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## I

(Information)

## COUNCIL

## COMMON POSITION (EC) No 39/97

adopted by the Council on 7 October 1997

with a view to adopting directive 97/.../EC of the European Parliament and of the Council of  
... relating to the quality of petrol and diesel fuels and amending Council Directive  
93/12/EEC

(97/C 351/01)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF  
THE EUROPEAN UNION,

Having regard to the Treaty establishing the European  
Community, and in particular Article 100a thereof,

Having regard to the proposal from the Commission <sup>(1)</sup>,

Having regard to the opinion of the Economic and Social  
Committee <sup>(2)</sup>,

Acting in accordance with the procedure laid down in  
Article 189b of the Treaty <sup>(3)</sup>,

(1) Whereas disparity between the laws or  
administrative measures adopted by the Member  
States on specifications of conventional and  
alternative fuels used by vehicles equipped with  
positive-ignition and compression-ignition engines  
creates barriers to trade in the Community and  
may thereby directly affect the establishment and  
functioning of the internal market and the  
international competitiveness of the European  
vehicle and refining industries; whereas in

accordance with the provisions of Article 3b of the  
Treaty, it therefore appears necessary to  
approximate the laws in this field;

(2) Whereas Article 100a (3) of the Treaty envisages  
that Commission proposals aimed at the  
establishment and functioning of the internal  
market and concerning, *inter alia*, health and  
environmental protection will take as a base a high  
level of protection;

(3) Whereas primary air pollutants such as nitrogen  
oxides, unburnt hydrocarbons, particulate matter,  
carbon monoxide, benzenes and other toxic  
exhaust emissions which contribute to the  
formation of secondary pollutants such as ozone  
are emitted in significant amounts through the  
exhaust and evaporative fumes of motor vehicles  
thereby posing directly and indirectly a  
considerable risk to human health and the  
environment;

(4) Whereas despite the increasing stringency of  
vehicle emission limit values laid down by Council  
Directives 70/220/EEC <sup>(4)</sup> and 88/77/EEC <sup>(5)</sup>,

<sup>(1)</sup> OJ C 77, 11. 3. 1997, p. 1, and OJ C 209, 10. 7. 1997, p.  
25.

<sup>(2)</sup> OJ C 206, 7. 7. 1997, p. 113.

<sup>(3)</sup> Opinion of the European Parliament of 10 April 1997 (OJ  
C 132, 28. 4. 1997, p. 170), Council common position of  
7 October 1997 and Decision of the European Parliament of  
...

<sup>(4)</sup> OJ L 76, 6. 4. 1970, p. 1. Directive as last amended by  
Directive 97/.../EC of the European Parliament and of the  
Council (see page ... of this Official Journal).

<sup>(5)</sup> OJ L 36, 9. 2. 1988, p. 33. Directive as last amended by  
Directive 96/1/EC of the European Parliament and of the  
Council (OJ L 40, 17. 2. 1996, p. 1).

- further measures to reduce atmospheric pollution caused by vehicles and other sources are necessary in order to achieve satisfactory air quality;
- (5) Whereas Article 4 of Directive 94/12/EC of the European Parliament and of the Council <sup>(1)</sup> introduced a new approach with regard to emission reduction policies for and beyond the year 2000 and required the Commission to examine *inter alia* the contribution that improvements in the quality of petrol and diesel and other fuels could make to reducing air pollution;
- (6) Whereas the European Auto/Oil Programme, the details of which are outlined in the Commission's communication on a future strategy for the control of atmospheric emissions from road transport, contributes towards a scientific, technical and economic basis for recommending the introduction at Community level of new environmental fuel specifications for petrol and diesel fuels;
- (7) Whereas the introduction of environmental fuels specifications for petrol and diesel fuels is an important element of the cost-effective package of European-wide and national/regional/local measures that should be put into effect;
- (8) Whereas the implementation of a combination of European-wide and national/regional/local measures to reduce vehicle emissions is part of the Commission's overall strategy to reduce air emissions from mobile and stationary sources in a cost-effective and balanced way;
- (9) Whereas it is necessary to obtain in the short term a reduction, in particular in urban areas, of polluting vehicle emissions, including primary pollutants such as unburnt hydrocarbons and carbon monoxide, secondary pollutants such as ozone, toxic emissions such as benzene and particle emissions;
- (10) Whereas this Directive should apply without prejudice to Council Directive 92/81/EEC of 19 October 1992 on the harmonization of the structures of excise duties on mineral oils <sup>(2)</sup>, and in particular Article 8 (4) thereof;
- (11) Whereas fuel specifications aiming at the reduction of both exhaust and evaporative emissions are generally lacking;
- (12) Whereas atmospheric pollution by lead arising from the combustion of leaded petrol constitutes a risk for human health and the environment and whereas therefore it is appropriate to ban the marketing of leaded petrol;
- (13) Whereas the need for vehicle emission reduction and the availability of the necessary refinery technology justify the setting of environmental fuel specifications for the marketing as from 1 January 2000 of unleaded petrol and diesel fuels;
- (14) Whereas, in order to protect human health and/or the environment in specific agglomerations or in specific ecologically sensitive areas with special problems of air quality, Member States should be permitted, subject to a procedure established in this Directive, to require that fuels may be marketed only if they comply with more stringent environmental specifications than established under this Directive; whereas this procedure is a derogation from the information procedure laid down in Council Directive 83/189/EEG in the field of technical standards and regulations <sup>(3)</sup>;
- (15) Whereas, in order to ensure compliance with the fuel quality standards required under this Directive, Member States should introduce monitoring systems, and whereas information on fuel quality collected by Member States should be communicated to the Commission according to a common format;
- (16) Whereas, on the basis of a comprehensive assessment, the Commission is to submit a proposal setting down *inter alia* environmental specifications for petrol and diesel fuels to be applied as from 1 January 2005; whereas this proposal is to confirm, modify and complement the indicative specifications set down in this Directive; whereas the Commission's proposal may, as appropriate, also set down environmental specifications for other types of fuel such as liquid petroleum gas, natural gas and biofuels;

<sup>(1)</sup> OJ L 100, 19. 4. 1994, p. 42.

<sup>(2)</sup> OJ L 316, 31. 10. 1992, p. 12. Directive as last amended by Directive 94/74/EC (OJ L 365, 31. 12. 1994, p. 46).

<sup>(3)</sup> OJ L 109, 26. 4. 1983, p. 8. Directive as last amended by Commission Decision 96/139/EC (OJ L 32, 30. 2. 1996, p. 31).

(17) Whereas further developments with regard to reference methods for measuring the specifications set out in this Directive may be desirable in the light of scientific and technical progress; whereas to this end, provision should be made in order to adapt the Annexes to this Directive to technical progress;

(18) Whereas Council Directive 85/210/EEC of 20 March 1985 on the approximation of the laws of the Member States concerning the lead content of petrol<sup>(1)</sup>, Council Directive 85/536/EEC of 5 December 1985 relating to crude-oil savings through the use of substitute fuel components in petrol<sup>(2)</sup>, and Article 1 (1) (b) and Article 2 (1) of Council Directive 93/12/EEC of 23 March 1993 relating to the sulphur content of certain liquid fuels<sup>(3)</sup>, should be repealed accordingly;

(19) Whereas the transitional measures for Austria referred to in Article 69 of the 1994 Act of Accession include Article 7 of Directive 85/210/EEC; whereas the application of this transitional measure should, for specific reasons of the protection of the environment, be prolonged until 1 January 2000,

HAVE ADOPTED THIS DIRECTIVE:

#### Article 1

##### Scope

This Directive sets technical specifications on health and environmental grounds for fuels to be used for vehicles equipped with positive-ignition and compression-ignition engines.

#### Article 2

##### Definitions

For the purpose of this Directive:

1. 'petrol' means any volatile mineral oil intended for the operation of internal combustion positive-ignition engines for the propulsion of vehicles and falling within CN codes 2710 00 27, 2710 00 29, 2710 00 32, 2710 00 34 of 2710 00 36;

2. 'diesel fuels' means gas oils falling within CN code 2710 00 66 and used for self-propelling vehicles as referred to in Directive 70/220/EEC and Directive 88/77/EEC.

For gas oils used for engines in non-road mobile machinery and agricultural tractors Member States may require the same sulphur content as defined for diesel fuels in this Directive or the sulphur content as defined for diesel fuels in Directive 93/12/EEC.

#### Article 3

##### Petrol

1. No later than 1 January 2000, Member States shall prohibit the marketing of leaded petrol within their territory.

2. Member States shall ensure that, no later than 1 January 2000, unleaded petrol can be marketed within their territory only if it complies with the environmental specifications set out in Annex I.

3. By way of derogation from paragraph 1, a Member State may be allowed, upon a request to be submitted to the Commission no later than 31 August 1998<sup>(\*)</sup>, to continue to permit the marketing of leaded petrol, until at the latest 1 January 2005, if it can demonstrate that the introduction of a ban would result in severe socio-economic problems or would not lead to overall environmental or health benefits because of *inter alia* the climatic situation in that Member State.

The lead content of leaded petrol shall not exceed 0,15 g/l and the benzene content shall comply with the specifications in Annex I. The other values of the specifications may remain unchanged compared to the present situation.

4. By way of derogation from paragraph 2, a Member State may be allowed, upon a request to be submitted to the Commission no later than 31 August 1998<sup>(\*)</sup>, to continue to permit the marketing, until at the latest 1 January 2003, of unleaded petrol with a sulphur content which does not comply with Annex I but which does not exceed the current content, if it can demonstrate that the introduction of the sulphur specification as set out in Annex I would result in severe socio-economic problems.

5. The Commission may authorize the derogations referred to in paragraphs 3 and 4.

The Commission shall notify the Member States and inform the Council of its decision.

<sup>(1)</sup> OJ L 96, 3. 4. 1985, p. 25. Directive as last amended by the 1994 Act of Accession.

<sup>(2)</sup> OJ L 334, 12. 12. 1985, p. 20. Directive as last amended by Directive 97/441/EC (OJ L 238, 21. 8. 1987, p. 40).

<sup>(3)</sup> OJ L 74, 27. 3. 1993, p. 81.

<sup>(\*)</sup> Deadline to be checked in the light of date of adoption of this Directive.

6. Notwithstanding paragraph 1, Member States may continue to permit the marketing of small quantities of leaded petrol with the specifications mentioned in the second subparagraph of paragraph 3 to a maximum of 0,5 % of total sales to be used by old vehicles of a characteristic nature and to be distributed through special interest groups.

#### *Article 4*

##### **Diesel fuel**

Member States shall ensure that, no later than 1 January 2000, diesel fuel can be marketed within their territory only if it complies with the environmental specifications set out in Annex II.

#### *Article 5*

##### **Free circulation**

No Member States may prohibit, restrict or prevent the placing on the market of fuels which comply with the requirements of this Directive as from 1 January 2000.

#### *Article 6*

##### **Marketing of fuels with more stringent environmental specifications**

1. By way of derogation from Articles 3, 4 and 5, Member States may require that in specific areas fuels may only be marketed if they comply with more stringent environmental specifications than those set out in Annexes I and II for all or part of the vehicle fleet with a view to protecting the health of the population in a specific agglomeration or the environment in a specific ecologically sensitive area in a Member State, if atmospheric pollution constitutes or may reasonably be expected to constitute a serious and recurrent problem for human health or the environment.

2. A Member State wishing to make use of a derogation provided for in paragraph 1 shall submit its request in advance, including the justification for it, to the Commission. The justification shall include evidence that the derogation respects the principle of proportionality and that it will not disrupt the free movements of persons and goods.

