regulation (EU) No 64/2012 of 23 January 2012 amending Regulation (EU) No 582/2011 implementing and amending Regulation (EC) No 595/2009 of the European Parliament and of the Council with respect to emissions from heavy duty vehicles (Euro VI) (Text with EEA relevance).

2.4.2. ***[***[F2]*Small series production****]***

As an alternative to the requirements set out in Section 4 of Annex 9B to UN/ECE Regulation No 49 and those described in this Annex, engine manufacturers whose world-wide annual production of engines within an engine type subject to this Regulation is less than 500 engines per year, may obtain EC type-approval on the basis of the other requirements of this Regulation when the emission control components of the engine system are at least monitored for circuit continuity, and for rationality and plausibility of sensor outputs, and when the aftertreatment system is at least monitored for total functional failure. Engine manufacturers whose world-wide annual production of engines within an engine type subject to this Regulation is less than 50 engines per year, may obtain EC type-approval on the basis of the requirements of this Regulation when the emission control components of the engine system are at least monitored for circuit continuity, and for rationality and plausibility of sensor outputs (component monitoring).

[[F3]A manufacturer shall not be permitted to use the alternative provisions specified in this point for more than 500 engines per year.**]**

Textual Amendments

F3 Inserted by Commission Regulation (EU) No 64/2012 of 23 January 2012 amending Regulation (EU) No 582/2011 implementing and amending Regulation (EC) No 595/2009 of the European Parliament and of the Council with respect to emissions from heavy duty vehicles (Euro VI) (Text with EEA relevance).

Textual Amendments

F2 Deleted by Commission Regulation (EU) No 64/2012 of 23 January 2012 amending Regulation (EU) No 582/2011 implementing and amending Regulation (EC) No 595/2009 of the European Parliament and of the Council with respect to emissions from heavy duty vehicles (Euro VI) (Text with EEA relevance).

F2 2.4.3. . . . . .

2.4.4. The approval authority shall inform the Commission of the circumstances of each type-approval granted under Sections 2.4.1 and 2.4.2.

2.5. **Conformity of production**

The OBD system is subject to the requirements for conformity of production specified in Directive 2007/46/EC.

If the approval authority decides that verification of the conformity of production of the OBD system is required, the verification shall be conducted in accordance with the requirements specified in Annex I to this Regulation.

3. PERFORMANCE REQUIREMENTS

3.1. The performance requirements shall be those set out in Section 5 of Annex 9B to UN/ECE Regulation No 49.

3.2. **OBD threshold limits**

3.2.1. The OBD threshold limits (hereinafter 'OTLs') applicable to the OBD system are those specified in the rows 'general requirements' of Table 1 for compression-ignition engines and of Table 2 for gas-fuelled engines and positive-ignition engines fitted to vehicles belonging to category M_3, to N_2 vehicles having a maximum permissible mass exceeding 7,5 tonnes, and to N_3 vehicles.

3.2.2. Until the end of the phase-in period set out in Article 4(7), the OBD threshold limits specified in rows 'phase-in period' of Table 1 for compression-ignition engines and of Table 2 for gas fuelled engines and positive-ignition engines fitted to vehicles belonging to category M_3, to N_2 vehicles having a maximum permissible mass exceeding 7,5 tonnes and, to N_3 vehicles shall apply.

TABLE 1

OTLs (Compression-ignition engines)

	Limit in mg/kWh	
	NO_x	**PM Mass**
Phase-in period	1 500	25
General requirements	1 200	25

TABLE 2

OTLs (all gas fuelled engines and positive-ignition engines fitted to vehicles belonging to category M_3, to N_2 vehicles having a maximum permissible mass exceeding 7,5 tonnes, and to N_3 vehicles)

	Limit in mg/kWh	
	NO_x	**CO[a]**
phase-in period	1 500	
general requirements	1 200	

a The OTL for CO shall be set at a later stage.

4. DEMONSTRATION REQUIREMENTS

4.1. The demonstration requirements shall be those set out in Section 6 of Annex 9B to UN/ECE Regulation No 49 and those described in Section 4 of this Annex.

4.2. In addition to the point 4.1 the manufacturer may use the requirements as set out in Appendix 2 to demonstrate the performance monitoring.

Approval authorities may approve a manufacturer's use of a type of performance monitoring technique other than the one referred to in Appendix 2. The chosen type of monitoring shall be demonstrated by the manufacturer by a robust technical case based upon the design characteristics, or by presentation of test results, or by reference to previous approvals, or by some other acceptable method, to be at least as robust, timely and efficient as the ones mentioned in Appendix 2.

5. DOCUMENTATION REQUIREMENTS

5.1. The documentation requirements shall be those set out in Section 8 of Annex 9B to UN/ECE Regulation No 49.

6. IN USE PERFORMANCE REQUIREMENTS

The requirements of this Section shall apply to the OBD system monitors in accordance with the provisions of Annex 9C to UN/ECE Regulation No 49.