3. The Member State involved shall provide the Commission with data on ambient air quality for the area in question as well as the predicted effects on air quality of the measures proposed.

4. The Commission shall provide this information to the other Member States without delay.

5. Member States may give their comments on the request and its justification within two months of the date of the Commission's provision of information.

6. The Commission shall take a decision on the request of Member States within three months after the date on which Member States have submitted their comments. The Commission will take these comments into account and will notify the Member States and inform the Council at the same time.

7. Any Member States may refer the Commission's decision to the Council within one month of its notification or, in the case of a non-decision, refer the matter to the Council within one month of the expiry of the period referred to in paragraph 6.

8. The Council, acting by a qualified majority, may take a different decision within two months of the matter being referred to it.

#### *Article 7*

##### **Change in supply of crude oils**

If, as a result of exceptional events, a sudden change in the supply of crude oils or petroleum products renders it difficult for the refineries in a Member State to respect the fuel specification requirements of Articles 3 and 4, that Member State shall inform the Commission thereof. The Commission, after informing the other Member States, may authorize higher limit values in that Member State for one or more fuel components for a period not exceeding six months.

The Commission shall notify the Member States and inform the Council of its decision.

Any Member State may refer the Commission's decision to the Council within one month of its notification.

The Council, acting by a qualified majority, may take a different decision within one month of the matter being referred to it.

#### *Article 8*

##### **Monitoring compliance and reporting**

1. Member States shall monitor compliance with the requirements of Articles 3 and 4 on the basis of the analytical methods set out in Annex I and II.

2. The Commission will promote the development of a uniform system for fuel quality monitoring. The Commission may for the purpose of developing such a system request the assistance of the European Committee for Standardization.

3. The Commission shall establish a common format for the submission of a summary of national fuel quality data no later than 30 June 2000.

4. Each year by 30 June Member States shall submit their summary for the preceding calendar year to the Commission for the first time by 30 June 2002.

#### *Article 9*

##### **Review process**

1. The Commission shall, periodically and for the first time not later than 12 months from the date of adoption of this Directive but in any event not later than 30 June 1999, and in the light of the assessment carried out in accordance with the requirements of Article 3 of Directive 97/.../EC of the European Parliament and of the Council of ... relating to measures to be taken against air pollution by emissions from motor vehicles and amending Council Directive 70/220/EEC <sup>(1)</sup>, submit to the European Parliament and the Council a proposal for a revision of this Directive as an integral part of the strategy designed to produce effects to meet the requirements of the Community air quality standards and related objectives at least cost.

2. The proposal shall contain the environmental specifications required for petrol which is marketed from 1 January 2005, confirming or modifying and complementing the indicative specifications stipulated in Annex III.

3. The proposal shall also contain environmental specifications for diesel fuel of a quality compatible with the effective functioning of new pollution abatement technologies the marketing of which will be ensured from 1 January 2005, confirming or modifying and complementing the indicative specifications stipulated in Annex IV. The proposal shall also allow for a gradual increase in the availability and a balanced distribution throughout the territory of the Member States of such diesel fuel and contain a date on which only such diesel fuel can be marketed.

4. The proposal shall, as appropriate, also contain environmental specifications for liquid petroleum gas, natural gas and biofuels.

#### *Article 10*

##### **Procedure for adaptation to technical progress**

Any amendments which are necessary in order to adapt the measuring methods as laid down in Annexes I and II

to this Directive, to take account of technical progress, shall be adopted by the Commission assisted by the Committee established in accordance with Article 12 of Directive 96/62/EC <sup>(2)</sup> and in accordance with the procedure laid down in Article 11 of this Directive.

Such adaptation must not result in any direct or indirect modification of the limit values laid down in this Directive.

#### *Article 11*

##### **Committee procedure**

1. The representative of the Commission shall submit to the committee referred to in Article 10 a draft of the measures to be taken. The committee shall deliver its opinion on the draft within a time limit which the chairman may lay down according to the urgency of the matter. The opinion shall be delivered by the majority laid down in Article 148 (2) of the Treaty in the case of decisions which the Council is required to adopt on a proposal from the Commission. The votes of the representatives of the Member States within the committee shall be weighted in the manner set out in that Article. The chairman shall not vote.

2. The Commission shall adopt the measures envisaged if they are in accordance with the opinion of the committee.

If the measures envisaged are not in accordance with the opinion of the committee, or if no opinion is delivered, the Commission shall, without delay, submit to the Council a proposal relating to the measures to be taken. The Council shall act by a qualified majority.

If, on the expiry of three months from the date of referral to the Council, the Council has not acted, the proposed measures shall be adopted by the Commission, save where the Council has decided against the said measures by a simple majority.

#### *Article 12*

##### **Repeal and amendment of the directives related to the fuel quality of petrol and diesel fuels**

1. Directives 85/210/EEC, 85/536/EEC and 87/441/EEC are hereby repealed as from 1 January 2000.

2. Directive 93/12/EEC is hereby amended by deleting Article 1 (1) (b) and Article 2 (1) as from 1 January 2000.

<sup>(1)</sup> See page 13 of this Official Journal.

<sup>(2)</sup> OJ L 296, 21. 11. 1996, p. 55.

*Article 13***Transposition into national legislation**

1. Member States shall adopt and publish the laws, regulations and administrative provisions necessary to comply with this Directive not later than 1 July 1999. They shall immediately inform the Commission thereof.

Member States shall apply these measures from 1 January 2000.

When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such reference shall be laid down by Member States.

2. Member States shall communicate to the Commission the texts of the main provisions of domestic law which they adopt in the field covered by this Directive.

*Article 14***Austria**

Article 7 of the Directive 85/210/EEC, as far as the benzene content of petrol referred to in Article 4 of that Directive is concerned, shall, until 1 January 2000, not apply to Austria.

*Article 15***Entry into force of the Directive**

This Directive shall enter into force on the date of its publication in the *Official Journal of the European Communities*.

*Article 16***Addressees**

This Directive is addressed to the Member States.

Done at Brussels, ...

*For the European Parliament*

*The President*

*For the Council*

*The President*

## ANNEX I

ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR VEHICLES  
EQUIPPED WITH POSITIVE-IGNITION ENGINES

## Type: Petrol

Parameter	Unit	Limits <sup>(1)</sup>		Test	
		Minimum	Maximum	Method	Date of publication
Research octane number		95	—	EN 25164	1993
Motor octane number		85	—	EN 25163	1993
Reid vapour pressure, summer period <sup>(2)</sup>	kPa	—	60,0	EN 12	1993
Distillation: evaporated at 100 °C	% v/v	46,0	—	EN-ISO 3405	1988
evaporated at 150 °C	% v/v	75,0	—		
Hydrocarbon analysis:					
— olefins	% v/v	—	18,0 <sup>(3)</sup>	ASTM D1319	1995
— aromatics		—	42,0	ASTM D1319	1995
— benzene		—	1,0	pr. EN 12177	1995 (*)
Oxygen content	% m/m	—	2,3	EN 1601	1996
Oxygenates:					
— Methanol, stabilizing agents must be added	% v/v	—	3	EN 1601	1996
— Ethanol, stabilizing agents may be necessary	% v/v	—	5	EN 1601	1996
— Iso-propyl alcohol	% v/v	—	10	EN 1601	1996
— Tert-butyl alcohol	% v/v	—	7	EN 1601	1996
— Iso-butyl alcohol	% v/v	—	10	EN 1601	1996
— Ethers containing 5 or more carbon atoms per molecule	% v/v	—	15	EN 1601	1996
Other oxygenates <sup>(4)</sup>	% v/v	—	10	EN 1601	1996
Sulphur content	mg/kg	—	150	pr.EN-ISO/ DIS 14596	1996 (*)
Lead content	g/l	—	0,005	EN 237	1996

(\*) The month of publication will be completed in due course.

<sup>(1)</sup> The values quoted in the specification are 'true values'. In the establishment of their limit values the terms of ISO 4259 'Petroleum products — Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

<sup>(2)</sup> The summer period shall begin no later than 1 May and shall not end before 30 September. For Member States with arctic conditions the summer period shall begin no later than 1 June and not end before 31 August and the RVP is limited to 70 kPa.

<sup>(3)</sup> Except for unleaded petrol regular (minimum motor octane number (MON) of 81 and a minimum research octane number (RON) of 91) for which the maximum olefin content shall be 21 % v/v. These limits shall not preclude the introduction on to the market of a Member State of another unleaded petrol with lower octane numbers than set out in this Annex.

<sup>(4)</sup> Other mono-alcohols with a final distillation point no higher than the final distillation point laid down in national specifications or, where these do not exist, in industrial specifications for motor fuels, and methyl tertiary butyl ether (MTBE tert-butoximethane) and tertiary amyl-methyl ether (TAME 2-methoxy-2-methyl butane), ethyl tertiary butyl ether (ETBE 2-ethoxy-2-methyl propane) and other ethers (R<sub>1</sub>-O-R<sub>2</sub>) with a final distillation point no higher than the final distillation point laid down in national specifications or, where these do not exist, in industrial specifications for motor fuels.



## ANNEX II

ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR VEHICLES  
EQUIPPED WITH COMPRESSION IGNITION ENGINES*Type:* Diesel fuel

Parameter	Unit	Limits <sup>(1)</sup>		Test	
		Minimum	Maximum	Method	Date of publication
Cetane number		51,0	—	EN-ISO 5165	1992
Density at 15 °C	kg/m <sup>3</sup>	—	845	EN-ISO 3675	1995
Distillation: 95 % point	°C	—	360	EN-ISO 3405	1988
Polycyclic aromatic hydrocarbons	% m/m	—	11	IP 391	1995
Sulphur content	mg/kg	—	350	pr. EN-ISO/ DIS 14596	1996 (*)

(\*) The month of publication will be completed in due course.

<sup>(1)</sup> The values quoted in the specification are 'true values'. In the establishment of their limit values the terms of ISO 4259 'Petroleum products — Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

## ANNEX III

INDICATIVE ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR  
VEHICLES EQUIPPED WITH POSITIVE IGNITION ENGINES

Type: Petrol

Parameter	Unit	Limits <sup>(1)</sup>		Test	
		Minimum	Maximum	Method	Date of publication
Research octane number		95		EN 25164	1993
Motor octane number		85		EN 25163	1993
Reid vapour pressure, summer period	kPa	—			
Distillation:	% v/v		—		
evaporated at 100 °C		—	—		
evaporated at 150 °C					
Hydrocarbon analysis:					
— olefins	% v/v	—			
— aromatic	% v/v	—	35,0	ASTM D1319	1995
— benzene	% v/v	—			
Oxygen content	% m/m	—			
Sulphur content	mg/kg	—	50	pr. EN-ISO/ DIS 14596	1996 (*)
Lead content	g/l	—			

(\*) The month of publication will be completed in due course.

<sup>(1)</sup> The values quoted in the specification are 'true values'. In the establishment of their limit values the terms of ISO 4259 'Petroleum products — Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

## ANNEX IV

INDICATIVE ENVIRONMENTAL SPECIFICATIONS FOR MARKET FUELS TO BE USED FOR  
VEHICLES EQUIPPED WITH COMPRESSION IGNITION ENGINES*Type: Diesel fuel*

Parameter	Unit	Limits <sup>(1)</sup>		Test	
		Minimum	Maximum	Method	Date of publication
Cetane number			—		
Density at 15 °C	kg/m <sup>3</sup>		—		
Distillation: 95 % point	°C	—			
Polycyclic aromatic hydrocarbons	% m/m	—			
Sulphur content	mg/kg	—	50	pr. EN-ISO/ DIS 14596	1996 (*)

(\*) The month of publication will be completed in due course.

(1) The values quoted in the specification are 'true values'. In the establishment of their limit values the terms of ISO 4259 'Petroleum products — Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account (R = reproducibility). The results of individual measurements shall be interpreted on the basis of the criteria described in ISO 4259 (published in 1995).

## STATEMENT OF THE COUNCIL'S REASONS

## I. INTRODUCTION

1. On 29 August 1996, the Commission forwarded its proposal, based on Article 100 a, to the Council.
2. The European Parliament gave its opinion on 10 April 1997, the Economic and Social Committee on 24 April 1997.

The Commission forwarded its amended proposal to the Council on 3 June 1997.

3. On 7 October 1997, the Council adopted its common position in accordance with Article 189b of the Treaty.

## II. OBJECTIVE

4. The purpose of the Commission proposal, which forms part of an overall strategy for the control of atmospheric emissions from road transport in accordance with Article 4 of Directive 94/12/EC and which takes into account the results of the Auto-oil Programme, is to further improve the quality of petrol and diesel fuels. The proposal is designed to combine European-wide and national/regional/local measures with the aim to contribute to the reduction of vehicle emissions in a cost-effective and balanced way.

## III. ANALYSIS OF THE COMMON POSITION

## 5. GENERAL COMMENT

The common position deviates from the Commission proposal in a number of issues in order, on the one hand, to provide for a higher quality of fuels and to give industry a clear indication for the longer term, and, on the other hand, to take better account of specific national situations.

## 6. SPECIFIC COMMENTS

The Council changed as follows the Commission amended proposal:

*(a) Definitions (Article 2)*

Diesel fuels for non-road mobile machinery and agricultural tractors are not covered, they will be dealt with, in accordance with Article 3, second paragraph, ninth indent of the common position on vehicle emissions, in the future Commission proposal to be presented no later than 30 June 1999.

Subparagraph 2 of paragraph 2 allows Member States to require for such machinery and tractors that diesel fuel meet the sulphur specifications as defined in this directive or in Council directive 93/12/EEC, until new Community legislation has been adopted in this area.

*(b) Derogations (Article 3)**(i) Leaded petrol*

The Council chose a more differentiated approach as follows (paragraphs 3, 5 and 6):

- an extended deadline for the derogation from the definitive ban, i.e. until 1. 1. 2005,
- an additional condition for a derogation, i.e. the criterion of overall environmental benefits in the context of, *inter alia*, different climatic situations,

- a specific provision on specifications for leaded petrol in order to ensure a higher quality of such petrol,
- a permission Member States may grant as regards the marketing of small quantities of leaded petrol to be used *inter alia* by vintage cars.

(ii) Sulphur content of unleaded petrol

The Council (paragraphs 4 and 5) took account of the difficulties of some Member States and provided for a derogation until 1 January 2003. This derogation allowed to reach the compromise on 150 mg/kg for the sulphur content of unleaded petrol (see also (c) below).

(c) *Compulsory specifications for petrol and diesel as from 1 January 2000 (Annex I and II)*

Petrol

The Council reduced the benzene content from 2 to 1 % v/v and the sulphur content from 200 to 150 mg/kg. The specification for aromatics was reduced from 45 to 42 % v/v.

This solution on the specifications for sulphur and aromatics is to be assessed in the light of the indicative specifications.

(d) *Indicative specifications (Annex III and IV and Article 9)*

The Council felt that, in parallel with the Vehicle Emissions Directive, industry should have a clear indication of the specifications it will have to comply with in the longer term and established therefore indicative environmental specifications as from 1 January 2005, which, in accordance with Article 9 on the review process, would be confirmed, modified or complemented by a Commission proposal, which would be presented no later than 30 June 1999.

These specifications are essentially 50 mg/kg for sulphur in petrol and diesel and 35 % v/v for aromatics in petrol.

(e) *Fuels with more stringent environmental specifications (Article 6)*

The Council adapted a slightly more precise text in:

- referring to the health of the population in a specific agglomeration and the environment in a specific ecologically sensitive area in a Member State, and
- adopting slightly the specific procedure in this case. In the recitals it clarified the relation of the procedure in this Article with the information procedure in Council Directive 83/189/EEC.

(f) *Monitoring compliance and reporting (Article 8)*

The Council adopted a simpler text with a deadline for the establishment of a common format by the Commission.

(g) *Review process (Article 9)*

The Council adapted this Article to the introduction of indicative specifications (see (d) above) and referred to a gradual increase in the availability and a balanced distribution of diesel fuel.

The Council covered the situation of captive fleets in Article 6 (1) ('all or part of the vehicle fleet').

(h) *Committee procedure (Article 11)*

The Council chose the type IIIB procedure.

(i) *Transitional measure for Austria (Article 14)*

In the interest of environment protection, the Council agreed to allow Austria to keep its benzene value also for the year 1999 when the transitional measures referred to in the Act of Accession will expire and the benzene specification under Directive 85/210/EEC (5 % of benzene) would otherwise have applied until 1 January 2000.

## COMMON POSITION (EC) No 40/97

adopted by the council on 7 october 1997

with a view to adopting Directive 97/.../EC of the European Parliament and of the Council relating to measures to be taken against air pollution by emissions from motor vehicles and amending Council Directive 70/220/EEC

(97/C 351/02)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF  
THE EUROPEAN UNION,

Having regard to the Treaty establishing the European  
Community, and in particular Article 100a thereof,

Having regard to the proposal from the Commission <sup>(1)</sup>,

Having regard to the Opinion of the Economic and Social  
Committee <sup>(2)</sup>,

Acting in accordance with the procedure laid down in  
Article 189b of the Treaty <sup>(3)</sup>,

- (1) Whereas measures should be adopted within the framework of the internal market;
- (2) Whereas the first programme of action of the European Community on protection of the environment <sup>(4)</sup>, approved by the Council on 22 November 1973, called for account to be taken of the latest scientific advances in combating atmospheric pollution caused by gases emitted from motor vehicles and for Directives adopted previously to be amended accordingly; whereas the fifth programme of action, which in its general approach was approved by the Council in its Resolution of 1 February 1993 <sup>(5)</sup>, provided for additional efforts to be made for a considerable reduction in the present level of emissions of pollutants from motor vehicles; whereas this fifth programme also set targets in terms of emission reductions for various pollutants on the understanding that emissions from both mobile and stationary sources would have to be reduced;

- (3) Whereas Council Directive 70/220/EEC <sup>(6)</sup> lays down the limit values for carbon monoxide and unburnt hydrocarbon emissions from the engines of such vehicles; whereas these limit values were first reduced by Council Directive 74/290/EEC <sup>(7)</sup> and supplemented, in accordance with Commission Directive 77/102/EEC <sup>(8)</sup>, by limit values for permissible emissions of nitrogen oxides; whereas the limit values for these three types of pollution were successively reduced by Commission Directive 78/665/EEC <sup>(9)</sup> and Council Directives 83/351/EEC <sup>(10)</sup> and 88/76/EEC <sup>(11)</sup>; whereas limit values for particulate pollutant emissions from diesel engines were introduced by Council Directive 88/436/EEC <sup>(12)</sup>; whereas more stringent European standards for the emissions of gaseous pollutants from motor vehicles below 1 400 cm<sup>3</sup> were introduced by Council Directive 89/458/EEC <sup>(13)</sup>; whereas these standards have been extended to all passenger cars independently of their engine capacity on the basis of an improved European test procedure comprising an extra-urban driving cycle; whereas requirements relating to evaporative emissions and to the durability of emission-related vehicle components as well as more stringent particulate pollutant standards for motor vehicles equipped with diesel engines were introduced by Council Directive 91/441/EEC <sup>(14)</sup>; whereas Directive 94/12/EC of the European Parliament and of the Council <sup>(15)</sup> introduced more stringent limit values for all pollutants and a new method for checking on the conformity of production; whereas passenger cars designed to carry more than six passengers and having a maximum mass of more than 2 500 kg, light commercial vehicles, and off-road vehicles, covered by Directive 70/220/EEC, which previously benefited from less stringent standards, have since been subject, pursuant to Council Directive

<sup>(1)</sup> OJ C 77, 11. 3. 1997, p. 8.

<sup>(2)</sup> OJ C 206, 7. 7. 1997, p. 113.

<sup>(3)</sup> Opinion of the European Parliament of 10 April 1997 (OJ C 132, 28. 4. 1997, p. 205), Common Position of the Council of 7 October 1997 and Decision of the European Parliament of ...

<sup>(4)</sup> OJ C 112, 20. 12. 1973, p. 1.

<sup>(5)</sup> OJ C 138, 17. 5. 1993, p. 1.

<sup>(6)</sup> OJ L 76, 6. 4. 1970, p. 1. Directive as last amended by Directive 96/69 of the European Parliament and of the Council (OJ L 282, 1. 11. 1996, p. 64).

<sup>(7)</sup> OJ L 159, 15. 6. 1974, p. 61.

<sup>(8)</sup> OJ L 32, 3. 2. 1977, p. 32.

<sup>(9)</sup> OJ L 223, 14. 8. 1978, p. 48.

<sup>(10)</sup> OJ L 197, 20. 7. 1983, p. 1.

<sup>(11)</sup> OJ L 36, 9. 2. 1988, p. 1.

<sup>(12)</sup> OJ L 214, 6. 8. 1988, p. 1.

<sup>(13)</sup> OJ L 226, 3. 8. 1989, p. 1.

<sup>(14)</sup> OJ L 242, 30. 8. 1991, p. 1.

<sup>(15)</sup> OJ L 100, 19. 4. 1994, p. 42.

93/59/EEC<sup>(1)</sup> and Directive 96/69/EC of the European Parliament and of the Council<sup>(2)</sup>, to standards as stringent as the respective standards for passenger cars, taking into account the specific conditions of these vehicles;

- (4) Whereas Article 4 of Directive 94/12/EC requires that the Commission propose standards which will be enforced after the year 2000, according to a new multi-faceted approach, based on a comprehensive assessment of costs and efficiency of all measures aimed at reducing road transport pollution; whereas the proposal should, besides the tightening of car emission standards, include complementary measures such as an improvement in fuel quality and a strengthening of the motor-vehicle inspection and maintenance programme; whereas the proposal should be based on the establishment of air quality criteria and associated emission reduction objectives and an evaluation of the cost-effectiveness of each package of measures, taking into account the potential contribution of other measures such as traffic management, enhancement of urban public transport, new propulsion technologies, or the use of alternative fuels;
- (5) Whereas, in order to help resolve the problem of atmospheric pollution, it is necessary to step in with a global strategy, encompassing the technological, management and tax aspects, for the development of sustainable mobility, taking into account the specific characteristics of the various European urban areas;
- (6) Whereas the Commission has implemented a European programme on air quality, road traffic emissions, fuels and engines technologies (the Auto/Oil Programme) with a view to fulfilling the requirements of Article 4 of Directive 94/12/EC; whereas the European motor vehicle and oil industries have carried out the European Programme on Emissions, Fuels and Engine Technologies (EPEFE) to determine the contribution which can be made both by future vehicles and the fuels which propel them; whereas the Auto/Oil and EPEFE programmes strive to ensure that proposals for Directives on polluting emissions seek the best solutions for both the citizen and for the economy; whereas a cost-effectiveness study within the Auto/Oil Programme has shown that a further improvement

of car emission technology is necessary with a view to achieving air quality in the year 2010 as described in the Commission communication on the Auto/Oil Programme;

- (7) Whereas the improvement of requirements for new passenger cars in Directive 70/220/EEC constitutes part of a consistent global Community strategy which will also include a revision of standards for light commercial vehicles and heavy duty vehicles from the year 2000, an improvement of motor fuels and more accurate assessment of in-service vehicle emission performance; whereas alongside these measures, additional cost-effective local measures will nevertheless be needed to achieve the air-quality criteria in the most polluting areas;
- (8) Whereas Directive 70/222/EEC is one of the separate Directives under the type-approval procedure laid down by Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers<sup>(3)</sup>; whereas the objective of reducing the level of pollutant emissions from motor vehicles cannot be sufficiently achieved by individual Member States and can therefore be better achieved by the approximation of the laws of the Member States relating to measures to be taken against air pollution by motor vehicles;
- (9) Whereas reductions of the Type I test limits applicable from the year 2000 (corresponding to a drop of 40 % in nitrogen oxides, 40 % in total hydrocarbons, 30 % in carbon monoxide for petrol-driven passenger cars, 20 % in nitrogen oxides, 20 % in the combined value for hydrocarbons plus nitrogen oxides, 40 % in carbon monoxide, 35 % in particulates for indirect injection diesel passenger cars and 40 % in nitrogen oxides, 40 % in the combined value for hydrocarbons plus nitrogen oxides, 40 % in carbon monoxide and 50 % in particulates) have, for direct-injection diesel passenger cars, been identified as key measures to achieve sufficient medium-term air quality; whereas these reductions have been applied to hydrocarbons and nitrogen oxides on the assumption that nitrogen oxides represent respectively 45 % and 80 % of the weight of the combined value measured for petrol/diesel passenger cars complying with Directive 94/12/EC; whereas separate limit values are now normally fixed for petrol-driven vehicles

<sup>(1)</sup> OJ L 186, 28. 7. 1993, p. 21.