6.1. **Technical requirements**

6.1.1. The technical requirements for assessing the in-use performance of OBD systems including requirements concerning communication protocols, numerators, denominators and their increment shall be those set out in Annex 9C to UN/ECE Regulation No 49.

6.1.2. In particular, the in-use performance ratio ($IUPR_m$) of a specific monitor m of the OBD system shall be calculated by the following formula:

$IUPR_m = Numerator_m / Denominator_m$

where:

'$Numerator_m$' means the numerator of a specific monitor m and is a counter indicating the number of times a vehicle has been operated in such a way that all monitoring conditions necessary for that specific monitor to detect a malfunction have been encountered; and

'$Denominator_m$' means the denominator of a specific monitor m and is a counter indicating the number of vehicle driving cycles that are of relevance to that specific monitor (or, 'in which events occur that are of relevance to that specific monitor').

6.1.3. The in-use performance ratio ($IUPR_g$) of a group g of monitors on board a vehicle is calculated by the following formula:

$IUPR_g = Numerator_g / Denominator_g$

where:

'$Numerator_g$' means the numerator of a group g of monitors and is the actual value ($Numerator_m$) of the specific monitor m that has the lowest in-use performance ratio as defined in Section 6.1.2 of all monitors within that group g of monitors on board a particular vehicle; and

'$Denominator_g$' means the denominator of a group g of monitors and is the actual value ($Denominator_m$) of the specific monitor m that has the lowest in-use performance ratio as defined in Section 6.1.2 of all monitors within that group g of monitors on board a particular vehicle.

6.2. **Minimum in-use performance ratio**

6.2.1. The in-use performance ratio $IUPR_m$ of a monitor m of the OBD system as defined in Section 5 of Annex 9C to UN/ECE Regulation No 49, shall be greater than or equal to the minimum in-use-performance ratio $IUPR_m(min)$ applicable to the monitor m throughout the useful life of the engine as specified in Article 4 of Regulation (EC) No 595/2009.

6.2.2. The value of minimum in-use-performance ratio IUPR(min) is 0,1 for all monitors.

6.2.3. The requirement of Section 6.2.1 is deemed to be fulfilled if for all groups of monitors g the following conditions are met:

6.2.3.1. The average value $\overline{IUPR_g}$ of the values $IUPR_g$ of all vehicles equipped with engines belonging to the OBD engine family under consideration is equal to or above IUPR(min), and

6.2.3.2. more than 50 % of all engines considered in Section 6.2.3.1 have an $IUPR_g$ equal to or above IUPR(min).

6.3. **Documentation requirements**

6.3.1. The documentation associated with each monitored component or system and required by Section 8 of Annex 9B to UN/ECE Regulation No 49 shall include the following information concerning in-use performance data:

(a) the criteria used for incrementing the numerator and the denominator;

(b) any criterion for disabling incrementation of the numerator or of the denominator.

6.3.1.1. Any criterion for disabling incrementation of the general denominator shall be added to the documentation referred to in Section 6.3.1.

6.4. **Statement of OBD in-use Performance compliance**

6.4.1. In the application for type-approval, the manufacturer shall provide a statement of OBD in-use Performance compliance in accordance with the model set out in Appendix 6. In addition to this statement, compliance with the requirements of Section 6.1 shall be verified through the additional assessment rules specified in Section 6.5.

6.4.2. This statement referred to in point 6.4.1 shall be attached to the documentation related to the OBD engine family required by points 5 and 6.3 of this Annex.

6.4.3. The manufacturer shall maintain records which contain all test data, engineering and manufacturing analyses, and other information which provides the basis for the

OBD in-use performance compliance statement. The manufacturer shall make such information available to the approval authority upon request.

6.4.4. During the phase-in period set out in Article 4(7), the manufacturer shall be exempted from providing the statement required by Section 6.4.1.

6.5. **Assessment of the in-use performance**

6.5.1. The OBD in-use performance and compliance with Section 6.2.3 of this Annex shall be demonstrated at least according to the procedure set out in Appendix 4 to this Annex.

6.5.2. National authorities and their delegates may pursue further tests to verify compliance with Section 6.2.3 of this Annex.

6.5.2.1. To demonstrate non-compliance with the requirements of Section 6.2.3 of this Annex, based on the provision of Section 6.5.2 of this Annex, the authorities must show for at least one of the requirements of Section 6.2.3 of this Annex non-compliance with a statistical confidence level of 95 %, based on a sample of at least 30 vehicles.

6.5.2.2. The manufacturer shall have the opportunity to establish compliance with the requirements of Section 6.2.3 of this Annex, for which non-compliance was demonstrated according to Section 6.5.2.1 of this Annex, by using a test based on a sample of at least 30 vehicles, with a better statistical confidence than the test mentioned in 6.5.2.1.

6.5.2.3. For tests performed according to Sections 6.5.2.1 and 6.5.2.2 both authorities and manufacturers must disclose relevant details, such as those relating to the selection of the vehicles, to the other party.

6.5.3. If non-compliance with the requirements of Section 6.2.3 of this Annex is established according to Sections 6.5.1 or 6.5.2 of this Annex, remedial measures in accordance with Article 13 shall be taken.

6.5.4. The reference to driving cycle in Annex 9C to UN/ECE Regulation No 49 shall be read as reference to Driving cycle as defined in Article 2 point 36 of this Regulation.

6.5.5. During the phase-in period set out in Article 4(7) the assessment of the in-use performance of OBD systems shall be conducted in accordance with the provisions set out in Appendix 5.

6.5.5.1. During the phase-in period set out in Article 4(7) compliance of the OBD systems with the requirements of Section 6.2.3 of this Annex is not mandatory.

Appendix 1

Additional monitoring requirements

1. LOW EGR FLOW

1.1. The following requirement shall apply in addition to those of Appendix 3 to Annex 9B to UN/ECE Regulation No 49.

In the case where the emissions would not exceed the OBD threshold limits even upon total failure of the EGR system's ability to maintain the commanded EGR flow rate (for example, because of the correct functioning of an SCR system downstream of the engine), then:

1.1.1. Where the control of the EGR flow rate is performed by means of a closed-loop system, the OBD system shall detect a malfunction when the EGR system cannot increase the EGR flow to achieve the demanded flow rate.

1.1.2. Where the control of the EGR flow rate is performed by means of an open-loop system, the OBD system shall detect a malfunction when the system has no detectable amount of EGR flow when EGR flow is expected.

2. EGR COOLER UNDERPERFORMANCE

2.1. The following requirements shall apply in addition to those of Appendix 3 to Annex 9B to UN/ECE Regulation No 49.

2.1.1. In the case where total failure of the EGR cooler system’s ability to achieve the manufacturer’s specified cooling performance would not result in the monitoring system detecting a failure (because the resulting increase in emissions would not reach the OBD threshold limit for any pollutant), the OBD system shall detect a malfunction when the system has no detectable amount of EGR cooling.

3. LOW BOOST PRESSURE

3.1. The following requirements shall apply in addition to those of Appendix 3 to Annex 9B to UN/ECE Regulation No 49.

3.1.1. In the case where the emissions would not exceed the OBD threshold limits even upon total failure of the boost system's ability to maintain the demanded boost pressure and the control of the boost pressure is performed by means of a closed-loop system, the OBD system shall detect a malfunction when the boost system cannot increase the boost pressure to achieve the demanded boost pressure.

3.1.2. In the case where the emissions would not exceed the OBD threshold limits even upon total failure of the boost system's ability to maintain the demanded boost pressure and the control of the boost pressure is performed by means of an open-loop system, the OBD system shall detect a malfunction when the system has no detectable amount of boost pressure when boost pressure is expected.

4. MALFUNCTIONING INJECTORS

4.1. The manufacturer shall submit to the approval authority an analysis of the long-term effects on the emission control system of malfunctioning fuel injectors (for example clogged or soiled injectors) even if the OTLs are not exceeded as a consequence of these malfunctions.

4.2. After the period set out in Article 4(7) the manufacturer shall submit to the approval authority a plan of the monitoring techniques he intends to use in addition to those

required by Appendix 3 to Annex 9B to UN/ECE Regulation No 49 in order to diagnose the effects considered in Section 4.1.

4.2.1. After approval of this plan by the authority, the manufacturer shall implement those techniques in the OBD system.

Appendix 2

Performance monitoring

1. GENERAL

1.1. This Appendix sets out provisions relating to the demonstration process applicable in some cases of performance monitoring.

2. DEMONSTRATION OF PERFORMANCE MONITORING

2.1. **Approval of the failure classification**

2.1.1. As specified in Section 4.2.1.1 of Annex 9B to UN/ECE Regulation No 49, in the case of performance monitoring no correlation to actual emissions is necessary. However, the approval authority may request test data in order to verify the classification of the malfunction effects as described in Section 6.2 of that Annex.

2.2. **Approval of the performance monitoring selected by the manufacturer**

[[F1]2.2.1. In arriving at an approval decision on the choice of the performance monitoring selected by the manufacturer, the approval authority shall consider technical information provided by the manufacturer.**]**

2.2.2. The performance threshold selected by the manufacturer for the monitor under consideration shall be determined on the parent engine of the OBD engine family during a qualification test performed as follows:

2.2.2.1. **[**[F1]The qualification test is performed in the same way as specified in Section 6.3.2 of Annex 9B to UN/ECE Regulation No 49.