<sup>(2)</sup> OJ L 282, 1. 11. 1996, p. 64.

<sup>(3)</sup> OJ L 42, 23. 2. 1970, p. 1. Directive as last amended by Directive 96/27/EC of the European Parliament and of the Council (OJ L 169, 8. 7. 1996, p. 1).

in order to monitor the emissions of both pollutants; whereas a combined limit value is maintained for diesel vehicles for which the Stage 2000 standards are the most demanding, with a view to facilitating engineering of future engines; whereas these reductions will take into account the effect on real emissions of a modification also adopted for the test cycle with a view to better representing emissions after a cold start ('deletion of 40 s');

evolution of the market fuel specifications to be available following legislation on the quality of petrol and diesel fuels;

- (10) Whereas new provisions for on-board diagnostics (OBD) should be introduced with a view to permitting an immediate detection of failure of anti-pollution vehicle equipment and thus allowing a significant upgrading of the maintenance of initial emissions performance on in-service vehicles through periodic or kerbside control; whereas, however, OBD are at a less developed stage for diesel vehicles and cannot be fitted on all such vehicles before 2005; whereas the Commission should take appropriate measures to ensure that the market for replacement emission-system parts is not closed or restricted by the introduction of OBD, provided such replacement parts are compatible with the effective operation of the OBD system;
- (11) Whereas the Type IV test which makes it possible to determine the evaporative emissions from vehicles with positive-ignition engines can be improved to better represent real evaporative emissions as well as the status of measuring techniques;
- (12) Whereas to adapt the behaviour of the exhaust-emission control systems of vehicles with positive-ignition engines to the actual requirements of practice, a new test should be introduced to measure emissions at low temperatures;
- (13) Whereas the characteristics of the reference fuels used for emission testing should reflect the
- (14) Whereas a new method for checking conformity of production on in-service vehicles has been identified as a cost-effective accompanying measure, and is included in the emissions Directive with the objective of implementation in the year 2001;
- (15) Whereas Member States should be allowed, by means of tax incentives, to expedite the placing on the market of vehicles which satisfy the requirements adopted at Community level, such incentives having to comply with the provisions of the Treaty and satisfy certain conditions intended to avoid distortions of the internal market; whereas this Directive does not affect the Member States' right to include emissions of pollutants and other substances in the basis for calculating road traffic taxes on motor vehicles;
- (16) Whereas it is necessary to establish indicative limit values to be applied from the year 2005 which can also be used for the purpose of, *inter alia*, encouraging the early introduction of vehicles containing the most advanced anti-pollution equipment; whereas tax incentives for vehicles complying with indicative values for the year 2005 are permitted only from 1 January 2000;
- (17) Whereas these indicative limit values should be confirmed or amended by a Directive of the European Parliament and of the Council on the basis of a proposal to be made by the Commission not later than 30 June 1999; whereas the Commission will at the same time propose a Directive concerning measures to improve the quality of fuels for the year 2005; whereas both Directives should enter into force together in 2005;
- (18) Whereas Member States may take measures to encourage faster progress towards replacing existing vehicles with low-emission vehicles;
- (19) Whereas Directive 70/220/EEC should be amended accordingly,



HAVE ADOPTED THIS DIRECTIVE:

#### *Article 1*

The Annexes to Directive 70/220/EEC are hereby amended in accordance with the Annex to this Directive.

#### *Article 2*

1. Subject to the provisions of Article 6, with effect from 1 January 1998 no Member State may, on grounds relating to air pollution by emissions from motor vehicles:

- refuse to grant EC type-approval pursuant to Article 4 (1) of Directive 70/156/EEC, or
- refuse to grant national type-approval, or
- prohibit the registration, sale or entry into service of vehicles,

if the vehicles comply with the requirements of Directive 70/220/EEC, as amended by this Directive.

2. Subject to the provisions of Article 6, with effect from 1 January 2000 Member States:

- may no longer grant EC type-approval pursuant to Article 4 (1) of Directive 70/156/EEC, and
- shall refuse national type-approval,

for a new vehicle type on grounds relating to air pollution by emissions if it fails to comply with the provisions of Directive 70/220/EEC, as amended by this Directive.

For the Type I test the limit values set out in row A of the table in section 5.3.1.4 of Annex I to Directive 70/220/EEC are to be used.

3. With effect from 1 January 2001, Member States shall:

- consider certificates of conformity which accompany new vehicles pursuant to Directive 70/156/EEC as no longer valid for the purpose of Article 7 (1) of that Directive, and
- refuse the registration, sale or entry into service of new vehicles which are not accompanied by a certificate of conformity in accordance with Directive 70/156/EEC, except where the provisions of Article 8 (2) of Directive 70/156/EEC are invoked,

on grounds relating to air pollution by emissions, if the vehicles fail to comply with the provisions of Directive 70/220/EEC, as amended by this Directive.

For the Type I test the limit values set out in row A of the table in section 5.3.1.4 of Annex I to Directive 70/220/EEC are to be used.

4. With effect from 1 January 2001 Member States shall consider as no longer valid the certificates of conformity of vehicles approved in accordance with footnote 1 to the table in section 5.3.1.4 of Annex I to Directive 70/220/EEC as inserted by Directive 96/69/EC.

#### *Article 3*

The Commission shall propose to the European Parliament and to the Council a further tightening of the emission standards of vehicles falling within the scope of this Directive no later than 12 months from the date of adoption of this Directive but in any event not later than 30 June 1999. Its proposal shall be based on a revised and enhanced version of the methodology used to prepare measures for this Directive.

The strategy put forward in the proposal shall be designed to produce effects to meet the requirements of the Community air quality standards and related objectives at the least possible cost, in particular the deadlines laid down for the attainment of these objectives, for example on acidification and eutrophication. The strategy should also be consistent with the objectives laid down in the Council conclusions of 25 June 1996 on the Community strategy to reduce CO<sub>2</sub> emissions from passenger cars and improve fuel economy, and shall as far as possible take account of:

- trends in air quality towards the year 2010 and beyond,
- noxious pollutant emissions in the Community from transport and non-transport sources and an estimate of the contribution that existing and pending and potential emission reduction measures from all sources could make towards improving air quality,
- technical developments with regard to vehicle technologies as well as new propulsion technologies (e. g. electric propulsion, fuel cells) and their market potential,
- refinery technologies,
- the potential for reducing vehicle emissions by the use of alternative fuels such as natural gas (CNG), liquefied petroleum gas (LPG), dimethyl ether (DME) and biofuels, including the distribution system needed for their application,

- possible improvements in the test procedures, in particular measurement methods for particulates and consideration of extending durability provisions,
- the potential and feasibility of technical, non-technical and local measures to reduce vehicle emissions; in this context the contribution of transport and other policy measures such as traffic management, urban public transport, enhanced inspection and maintenance and vehicle scrappage schemes should be evaluated,
- the particular situation of captive fleets and the potential for emission reductions related to the use by such fleets of fuels with very stringent environmental specifications,
- the potential emission reductions to be gained from fixing the environmental specifications of fuels to be used in agricultural tractors as covered by Directive 74/150/EEC and in internal combustion engines to be installed in non-road mobile machinery as covered by Directive .../.../EC,
- the contribution that selective and differentiated fiscal measures could make to reducing vehicle emissions without any negative impact on the functioning of the internal market, taking into account the effects of revenue losses on neighbouring countries,
- the effect of any such measures on CO<sub>2</sub> emissions,
- the strategies followed by relevant third countries to improve air quality and the emission limit values and environmental fuel specifications envisaged in those strategies,
- the supply situation and qualities of crude oil available to the Community.

In developing its strategy in accordance with the elements set out above the Commission shall take into account only those measures which can reasonably be expected to be effective at or around 2010.

The proposal shall contain, *inter alia*, mandatory emission limit values to be applied from 1 January 2005 confirming or amending the indicative limit values stipulated in section 5.3.1.4, row B of Annex I to Directive 70/220/EEC, as amended by this Directive. In addition, the proposal shall establish whether the framework under which Member States can make provision for tax incentives established in Directive 70/220/EEC, as amended by this Directive, should be revised.

The proposal shall be submitted to the European Parliament and the Council at the same time as the proposal referred to in Article 9 of Directive 97/.../EC of the European Parliament and of the Council of ..... relating to the quality of petrol and diesel fuels <sup>(1)</sup>; the measures shall enter into effect at the same time as the measures included in the proposal to be submitted in accordance with Article 9 of that Directive.

#### Article 4

Suitable approval procedures for replacement parts shall be defined as soon as possible for those emission control components that are critical to the correct functioning of OBD systems and shall be adopted in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.

#### Article 5

Member States may make provision for tax incentives only in respect of motor vehicles in series production which comply with Directive 70/220/EEC, as amended by this Directive. Such incentives shall comply with the provisions of the Treaty and satisfy the following conditions:

- they shall apply to all new series-production vehicles offered for sale on the market of a Member State which comply in advance with the mandatory limit values set out in row A of the table in section 5.3.1.4 of Annex I to Directive 70/220/EEC, as amended by this Directive, and thereafter as from 1 January 2000, with the indicative limit values set out in row B of the same table,
- they shall be terminated with effect from the mandatory application of the emission limit values laid down in Article 2 (3) for new motor vehicles, or by 1 January 2005 in the case of the indicative limit values set out in row B of the table in section 5.3.1.4 of Annex I to Directive 70/220/EEC, as amended by this Directive,
- for each type of motor vehicle, they shall not exceed the additional cost of the technical solutions introduced to ensure compliance with the values set in Article 2 (3) or the indicative limit values set out in row B of the table in section 5.3.1.4 of Annex I to Directive 70/220/EEC, as amended by this Directive, and of their installation on the vehicle.

The Commission shall be informed in sufficient time of plans to institute or change the incentives referred to in the first paragraph, so that it can submit its observations.

<sup>(1)</sup> OJ ...

*Article 6*

This Directive shall be brought into effect at the same time as, and in accordance with the same timetable for, the introduction of measures specified in Directive .../EC (\*).