2.2.2.2. The decrease of performance of the component under consideration is measured and subsequently serves as the performance threshold for the parent engine of the OBD engine family.**]**

[[F1]2.2.3. The performance monitoring criteria approved for the parent engine shall be considered to be applicable to all other members of the OBD engine family without further demonstration.**]**

[[F3]2.2.4. Upon agreement between the manufacturer and the approval authority, adaptation of the performance threshold to different members of the OBD engine family in order to cover different design parameters (for example EGR cooler size) shall be possible. Such agreement shall be based on technical elements showing its pertinence.

2.2.4.1. At the request of the approval authority, a second member of the OBD engine family may be subject to the approval process described in point 2.2.2.**]**

2.3. **Qualification of a deteriorated component**

[[F1]2.3.1. For the purpose of demonstrating the OBD performance of the selected monitor of an OBD engine family, a deteriorated component shall be qualified on the parent engine of the OBD engine family in accordance with Section 6.3.2 of Annex 9B to UN/ECE Regulation No 49.**]**

[[F3]2.3.2. In case of a second engine tested in accordance with section 2.2.4.1, the deteriorated component shall be qualified on that second engine in accordance with Section 6.3.2 of Annex 9B to UN/ECE Regulation No 49.**]**

2.4. **Demonstration of the OBD performance**

2.4.1. The demonstration of the OBD performance shall be conducted according to the requirements of Section 7.1.2 of Annex 9B to UN/ECE Regulation No 49 using the qualified deteriorated component that is qualified for use with the parent engine.

Appendix 3

Demonstration requirements in case of performance monitoring of a wall-flow diesel particulate filter

1. GENERAL

1.1. This Appendix specifies the OBD demonstration process applicable in the case where the filtering process of a wall-flow diesel particulate filter (DPF) is subject to performance monitoring.

1.1.1. A deteriorated wall-flow DPF can be created, for example, by drilling holes into the DPF substrate or by grinding the end caps of the DPF substrate.

2. QUALIFICATION TEST

2.1. **Principle**

2.1.1. A deteriorated wall-flow DPF is considered as a Qualified Deteriorated Component if, under the operating conditions of the engine specified for the purpose of that test, the pressure drop (delta pressure) across that deteriorated wall-flow DPF exceeds or is no less than 60 % of the pressure drop measured across a clean and non-deteriorated wall-flow DPF of the same type.

2.1.1.1. The manufacturer shall demonstrate that this clean and non-deteriorated wall-flow DPF leads to the same back-pressure as the deteriorated one before its deterioration.

2.1.2. Upon request of the manufacturer, the approval authority may accept per derogation a pressure drop threshold of 50 % instead of 60 %. In order to apply for that derogation, the manufacturer shall justify his request by sound technical arguments, such as the spread in new filter quality etc.

2.1.2.1. When granting such a derogation, the approval authority shall notify the manufacturer, the Commission, and all Members States of its decision.

2.2. **Qualification process**

2.2.1. For qualifying a deteriorated wall-flow DPF, the engine equipped with that wall-flow DPF shall be operated under stabilised steady-state conditions, set at the speed and load values specified for mode 9 in the WHSC test cycle specified in Annex 4B to UN/ECE Regulation No 49 (55 % normalised speed and 50 % normalised torque).

2.2.2. To qualify a deteriorated wall-flow DPF as a ‘Qualified Deteriorated Component’, the manufacturer shall demonstrate that the pressure drop across that deteriorated wall-flow DPF, measured when the engine system is operated under the conditions specified in Section 2.2.1, is no less than the percentage of the pressure drop across a clean and non-deteriorated DPF under the same conditions which is applicable in accordance with Sections 2.1.1 and 2.1.2 of this Appendix.

2.3. **Demonstration of the OBD performance**

2.3.1. The demonstration of the OBD performance shall be conducted in accordance with the requirements of Section 7.1.2 of Annex 9B to UN/ECE Regulation No 49 with the qualified deteriorated wall-flow DPF mounted on the parent engine system.