*Article 7*

1. Member States shall adopt and publish the laws, regulations and administrative provisions necessary to comply with this Directive before 1 January 1998. They shall forthwith inform the Commission thereof.

When Member States adopt these measures, they shall contain a reference to this Directive or shall be accompanied by such reference on the occasion of their official publication. The methods of making such a reference shall be laid down by Member States.

2. Member States shall communicate to the Commission the texts of the main provisions of national law which they adopt in the field covered by this Directive.

*Article 8*

This Directive shall enter into force on the day of its publication in the *Official Journal of the European Communities*.

*Article 9*

This Directive is addressed to the Member States.

Done at ...

*For the European Parliament,*

*The President*

*For the Council*

*The President*

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(<sup>1</sup>) See footnote 1 on p. ...

## ANNEX

## AMENDMENTS TO THE ANNEXES TO DIRECTIVE 70/220/EEC

1. The list of Annexes inserted between the Articles and Annex I shall read as follows:

*'LIST OF ANNEXES*

ANNEX I: SCOPE, DEFINITIONS, APPLICATION FOR EC TYPE-APPROVAL, GRANTING OF EC TYPE-APPROVAL, REQUIREMENTS AND TESTS, EXTENSION OF EC TYPE-APPROVAL, CONFORMITY OF PRODUCTION AND IN-SERVICE VEHICLES, ON-BOARD DIAGNOSTIC (OBD) SYSTEMS

*Appendix 1:* Verification of production conformity  
(1st statistical method)

*Appendix 2:* Verification of production conformity  
(2nd statistical method)

*Appendix 3:* In-service conformity check

*Appendix 4:* Statistical procedure for in-service conformity testing

ANNEX II: INFORMATION DOCUMENT

*Appendix:* Information on text conditions

ANNEX III: TYPE I TEST (verifying the average tailpipe emissions after a cold start)

*Appendix 1:* Operating cycle used for the type I test

*Appendix 2:* Chassis dynamometer

*Appendix 3:* Measurement method on the road-simulation on a chassis dynamometer

*Appendix 4:* Verification of inertias other than mechanical

*Appendix 5:* Description of tailpipe emission-sampling systems

*Appendix 6:* Method of calibrating the equipment

*Appendix 7:* Total system verification

*Appendix 8:* Calculation of the emission of pollutants

ANNEX IV: TYPE II TEST (carbon monoxide emission test at idling speed)

ANNEX V: TYPE III TEST (verifying emissions of crankcase gases)

ANNEX VI: TYPE IV TEST (determination of evaporative emissions from vehicles with positive-ignition engines)

*Appendix 1:* Calibration frequency and methods

*Appendix 2:* Diurnal ambient temperature profile for the diurnal emission test

ANNEX VII: TYPE VI TEST: Verifying the average low ambient temperature carbon monoxide and hydrocarbon tailpipe emissions after a cold start

ANNEX VIII: TYPE V TEST (ageing test for verifying the durability of anti-pollution devices)

ANNEX IX: SPECIFICATIONS OF REFERENCE FUELS

ANNEX X: MODEL EC TYPE-APPROVAL CERTIFICATE

*Appendix:* Addendum to EC information document

ANNEX XI: ON-BOARD-DIAGNOSTICS (OBD) FOR MOTOR VEHICLES

*Appendix 1:* Functional aspects of OBD systems

*Appendix 2:* Essential characteristics of the vehicle family'

## ANNEX I

2. The heading reads as follows:

**'SCOPE, DEFINITIONS, APPLICATION FOR EC TYPE-APPROVAL, GRANTING OF EC TYPE-APPROVAL, REQUIREMENTS AND TESTS, EXTENSION OF EC TYPE-APPROVAL, CONFORMITY OF PRODUCTION AND IN-SERVICE VEHICLES, ON-BOARD DIAGNOSTIC (OBD) SYSTEMS'.**

3. Section 1:

The first sentence reads as follows:

'This Directive applies to

- tailpipe emissions at normal and low ambient temperature, evaporative emissions, emissions of crankcase gases, the durability of anti-pollution devices and on-board diagnostic (OBD) systems of motor vehicles equipped with positive-ignition engines,
- and
- tailpipe emissions, the durability of anti-pollution devices and on-board diagnostic (OBD) systems of vehicles of category M<sub>1</sub> and N<sub>1</sub> <sup>(1)</sup>, equipped with compression-ignition engines,

covered by Article 1 of Directive 70/220/EEC in the version of Directive 83/351/EEC, with the exception of those vehicles of categories N<sub>1</sub> for which type-approval has been granted pursuant to Directive 88/77/EEC <sup>(2)</sup>.'

4. New sections 2.13, 2.14, 2.15 and 2.16 are added to read as follows:

- '2.13. 'OBD' an on-board diagnostic system for emission control which has the capability of identifying the likely area of malfunction by means of fault codes stored in computer memory.
- 2.14. 'In-service test' means the test and evaluation of conformity conducted in accordance with section 7.1.7 of this Annex.
- 2.15. 'Properly maintained and used' means, for the purpose of a test vehicle, that such a vehicle satisfies the criteria for acceptance of a selected vehicle laid down in section 2 of Appendix 3 to this Annex.
- 2.16. "Defeat device" means any element of design which senses temperature, vehicle speed, engine RPM, transmission gear, manifold vacuum or any other parameter for the purpose of activating, modulating, delaying or deactivating the operation of any part of the emission control system, that reduces the effectiveness of the emission control system under conditions which may reasonably be expected to be encountered in normal vehicle operation and use. Such an element of design may not be considered a defeat device if:
  - I. the need for the device is justified in terms of protecting the engine against damage or accident and for safe operation of the vehicle, or
  - II. the device does not function beyond the requirements of engine starting, or
  - III. conditions are substantially included in the Type I or Type VI test procedures.'

5. Sections 3 to 3.2.1 read as follows:

'3. APPLICATION FOR EC TYPE-APPROVAL

- 3.1. The application for EC type-approval pursuant to Article 3 (4) of Directive 70/156/EEC of a vehicle type with regard to its tailpipe emissions, evaporative emissions, durability of anti-pollution devices as well as to its on-board diagnostic (OBD) system must be submitted by the vehicle manufacturer.

Should the application concern an on-board diagnostic (OBD) system the procedure described in Annex XI, section 3 must be followed.

- 3.1.1. Should the application concern an on-board diagnostic (OBD) system, it must be accompanied by the additional information required in section 3.2.12.2.8 of Annex II together with:

- 3.1.1.1. a declaration by the manufacturer of:

<sup>(1)</sup> As defined in Part A of Annex II to Directive 70/156/EEC.

<sup>(2)</sup> OJ L 36, 9. 2. 1998, p. 33.

- 3.1.1.1.1. in the case of vehicles equipped with positive-ignition engines, the percentage of misfires out of a total number of firing events that would result in emissions exceeding the limits given in section 3.3.2 of Annex XI if that percentage of misfire had been present from the start of a type I test as described in section 5.3.1 of Annex III;
  - 3.1.1.1.2. in the case of vehicles equipped with positive-ignition engines, the percentage of misfires out of a total number of firing events that could lead to an exhaust catalyst, or catalysts, overheating prior to causing irreversible damage;
  - 3.1.1.2. detailed written information fully describing the functional operation characteristics of the OBD system, including a listing of all relevant parts of the vehicle's emission control system, i. e. sensors, actuators and components, that are monitored by the OBD system;
  - 3.1.1.3. a description of the malfunction indicator (MI) used by the OBD system to signal the presence of a fault to a driver of the vehicle;
  - 3.1.1.4. the manufacturer must describe provisions taken to prevent tampering with and modification of the emission control computer;
  - 3.1.1.5. when appropriate, copies of other type-approvals with the relevant data to enable extensions of approvals;
  - 3.1.1.6. if applicable, the particulars of the vehicle family as referred to in Annex XI, Appendix 2.
  - 3.1.2. For the tests described in section 3 of Annex XI, a vehicle representative of the vehicle type or vehicle family fitted with the OBD system to be approved must be submitted to the technical service responsible for the type-approval test. If the technical service determines that the submitted vehicle does not fully represent the vehicle type or vehicle family described in Annex XI, Appendix 2, an alternative and if necessary an additional vehicle must be submitted for test in accordance with section 3 of Annex XI.
  - 3.2. A model of the information document relating to tailpipe emissions, evaporative emissions, durability and the on-board diagnostic (OBD) system is given in Annex II.
  - 3.2.1. Where appropriate, copies of other type-approvals with the relevant data to enable extension of approvals and establishment of deterioration factors must be submitted.'
6. Sections 4 to 4.2 read as follows:
- '4. GRANTING OF EC TYPE-APPROVAL
  - 4.1. If the relevant requirements are satisfied, EC type-approval is granted pursuant to Article 4 (3) of Directive 70/156/EEC.
  - 4.2. A model of the EC type-approval certificate relating to tailpipe emissions, evaporative emissions, durability and the on-board diagnostic (OBD) system is given in Annex X.'
7. Section 5:
- The note is replaced by the following text:
- 'Note:
- As an alternative to the requirements of this section, vehicle manufacturers whose world-wide annual production is less than 10 000 units may obtain EC type-approval on the basis of the corresponding technical requirements in:
- the California Code of Regulations, Title 13, Sections 1960.1 (f) (2) or (g) (1) and (g) (2), 1960.1 (p) applicable to 1996 and later model year vehicles, 1968.1, 1976 and 1975, applicable to 1995 and later model year light-duty vehicles, published by Barclay's Publishing.
- The type-approval authority must inform the Commission of the circumstances of each approval granted under this provision.'
8. Section 5.1.1:
- The second paragraph is replaced by the following:
- 'The technical measures taken by the manufacturer must be such as to ensure that the tailpipe and evaporative emissions are effectively limited, pursuant to this Directive, throughout the normal life of the vehicle and under normal conditions of use. This will include the security of those hoses and their joints and connections, used within the emission control systems, which must be so constructed as to conform with the original design intent.

For tailpipe emissions, these provisions are deemed to be met if the provisions of sections 5.3.1.4 (type-approval) and section 7 (conformity of production and in-service vehicles) respectively are complied with.

For evaporative emissions, these provisions are deemed to be met if the provisions of section 5.3.4 (type-approval) and section 7 (conformity of production) are complied with.'

The former third and fourth paragraphs are deleted and replaced by a new paragraph reading as follows:

'The use of a defeat device is prohibited.'

9. A new section 5.1.3 is added to read as follows:

'5.1.3. Provision must be made to prevent excess evaporative emissions and fuel spillage caused by a missing fuel filler cap. This may be achieved by using one of the following:

- an automatically opening and closing, non-removable fuel filler cap,
- design features which avoid excess evaporative emissions in the case of a missing fuel filler cap,
- any other provision which has the same effect. Examples may include, but are not limited to, a tethered filler cap, a chained filler cap or one utilizing the same locking key for the filler cap as for the vehicle's ignition. In this case the key must be removable from the filler cap only in the locked condition.'