Appendix 4

Assessment of the in-use performance of the on-board diagnostic system

1. GENERAL

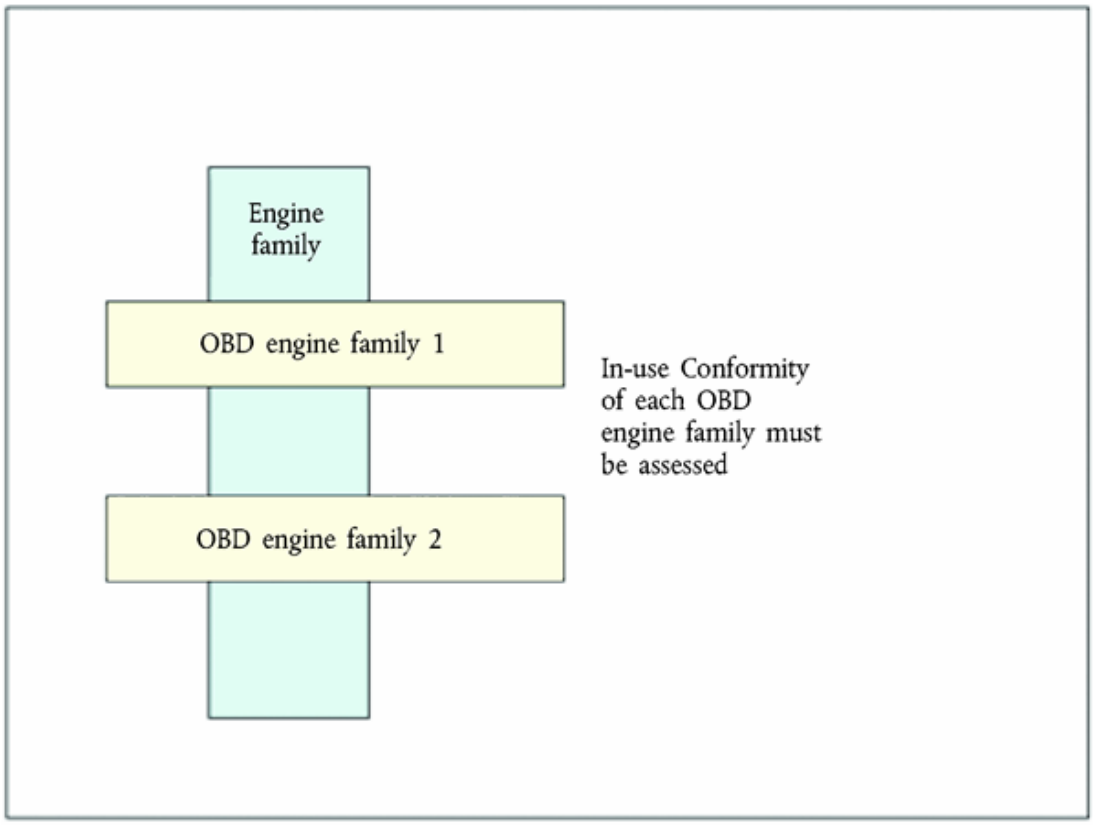
1.1. This Appendix sets out the procedure to be followed when demonstrating the OBD in-use performance with regard to the provisions set out in Section 6 of this Annex.

2. PROCEDURE FOR DEMONSTRATING OBD IN-USE PERFORMANCE

2.1. The OBD in-use performance of an engine family shall be demonstrated by the manufacturer to the approval authority that granted the type-approval for the vehicles or engines concerned. The demonstration shall require consideration of the OBD in-use performance of all OBD engine families within the engine family under consideration (Figure 1).

Figure 1

Two OBD engine families within one engine family



2.1.1. The demonstration of OBD in-use performance shall be organised and conducted by the manufacturer, in close cooperation with the approval authority.

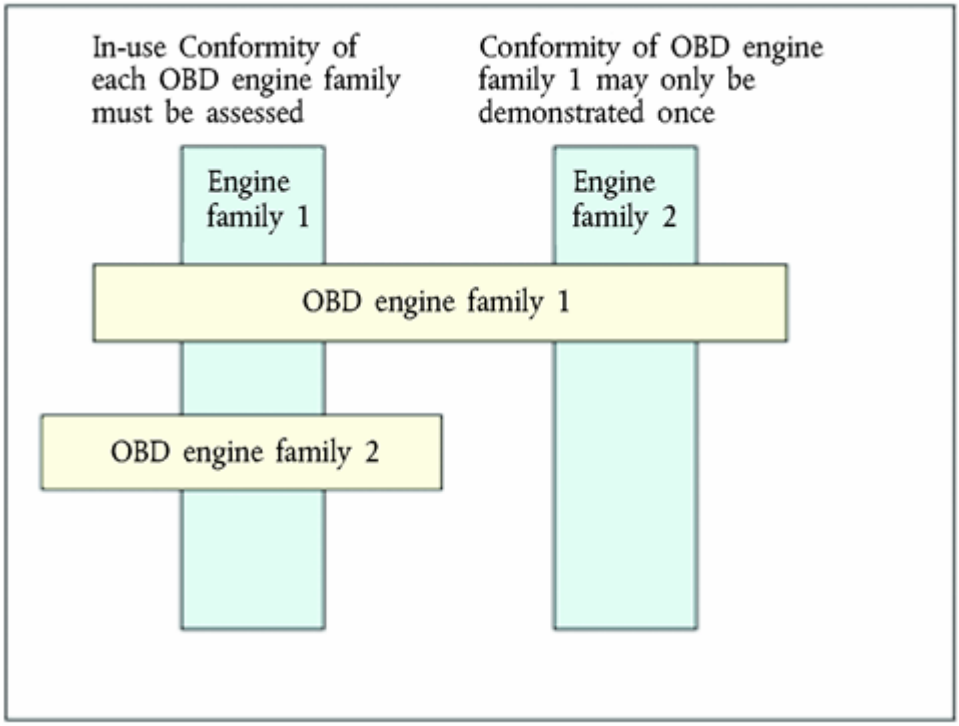
2.1.2. The manufacturer may use in the demonstration of conformity relevant elements that were used to demonstrate the conformity of an OBD engine family within another engine family provided that this earlier demonstration took place no more than 2 years before the current demonstration (Figure 2).

2.1.2.1. A manufacturer may not, however, then use these elements in demonstrating conformity of a third or subsequent, engine family unless each of these demonstrations

takes place within 2 years of the first use of the elements in a demonstration of conformity.

Figure 2

Previously demonstrated conformity of an OBD engine family



2.2. The demonstration of OBD in-use performance shall be performed at the same time and at the same frequency as the in-service conformity demonstration specified in Annex II.

2.3. The manufacturer shall report the initial schedule and the sampling plan for conformity testing to the approval authority at the time of the initial type-approval of a new engine family.

2.4. Vehicle types without a communication interface which permits the collection of the necessary in-use performance data as specified in Annex 9C to UN/ECE Regulation No 49, with missing data or with a non-standard data protocol shall be considered as non-compliant.

2.4.1. Individual vehicles with mechanical or electrical faults which prevent the collection of the necessary in-use performance data as specified in Annex 9C to UN/ECE Regulation No 49 shall be excluded from the conformity testing survey and the vehicle type shall not be considered non-compliant unless insufficient vehicles that meet the sampling requirements can be found to permit the survey to be properly conducted.

2.5. Engine or vehicle types where the collection of in-use performance data influences the OBD monitoring performance shall be considered as non-compliant.

3. OBD IN-USE PERFORMANCE DATA

3.1. The OBD in-use performance data to be considered for assessing the conformity of an OBD engine family shall be those recorded by the OBD system according to Section 6

of Annex 9C to UN/ECE Regulation No 49, and made available according to Section 7 of that Annex.

4. ENGINE OR VEHICLE SELECTION

4.1. **Engine selection**

4.1.1. In the case where an OBD engine family is used in several engine families (Figure 2), engines from each of these engine families shall be selected by the manufacturer for demonstrating the in-use performance of that OBD engine family.

4.1.2. Any engine of a particular OBD engine family may be included in the same demonstration even if the monitoring systems with which they are equipped are of different generations or at different modification states.

4.2. **Vehicle selection**

4.2.1. *Vehicle segments*

4.2.1.1. For the purpose of classifying the vehicles subject to demonstration, six vehicle segments shall be considered:

(a) for vehicles of class N: long-haul vehicles, distribution vehicles, and others such as construction vehicles;

(b) for vehicles of class M: coaches and inter-city buses, city buses, and others such as M_1 vehicles.

4.2.1.2. Where possible, vehicles shall be selected from each segment in a survey.

4.2.1.3. There shall be a minimum of 15 vehicles per segment.

4.2.1.4. In the case where an OBD engine family is used in several engine families (Figure 2), the number of engines from each of these engine families within a vehicle segment shall be as representative as possible of their volume share, in terms of vehicles sold and in use, for that vehicle segment.

4.2.2. *Vehicle qualification*

4.2.2.1. The engines selected shall be fitted to vehicles registered and used in a Member State.

4.2.2.2. Each vehicle selected shall have a maintenance record to show that the vehicle has been properly maintained and serviced in accordance with the manufacturer's recommendations.

4.2.2.3. The OBD system shall be checked for proper functioning. Any malfunction indications relevant to the OBD system itself that are stored in the OBD memory shall be recorded and the required repairs shall be carried out.

4.2.2.4. The engine and vehicle shall exhibit no indications of abuse such as overloading, misfuelling, or other misuse, or other factors such as tampering that could affect the OBD performance. OBD system fault codes and information on operating hours stored in the computer memory shall be amongst the evidence taken into account in determining whether the vehicle has been subject to abuse or is otherwise ineligible for inclusion in a survey.

4.2.2.5. All emission control system and OBD components on the vehicle shall be as stated in the applicable type-approval documents.