10. Figure I.5.2 is replaced by the following new figure:

'Figure I.5.2

**Different routes for type-approval and extensions**

Type-approval test	Positive-ignition engined vehicles of categories M and N	Compression-ignition engined vehicles of categories M <sub>1</sub> and N <sub>1</sub>
Type I	Yes (maximum mass ≤ 3,5 t)	Yes (maximum mass ≤ 3,5 t)
Type II	Yes (maximum mass > 3,5 t)	—
Type III	Yes	—
Type IV	Yes (maximum mass ≤ 3,5 t)	—
Type V	Yes (maximum mass ≤ 3,5 t)	Yes (maximum mass ≤ 3,5 t)
Type VI	Yes M <sub>1</sub> vehicles ≤ 2 500 kg designed to carry not more than six occupants	—
Extension	Section 6	— Section 6 — M <sub>2</sub> and N <sub>2</sub> with reference mass not more than 2 840 kg
On-board diagnostics	Yes M <sub>1</sub> vehicles ≤ 2 500 kg designed to carry not more than six occupants	Yes in accordance with section 8.2 M <sub>1</sub> vehicles ≤ 2 500 kg designed to carry not more than six occupants'

11. Section 5.1:

New section 5.1.4 is added, as follows:

'5.1.4. *Provisions for electronic system security*

5.1.4.1. Any vehicle with an emission control computer must include features to deter modification, except as authorized by the manufacturer. Any reprogrammable computer codes or operating parameters must be resistant to tampering

and the computer and any related maintenance instructions must conform to the provisions in ISO DIS 15031-7. Any removable calibration memory chips must be potted, encased in a sealed container or protected by electronic algorithms and must not be changeable without the use of specialized tools and procedures.

- 5.1.4.2. Computer-coded engine operating parameters must not be changeable without the use of specialized tools and procedures (e. g. soldered or potted computer components or sealed (or soldered) computer enclosures).
- 5.1.4.3. In the case of mechanical fuel-injection pumps fitted to compression-ignition engines, manufacturers must take adequate steps to protect the maximum fuel delivery setting from tampering while a vehicle is in service.
- 5.1.4.4. Manufacturers may apply to the approval authority for an exemption to one of these requirements for those vehicles which are unlikely to require protection. The criteria that the approval authority will evaluate in considering an exemption will include, but are not limited to, the current availability of performance chips, the high-performance capability of the vehicle and the projected sales volume of the vehicle.
- 5.1.4.5. Manufacturers using programmable computer code systems (e. g. Electrical Erasable Programmable Read-Only Memory, EEPROM) must deter unauthorized reprogramming. Manufacturers must include enhanced tamperprotection strategies including data encryption using methods to secure the encryption algorithm and write protect features requiring electronic access to an off-site computer maintained by the manufacturer. Comparable methods may be considered by the authority if they give the same level of protection.'

12. Sections 5.2.1 and 5.2.3 are replaced by the following:

- 5.2.1. Positive-ignition engined vehicles must be subject to the following tests:
- Type I (verifying the average tailpipe emissions after a cold start),
  - Type II (carbon monoxide emission at idling speed),
  - Type III (emission of crankcase gases),
  - Type IV (evaporation emissions),
  - Type V (durability of anti-pollution control devices),
  - Type VI (verifying the average low ambient temperature carbon monoxide and hydrocarbon tailpipe emissions after a cold start,
  - OBD-test.'
- 5.2.3. Compression-ignition engined vehicles must be subject to the following tests:
- Type I (verifying the average tailpipe emissions after a cold start)
  - Type V (durability of anti-pollution control devices)
  - and, where applicable, OBD test.'

13. Section 5.3.1.4:

— After the first paragraph a new table is inserted to read as follows:

Category of vehicle			Reference mass	Limit values								
				Mass of carbon monoxide		Mass of hydrocarbon		Mass of oxides of nitrogen		Combined mass of hydrocarbons and oxides of nitrogen		Mass of particulates
				(CO)		(HC)		(NO <sub>x</sub> )		(HC + NO <sub>x</sub> )		(PM)
			RW (kg)	L <sub>1</sub> (g/km)		L <sub>2</sub> (g/km)		L <sub>3</sub> (g/km)		L <sub>2</sub> + L <sub>3</sub> (g/km)		L <sub>4</sub> (g/km)
	Category	Class		Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Diesel
A (2000)	M	—	all	2,3	0,64	0,20	—	0,15	0,50	—	0,56	0,05
B (2005)	M	—	all	1,00	0,50	0,10	—	0,08	0,25	—	0,30	0,025'

— The first line of the present table relating to vehicles of category M is deleted.



## 14. A new section 5.3.5 is added as follows:

- 5.3.5. <sup>(1)</sup> Type VI test (verifying the average low ambient temperature carbon monoxide and hydrocarbon tailpipe emissions after a cold start).
- 5.3.5.1. This test must be carried out on all M<sub>1</sub> vehicles equipped with a positive-ignition engine, except vehicles designed to carry more than six occupants and vehicles whose maximum mass exceeds 2 500 kg.
- 5.3.5.1.1. The vehicle is placed on a chassis dynamometer equipped with a means of load an inertia simulation.
- 5.3.5.1.2. The test consists of the four elementary urban driving cycles of part one of the Type I test. The Part One test is described in Annex III, Appendix 1 and illustrated in figures III.1.1 and III.1.2 of the Appendix. The low ambient temperature test lasting a total of 780 seconds must be carried out without interruption and start at engine cranking.
- 5.3.5.1.3. The low ambient temperature test must be carried out at an ambient test temperature of 266 °K (−7 °C). Before the test is carried out the test vehicles must be conditioned in a uniform manner to ensure that the test results may be reproducible. The conditioning and other test procedures are carried out as described in Annex VII.
- 5.3.5.1.4. During the test the exhaust gases are diluted and a proportional sample collected. The exhaust gases of the vehicle tested are diluted, sampled and analysed, following the procedure described in Annex VII, and the total volume of the diluted exhaust is measured. The diluted exhaust gases are analysed for carbon monoxide and hydrocarbons.
- 5.3.5.2. Subject to the requirements in 5.3.5.2.2 and 5.3.5.3 the test must be performed three times. The resulting mass of carbon monoxide and hydrocarbon emission must be less than the limits shown in the table below:

Test temperature	Carbon monoxide L <sub>1</sub> (g/km)	Hydrocarbons L <sub>2</sub> (g/km)
266 °K (− 7 °C)	15	1,8

- 5.3.5.2.1. Notwithstanding the requirements of 5.3.5.2, for each pollutant, not more than one of the three results obtained may exceed the limit prescribed by not more than 10 %, provided the arithmetical mean value of the three results is below the prescribed limit. Where the prescribed limits are exceeded for more than one pollutant it is immaterial whether this occurs in the same test or in different tests.
- 5.3.5.2.2. The number of tests prescribed in 5.3.5.2 may, at the request of the manufacturer, be increased to 10 provided that the arithmetical mean of the first three results falls between 100 % to 110 % of the limit. In this case, the requirement after testing is only that the arithmetical mean of all 10 results must be less than the limit value.
- 5.3.5.3. The number of tests prescribed in 5.3.5.2 may be reduced according to 5.3.5.3.1 and 5.3.5.3.2.
- 5.3.5.3.1. Only one test is performed if the result obtained for each pollutant of the first test is less than or equal to 0,70 L.
- 5.3.5.3.2. If the requirement of 5.3.5.3.1 is not satisfied, only two tests are performed if for each pollutant the result of the first test is less than or equal to 0,85 L and the sum of the first two results is less than or equal to 1,70 L and the result of the second test is less than or equal to L.

$$(V_1 \leq 0,85 \text{ L and } V_1 + V_2 \leq 1,70 \text{ L and } V_2 \leq L).$$

## 15. The former section 5.3.5 is renumbered as 5.3.6 and 5.3.6.3 is amended as follows:

- 5.3.6.3. Deterioration factors are determined using either the procedure in 5.3.6.1 or using the values in the table in 5.3.6.2. The deterioration factors are used to establish compliance with the requirements of 5.3.1.4.'

## 16. Insert new section 5.3.7:

- 5.3.7. *Emissions data required for roadworthiness testing*
- 5.3.7.1. This requirement applies to all vehicles powered by a positive-ignition engine for which EC type-approval is sought in accordance with this Directive.

<sup>(1)</sup> This section is applicable to new types from 1 January 2002.

- 5.3.7.2. When tested in accordance with Annex IV (type II test) at normal idling speed:
- the carbon monoxide content by volume of the exhaust gases emitted must be recorded,
  - the engine speed during the test must be recorded, including any tolerances.
- 5.3.7.3. When tested at 'high idle' speed (i. e. > 2 000 min<sup>-1</sup>):
- the carbon monoxide content by volume of the exhaust gases emitted must be recorded,
  - the Lambda value <sup>(1)</sup> must be recorded.
  - the engine speed during the test must be recorded, including any tolerances.
- 5.3.7.4. The engine oil temperature at the time of the test must be measured and recorded.
- 5.3.7.5. The table in section 1.9 of the Appendix to Annex X must be completed.
- 5.3.7.6. The manufacturer must confirm the accuracy of the Lambda value recorded at the time of type-approval in section 5.3.7.3 as being representative of typical production vehicles within 24 months of the date of the granting of type-approval by the technical service. An assessment must be made on the basis of surveys and studies of production vehicles.'
17. Section 6.1 is amended as follows:
- '6.1. Tailpipe emission related extension (type I, type II and type VI tests).'
18. Sections 6.1.2.1, 6.1.2.2 and 6.1.2.3 are amended as follows:
- '6.1.2.1 For each of the transmission ratios used in the type I and type VI tests, . . . . . (rest unchanged).
- 6.1.2.2. If, for each gear ratio,  $E \leq 8 \%$ , the extension is granted without repeating the type I and type VI tests.
- 6.1.2.3. If, for at least one gear ratio,  $E \leq 8 \%$ , and if, for each gear ratio,  $E \leq 13 \%$ , the type I and type VI tests must be repeated, . . . . (rest unchanged).'
19. A new section 6.4 is added to read as follows:
- '6.4. On-board diagnostics
- 6.4.1. Approval granted to a vehicle type with respect to the OBD system may be extended to different vehicle types belonging to the same vehicle-OBd family as described in Annex XI, Appendix 2. The engine emission control system must be identical to that of the vehicle already approved and comply with the description of the OBD engine family given in Annex XI, Appendix 2, regardless of the following vehicle characteristics:
- engine accessories,
  - tyres,
  - equivalent inertia,
  - cooling system,
  - overall gear ratio,
  - transmission type,
  - type of bodywork.'

(<sup>1</sup>) The Lambda value must be calculated using the simplified Brettschneider equation as follows:

$$\lambda = \frac{[\text{CO}_2] + \frac{[\text{CO}]}{2} + [\text{O}_2] + \left( \frac{\text{Hcv}}{4} \times \frac{3,5}{3,5 + \frac{[\text{CO}]}{[\text{CO}_2]}} - \frac{\text{Ocv}}{2} \right) \times ([\text{CO}_2] + [\text{CO}])}{\left( 1 + \frac{\text{Hcv}}{4} - \frac{\text{Ocv}}{2} \right) \times ([\text{CO}_2] + [\text{CO}] + \text{K1} \times [\text{HC}] )}$$

Where:

[ ] = Concentration in % vol.

K1 = Conversion factor for NDIR measurement to FID measurement (provided by manufacturer of measurement equipment)

Hcv = Atomic ratio of hydrogen to carbon [1,7261]

Ocv = Atomic ratio of oxygen to carbon [0,0175].

20. Section 7.1 is amended as follows:

- ‘7.1. Measures to ensure the conformity of production must be taken in accordance with the provisions of Article 10 of Directive 70/156/EEC, as last amended by Directive 96/27/EEC (whole vehicle type-approval). That Article entrusts the manufacturer with the responsibility for taking measures to ensure the conformity of production to the type approved. Conformity of production is checked on the basis of the description in the type-approval certificate set out in Annex X to this Directive.

As a general rule, conformity of production with regard to limitation of tailpipe and evaporative emissions from the vehicle is checked on the basis of the description in the type-approval certificate set out in Annex X and, where necessary, of all or some of the tests of types I, II, III and IV described in section 5.2.