5. IN-USE PERFORMANCE SURVEYS[(2)]

5.1. **Collection of in-use performance data**

5.1.1. In accordance with the provisions of Section 6, the manufacturer shall retrieve the following information from the OBD system of each vehicle in the survey:

(a) the VIN (vehicle identification number);

(b) the $numerator_g$ and $denominator_g$ for each group of monitors recorded by the system in accordance with the requirements of Section 6 of Annex 9C to UN/ECE Regulation No 49;

(c) the general denominator;

(d) the value of the ignition cycle counter;

(e) the total engine running hours.

5.1.2. The results from the group of monitors under evaluation shall be disregarded if a minimum value of 25 for its denominator has not been reached.

5.2. **Assessment of the in-use performance**

5.2.1. The actual performance ratio per group of monitors of an individual engine ($IUPR_g$) shall be calculated from the $numerator_g$ and $denominator_g$ retrieved from the OBD system of that vehicle.

5.2.2. The assessment of the in-use performance of the OBD engine family in accordance with the requirements of Section 6.5.1 shall be made for each group of monitors within the OBD engine family considered in a vehicle segment.

5.2.3. For any segment of vehicles defined in Section 4.2.1 of this Appendix, the OBD in-use performance is considered as being demonstrated for the purposes of Section 6.5.1 of this Annex if, and only if, for any group g of monitors the following conditions are met:

(a) the average value $\overline{IUPR_g}$ of the $IUPR_g$ values of the considered sample is greater than 88 % of IUPR(min); and

(b) more than 34 % of all engines in the considered sample have an $IUPR_g$ value of more or equal than IUPR(min).

6. REPORT TO THE APPROVAL AUTHORITY

The manufacturer shall provide the approval authority with a report on the in-use performance of the OBD engine family that contains the following information:

6.1. The list of the engine families within the considered OBD engine family (Figure 1).

6.2. The following information concerning the vehicles considered in the demonstration:

(a) the total number of vehicles considered in the demonstration;

(b) the number and the type of vehicle segments;

(c) the VIN, and a short description (type-variant-version) of each vehicle.

6.3. In-use performance information for each vehicle:

(a) the numerator$_g$, denominator$_g$, and in-use performance ratio (IUPR$_g$) for each group of monitors;

(b) the general denominator, the value of the ignition cycle counter, the total engine running hours.

6.4. The results of the in-use performance statistics for each group of monitors:

(a) the average value $\overline{IUPR_g}$ of the IUPR$_g$ values of the sample;

(b) the number and the percentage of engines in the sample that have an IUPR$_g$ equal to or above IUPR$_m$(min).

Appendix 5

Assessment of the in-use performance of the on-board diagnostic system during the phase-in period

1. GENERAL

1.1. This Appendix specifies the process to be followed for the in-use performance assessment of the OBD system as regards the provisions set out in Section 6 during the phase-in period set out in Article 4(7).

2. PROCEDURE FOR OBD IN-USE PERFORMANCE ASSESSMENT

2.1. The in-use performance assessment during the phase-in period set out in Article 4(7) shall consist of a survey programme including at least two in-use performance surveys, each of 9 months duration. These two surveys shall be completed not later than by 1 July 2015.

2.2. Each manufacturer's first survey shall start when the first complete or completed vehicle fitted with an engine produced by that manufacturer and type-approved according to this Regulation is put into service.

2.3. The surveys shall be organised and conducted by each manufacturer, in close cooperation with the approval authority that granted the type-approval of the vehicles or engines concerned.

2.4. **Data Handling During the Phase-In Period set out in Article 4(7)**

2.4.1. In order to achieve the aim of the phase-in period set out in Article 4(7) with respect to improvements in the assessment of the OBD in-use performance requirements set out in Appendix 4 of this Annex, manufacturers shall provide approval authorities and the Commission with following information:

(a) the IUPR data that manufacturers are required to supply in accordance with Section 6 of this Appendix;

(b) additional OBD information that manufacturers are required to supply by this Regulation and that may or may not be considered to be confidential;

(c) additional data provided voluntarily by the manufacturer as an aid to achieving the aim of the phase-in period, and which may be considered to be commercially sensitive by the manufacturer.

2.4.2. The passing of information considered confidential or commercially sensitive under the terms of this Regulation falling into the category referred to in points (b) or (c) of Section 2.4.1 to third parties other than those mentioned in Section 2.4.1 and 2.4.3 shall be subject to the manufacturer's agreement.

2.4.3. Examples of the kinds of aspects of the complementary data within the category defined in point (c) of Section 2.4.1 that might reasonably be thought to be commercially sensitive include the following:

(a) information that would permit the identity of either the vehicle or engine manufacturer, or of the vehicle operator, to be determined or to be inferred with reasonable confidence;

(b) information on measurement techniques that are under development.

2.5. Section 2.4 of Appendix 4 shall apply to the problems posed by faulty or non-conformant communication interfaces.

2.6. Engines or vehicles where the collection of in-use performance data influences the OBD monitoring performance shall be considered to be non-compliant.