*Conformity of in-service vehicles*

With reference to type-approvals granted for emissions, these measures must also be appropriate for confirming the functionality of the emission control devices during the normal useful life of the vehicles under normal conditions of use (conformity of in-service vehicles properly maintained and used). For the purpose of this Directive these measures must be checked for a period of up to 5 years of age or 80 000 km, whichever is the sooner.

- 7.1.1. Audit of in-service conformity by the type-approval authority is conducted on the basis of any relevant information that the manufacturer has, under procedures similar to those defined in Article 10 (1) and (2), and in Annex 10 (1) and (2) of Directive 70/156/EEC.

An audit of in-service conformity will be conducted by the type-approval authority on the basis of information supplied by the manufacturer. Such information must include:

- relevant surveillance test data obtained in accordance with applicable requirements and test procedures, together with full information for each tested vehicle such as vehicle status, use history, service conditions and other relevant factors;
- relevant information on service and repair measures,
- other relevant tests and observations recorded by the manufacturer, including especially records of indications from the OBD system. <sup>(1)</sup>

- 7.1.2. The information gathered by the manufacturer must be sufficiently comprehensive to ensure that in-service performance can be assessed for normal conditions of use as defined in 7.1, and in a way representative of the manufacturer's geographic market penetration.’ <sup>(1)</sup>

Sections 7.1. to 7.1.3 are renumbered as 7.1.3 to 7.1.5.

21. A new title and section 7.1.6 are added to read as follows:

*‘On-board Diagnostics (OBD)’*

- 7.1.6. If a verification of the performance of the OBD system is to be carried out, it must be conducted in accordance with the following:
- 7.1.6.1. When the approval authority determines that the quality of production seems unsatisfactory a vehicle is randomly taken from the series and subjected to the tests described in Annex XI, Appendix 1.
- 7.1.6.2. The production is deemed to conform if this vehicle meets the requirements of the tests described in Annex XI, Appendix 1.
- 7.1.6.3. If the vehicle taken from the series does not satisfy the requirements of section 7.1.6.1 a further random sample of four vehicles must be taken from the series and subjected to the tests described in Annex XI, Appendix 1. The tests may be carried out on vehicles which have been run in for no more than 15 000 km.
- 7.1.6.4. The production is deemed to conform if at least 3 vehicles meet the requirements of the tests described in Annex XI, Appendix 1.’

22. A new section 7.1.7. is added as follows:

- ‘7.1.7. On the basis of the audit referred to in 7.1.1, the type-approval authority must either:
- decide that conformity in use is satisfactory and not take any further action, or
  - decide that the information is insufficient or the conformity of vehicles in use is unsatisfactory, and proceed to have vehicles tested in accordance with Appendix 3 to this Annex.

<sup>(1)</sup> Sections 7.1.1 and 7.1.2 will be re-examined and completed without delay in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.

- 7.1.7.1. Where type I tests are considered necessary to check the conformity of emission control devices with the requirements for their performance while in service, such tests must be carried out using a test procedure meeting the statistical criteria defined in Appendix 4 to this Annex.
- 7.1.7.2. The type-approval authority, in cooperation with the manufacturer, must select a sample of vehicles with sufficient mileage whose use under normal conditions can be reasonably assured. The manufacturer must be consulted on the choice of the vehicles in the sample and be allowed to attend the confirmatory checks of the vehicles.
- 7.1.7.3. The manufacturer is authorized, under the supervision of the type-approval authority, to carry out checks, even of a destructive nature, on those vehicles with emission levels in excess of the limit values with a view to establishing possible causes of deterioration which cannot be attributed to the manufacturer himself (e. g. use of leaded petrol before the test date). Where the results of the checks confirm such causes, those test results are excluded from the conformity check.
- 7.1.7.4. Where the type-approval authority is not satisfied with the results of the tests in accordance with the criteria defined in Appendix 4, the remedial measures referred to in Article 11 (2) and in Annex X to Directive 70/156/EEC are extended to vehicles in service belonging to the same vehicle type which are likely to be affected with the same defects in accordance with section 6 of Appendix 3.

The plan of remedial measures presented by the manufacturer must be approved by the type-approval authority. The manufacturer is responsible for the execution of the remedial plan as approved.

The type-approval authority must notify its decision to all Member States within 30 days. The Member States may require the same plan of remedial measures be applied to all vehicles of the same type registered in their territory.

- 7.1.7.5. If a Member State has established that a vehicle type does not conform to the applicable requirements of Appendix 3 to this Annex, it must notify without delay the Member State which granted the original type-approval in accordance with the requirements of Article 11 (3) of Directive 70/156/EEC.

The results submitted by the competent authority of a Member State to the type-approval authority must be fully documented in accordance with Appendix 3 to this Annex. Results of testing by the competent authority of a Member State and details of test vehicle mileage, maintenance records and operating location, must be made available to the manufacturer.

The general requirements laid down in sections 3 and 4, and as the case may be, those of Article 11 (6) of Directive 70/156/EEC are applicable.

23. Section 8 is deleted.

24. A new section 8 is added to read as follows:

**8. ON-BOARD DIAGNOSTIC (OBD) SYSTEM FOR MOTOR VEHICLES**

**8.1. Vehicles of category M<sub>1</sub> equipped with positive-ignition engines, except**

- vehicles designed to carry more than six occupants including the driver,
- vehicles whose maximum mass exceeds 2 500 kg,

must be fitted with an on-board diagnostic (OBD) system for emission control in accordance with Annex XI.

**8.2. Vehicles of category M<sub>1</sub> equipped with compression-ignition engines, except**

- vehicles designed to carry more than six occupants including the driver,
- vehicles whose maximum mass exceeds 2 500 kg,

from 1 January 2005, must be fitted with an on-board diagnostic system (OBD) for emission control in accordance with Annex XI. Where diesel-engined vehicles entering into service prior to this date are fitted with an OBD system, the provisions of sections 6.5.3 to 6.5.3.5 of Annex XI, Appendix 1 are applicable.

**8.3. Vehicles of other categories**

Vehicles of other categories or vehicles of category M<sub>1</sub>, not covered by 8.1 and 8.2, may be fitted with an on-board diagnostic system. In this case, the requirements of Annex XI are applicable.

25. New Appendices 3 and 4 are added as follows:

*Appendix 3*

**IN-SERVICE CONFORMITY CHECK**

1. INTRODUCTION

This Appendix sets out the criteria referred to in section 7.1.7 of this Annex regarding the selection of vehicles for testing and the procedures for the in-service conformity control.

2. SELECTION CRITERIA

The criteria for acceptance of a selected vehicle are defined in sections 2.1 to 2.8 of this Appendix. Information is collected by vehicle examination and an interview with the owner/driver.

2.1. The vehicle must belong to a vehicle type that is type-approved under this Directive and covered by a certificate of conformity in accordance with Directive 70/156/EEC. It must be registered and used in the European Community.

2.2. The vehicle must have been in service for at least 15 000 km or 6 months, whichever is the later, and for no more than 80 000 km or 5 years, whichever is the sooner.

2.3. There must be a maintenance record to show that the vehicle has been properly maintained, e. g. has been serviced in accordance with the manufacturer's recommendations.

2.4. the vehicle must exhibit no indications of abuse (e. g. racing, overloading, misfuelling, or other misuse), or other factors (e. g. tampering) that could affect emission performance. In the case of vehicles fitted with an OBD system, the fault code and mileage information stored in the computer are taken into account. A vehicle must not be selected for testing if the information stored in the computer shows that the vehicle has operated after a fault code was stored and a relatively prompt repair was not carried out.

2.5. There must have been no unauthorized major repair to the engine or major repair of the vehicle.

2.6. The lead content and sulphur content of a fuel sample from the vehicle tank must meet applicable standards and there must be no evidence of misfuelling. Checks may be done in the tailpipe, etc.

2.7. There must be no indication of any problem that might jeopardize the safety of laboratory personnel.

2.8. All anti-pollution system components on the vehicle must be in conformity with the applicable type-approval.

3. DIAGNOSIS AND MAINTENANCE

Diagnosis and any normal maintenance necessary must be performed on vehicles accepted for testing, prior to measuring exhaust emissions, in accordance with the procedure laid down in section 3.1 to 3.7.

3.1. The following checks must be carried out: checks on air filter, all drive belts, all fluid levels, radiator cap, all vacuum hoses and electrical wiring related to the antipollution system for integrity; checks on ignition, fuel metering and anti-pollution device components for maladjustments and/or tampering. All discrepancies must be recorded.

3.2. If the OBD malfunction indicator registers a malfunction during a preconditioning cycle, the fault may be identified and repaired. The test may be rerun and the results of that repaired vehicle used.

3.3. The ignition system must be checked and defective components replaced, for example spark plugs, cables, etc.

3.4. The compression must be checked. If the result is unsatisfactory the vehicle is rejected.

3.5. The engine parameters must be checked to the manufacturer's specifications and adjusted if necessary.

3.6. If the vehicle is within 800 km of a scheduled maintenance service, that service must be performed according to the manufacturer's instructions. Regardless of odometer reading, the oil and air filter may be changed at the request of the manufacturer.

- 3.7. Upon acceptance of the vehicle, the fuel must be replaced with appropriate emission test reference fuel, unless the manufacturer accepts the use of market fuel.

#### 4. IN-SERVICE TESTING

- 4.1. When a check on vehicles is deemed necessary, emission tests in accordance with Annex III to this Directive are performed on pre-conditioned vehicles selected in accordance with the requirements of sections 2 and 3 of this Appendix.
- 4.2. Vehicles equipped with an OBD system may be checked for proper in-service functionality of the malfunction indication, etc., in relation to levels of emissions (e. g. the malfunction indication limits defined in Annex XI to this Directive) for the type-approved specifications.
- 4.3. The OBD system may be checked, for example, for levels of emissions above the applicable limit values with no malfunction indication, systematic erroneous activation of the malfunction indication and identified faulty or deteriorated components in the OBD system.
- 4.4. If a component or system operates in a manner not covered by the particulars in the type-approval certificate and/or information package for such vehicle types and such deviation has not been authorized under Article 5 (3) or (4) of Directive 70/156/EEC, with no malfunction indication by the OBD, the component or system must not be replaced prior to emission testing, unless it is determined that the component or system has been tampered with or abused in such a manner that the OBD does not detect the resulting malfunction.

#### 5. EVALUATION OF RESULTS

- 5.1. The test results are submitted to the evaluation procedure in accordance with Appendix 4 to this Annex.
- 5.2. Test results must not be multiplied by deterioration factors.

#### 6. PLAN OF REMEDIAL MEASURES

- 6.1. When the type-approval authority is certain that a vehicle type is not in conformity with the requirements of these provisions, it must request the manufacturer to submit a plan of remedial measures to remedy the non-compliance.
- 6.2. The plan of remedial measures must be filed with the type-approval authority not later than 60 working days from the date of the notification referred to in section 6.1. The type-approval authority must within 30 working days declare its approval or disapproval of the plan of remedial measures. However, where the manufacturer can demonstrate, to the satisfaction of the competent type-approval authority, that further time is required to investigate the non-compliance in order to submit a plan of remedial measures, an extension is granted.
- 6.3. The remedial measures must apply to all vehicles likely to be affected by the same defect. The need to amend the type-approval documents must be assessed.
- 6.4. The manufacturer must provide a copy of all communications related to the plan of remedial measures, and must also maintain a record of the recall campaign, and supply regular status reports to the type-approval authority.
- 6.5. The plan of remedial measures must include the requirements specified in 6.5.1 to 6.5.11. The manufacturer must assign a unique identifying name or number to the plan of remedial measures.
- 6.5.1. A description of each vehicle type included in the plan of remedial measures.
- 6.5.2. A description of the specific modifications, alterations, repairs, corrections, adjustments, or other changes to be made to bring the vehicles into conformity including a brief summary of the data and technical studies which support the manufacturer's decision as to the particular measures to be taken to correct the non-conformity.
- 6.5.3. A description of the method by which the manufacturer informs the vehicle owners.
- 6.5.4. A description of the proper maintenance or use, if any, which the manufacturer stipulates as a condition of eligibility for repair under the plan of remedial measures, and an explanation of the manufacturer's reasons for imposing any such condition. No maintenance or use conditions may be imposed unless it is demonstrably related to the non-conformity and the remedial measures.
- 6.5.5. A description of the procedure to be followed by vehicle owners to obtain correction of the non-conformity. This must include a date after which the remedial measures may be taken, the estimated time for the workshop to perform the repairs and where they can be done. The repair must be done expeditiously, within a reasonable time after delivery of the vehicle.