3. OBD IN-USE PERFORMANCE DATA

3.1. The OBD in-use performance data to be considered for assessing the conformity of an OBD engine family shall be those recorded by the OBD system in accordance with Section 6 of Annex 9C to UN/ECE Regulation No 49, and made available in accordance with the requirements of Section 7 of that Annex.

4. VEHICLE AND ENGINE SELECTION

4.1. **Engine selection**

4.1.1. In each of the two surveys required by Section 2.1 only one engine family and one OBD engine family shall be considered.

4.1.2. If before 1 July 2015 a manufacturer has placed more than one engine family or OBD engine family on the market, the two surveys shall cover different engine families or OBD engine families, respectively.

4.1.3. One of the surveys undertaken shall be performed using vehicles equipped with engines belonging to the engine family with the highest sales volume reasonably expected after 31 December 2013, considering information provided by the manufacturer.

4.1.4. Engines of a single engine family or OBD engine family may continue to be included in the same survey even if the monitoring systems with which they are equipped are of different generations or modification states.

4.2. **Vehicle selection**

4.2.1. The vehicle selection rules shall be those defined in Section 4.2 of Appendix 4 to this Annex.

5. IN-USE PERFORMANCE SURVEYS

5.1. **Collection of in-use performance data**

5.1.1. The rules concerning the collection of in-use performance data shall be those specified in Section 5.1 of Appendix 4.

Notwithstanding the provisions of Section 5.1.2 of Appendix 4, the results from the group of monitors under evaluation shall be disregarded if a minimum value of 25 for its denominator has not been reached unless disregarding the data would result in there being fewer than 10 vehicles considered for the sampling in the survey during the 9 month survey duration.

5.2. **Assessment of the in-use performance**

5.2.1. An assessment of the in-use performance shall be made for each group of monitors within the OBD engine family considered in a vehicle segment.

5.2.2. The actual performance ratio per group of monitors for an individual engine ($IUPR_g$) shall be calculated from the $numerator_g$ and $denominator_g$ retrieved from the OBD system of the vehicle in which it is fitted.

5.2.3. The assessment of the in-use performance of the OBD engine family shall be made for each group of monitors within the OBD engine family considered in a vehicle segment in accordance with the provisions of Section 6.5.1 of this Annex

5.2.4. If any of the conditions mentioned in Section 6.5.1 of this Annex is not met, this shall be reported to the approval authority together with the manufacturer's assessment of the reason for this situation arising and, if applicable, a plan of the work that the manufacturer will undertake with the aim of correcting the issue at latest for all vehicles registered for the first time in the Union after the end of the phase-in period.

6. REPORT TO THE APPROVAL AUTHORITY AND THE COMMISSION

For each survey performed in accordance with the provisions of this Appendix, the manufacturer shall provide the approval authority and the Commission with a report on the in-use performance of the OBD engine family that contains the following information:

6.1. The list of the engine families and OBD engine families considered for the survey.

6.2. Information concerning the vehicles considered in the survey including the following:

(a) the total number of vehicles considered in the survey;

(b) the number and the type of vehicle segments;

(c) the VIN, and a short description (type-variant-version) of each vehicle;

(d) the segment to which an individual vehicle belongs;

(e) the usual type of duty or mode of operation of each individual vehicle;

(f) the accumulated mileage of each individual vehicle and/or the accumulated operating hours of its engine.

6.3. In-use performance information for each vehicle including the following:

(a) the numerator_g, denominator_g, and in-use performance ratio ($IUPR_g$) for each group of monitors;

(b) the general denominator, the value of the ignition cycle counter, the total engine running hours.

6.4. The results of the in-use performance statistics including the following:

(a) the average value $\overline{IUPR_g}$ of the $IUPR_g$ values of the sample;

(b) the number and the percentage of engines in the sample that have an $IUPR_g$ equal to or above $IUPR_m$(min).

Appendix 6

Model of an OBD in-use performance compliance statement

(Name of manufacturer) attests that the engines within this OBD engine family have been so designed and manufactured as to comply with all requirements of Section 6.1 and 6.2 of Annex X to Regulation (EU) No 582/2011.

(Name of manufacturer) makes this statement in good faith, after having performed an appropriate engineering evaluation of the OBD in-use performance of the engines within the OBD engine family over the applicable range of operating and ambient conditions.

[date]

(**1**) The failure classification rules are specified in Annex 9B to UN/ECE Regulation No 49.

(**2**) This Section is subject to review after the end of the phase-in period specified in Article 4(7).

Status:
Point in time view as at 03/02/2012.

Changes to legislation:
There are outstanding changes not yet made to Commission Regulation (EU) No 582/2011. Any changes that have already been made to the legislation appear in the content and are referenced with annotations.