- 6.5.6. A copy of the information transmitted to the vehicle owner.
- 6.5.7. A brief description of the system which the manufacturer uses to assure an adequate supply of component or systems for fulfilling the remedial action. It must be indicated when there will be an adequate supply of components or systems to initiate the campaign.
- 6.5.8. A copy of all instructions to be sent to those persons who are to perform the repair.
- 6.5.9. A description of the impact of the proposed remedial measures on the emissions, fuel consumption, driveability, and safety of each vehicle type, covered by the plan of remedial measures with data, technical studies, etc. which support these conclusions.
- 6.5.10. Any other information, reports or data the type-approval authority may reasonably determine is necessary to evaluate the plan of remedial measures.
- 6.5.11. Where the plan of remedial measures includes a recall, a description of the method for recording the repair must be submitted to the type-approval authority. If a label is used, an example of it must be submitted.
- 6.6. The manufacturer may be required to conduct reasonably designed and necessary tests on components and vehicles incorporating a proposed change, repair, or modification to demonstrate the effectiveness of the change, repair, or modification.
- 6.7. The manufacturer is responsible for keeping a record of every vehicle recalled and repaired and the workshop which performed the repair. The type-approval authority must have access to the record on request for a period of 5 years from the implementation of the plan of remedial measures.

#### *Appendix 4* <sup>(1)</sup>

#### STATISTICAL PROCEDURE FOR IN-SERVICE CONFORMITY TESTING

- 1. This Appendix describes the procedure to be used to verify the in-service conformity requirements for the type I test.
- 2. Two different procedures are to be followed:
  - 1. One dealing with vehicles identified in the sample, due to an emission-related defect, causing outliers in the results (section 3).
  - 2. The other dealing with the total sample (section 4).
- 3. PROCEDURE TO BE FOLLOWED WITH OUTLYING EMITTERS IN THE SAMPLE.
  - 3.1. A vehicle is said to be an outlying emitter, when for any regulated component the limit value as shown in section 5.3.1.4 of Annex I is exceeded significantly.
  - 3.2. With a minimum sample size of 3, and a maximum sample size as determined by the procedure of paragraph 4, the sample is scanned for the occurrence of outlying emitters.
  - 3.3. When an outlying emitter is found, the cause of the excess emission must be determined.
  - 3.4. When more than one vehicle is found to be an outlying emitter, due to the same cause, the sample is regarded as having failed.
  - 3.5. When only one outlying emitter has been found, or when more than one outlying emitter is found, but due to different causes, the sample is increased by one vehicle, unless the maximum sample size has already been reached.
    - 3.5.1. When in the increased sample more than one vehicle is found to be an outlying emitter, due to the same cause, the sample is regarded as having failed.
    - 3.5.2. When in the maximum sample size not more than one outlying emitter is found, where the excess emission is due to the same cause, the sample is regarded as having passed with regard to the requirements of section 3 of this Appendix.

<sup>(1)</sup> The provisions laid down in Appendix 4 must be re-examined and completed without delay in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.

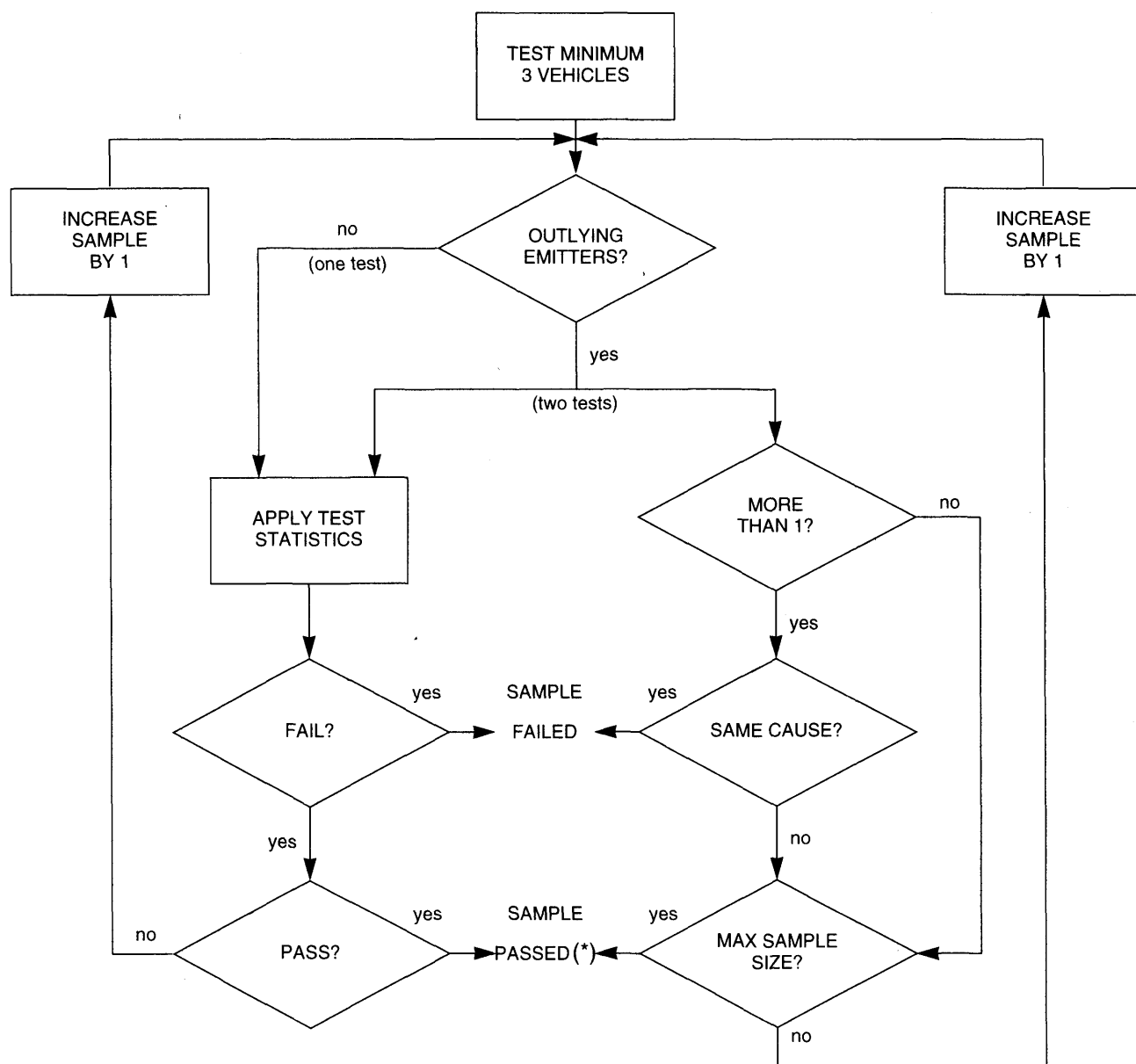
- 3.6. Whenever a sample is increased due to the requirements of 3.5, the statistical procedure of paragraph 4 is applied to the increased sample.
4. PROCEDURE TO BE FOLLOWED WITHOUT SEPARATE EVALUATION OF OUTLYING EMITTERS IN THE SAMPLE.
- 4.1. With a minimum sample size of three the sampling procedure is set so that the probability of a batch passing a test with 40 % of the production defective is 0,95 (producer's risk = 5 %) while the probability of a batch being accepted with 75 % of the production defective is 0,15 (consumer's risk = 15 %).
- 4.2. For each of the pollutants given in section 6.2.1 of Annex I, the following procedure is used (see Figure I/7).  
Where  
 $L$  = the limit value for the pollutant,  
 $X_i$  = the value of the measurement for the  $i$ -th vehicle of the sample,  
 $n$  = the current sample number.
- 4.3. The test statistic quantifying the number of non-conforming vehicles, i.e.  $x_i > L$ , is computed for the sample.
- 4.4. Then:  
 — if the test statistic does not exceed the pass decision number for the sample size given in the following table, a pass decision is reached for the pollutant,  
 — if the test statistic equals or exceeds the fail decision number for the sample size given in the following table, a fail decision is reached for the pollutant,  
 — otherwise, an additional vehicle is tested and the procedure is applied to the sample with one extra unit.
- In the following table the pass and fail decision numbers are computed in accordance with the International Standard ISO 8422:1991.
5. A sample is regarded as having passed the test when it has passed both the requirements of sections 3 and 4 of this Appendix.

Table for Acceptance — Rejection Sampling Plan by Attributes

Cumulative sample size	Pass decision number	Fail decision number
3	0	—
4	1	—
5	1	5
6	2	6
7	2	6
8	3	7
9	4	8
10	4	8
11	5	9
12	5	9
13	6	10
14	6	11
15	7	11
16	8	12
17	8	12
18	9	13
19	9	13
20	11	12



Figure I.7



(\*) If it fulfills both tests'.

## ANNEX II

26. Section 3.2.1.6 is amended to read:

'3.2.1.6. Normal engine idling speed (including tolerance)

..... min<sup>-1</sup>

A new section is inserted after 3.2.1.7 as follows:

'3.2.1.8. High idle engine speed (including tolerance)

..... min<sup>-1</sup>

27. The following new sections and footnotes are added to section 3:

3.2.12.2.8. On-Board-diagnostic (OBD) system)

3.2.12.2.8.1. Written description and/or drawing of the MI:

.....

3.2.12.2.8.2. List and purpose of all components monitored by the OBD system:

.....

3.2.12.2.8.3. Written description (general working principles) for:

.....

3.2.12.2.8.3.1. Positive-ignition engines <sup>(1)</sup>:

.....

3.2.12.2.8.3.1.1. Catalyst monitoring <sup>(1)</sup>:

.....

3.2.12.2.8.3.1.2. Misfire detection <sup>(1)</sup>:

.....

3.2.12.2.8.3.1.3. Oxygen sensor monitoring <sup>(1)</sup>:

.....

3.2.12.2.8.3.1.4. Other components monitored by the OBD system <sup>(1)</sup>:

.....

3.2.12.2.8.3.2. Compression-ignition engines <sup>(1)</sup>:

.....

3.2.12.2.8.3.2.1. Catalyst monitoring <sup>(1)</sup>:

.....

3.2.12.2.8.3.2.2. Particulate trap monitoring <sup>(1)</sup>:

.....

3.2.12.2.8.3.2.3. Electronic fuelling system monitoring <sup>(1)</sup>:

.....

3.2.12.2.8.3.2.4. Other components monitored by the OBD system <sup>(1)</sup>:

.....

3.2.12.2.8.4. Criteria for MI activation (fixed number of driving cycles or statistical method):

.....

3.2.12.2.8.5. List of all OBD output codes and formats used (with explanation of each):

.....

<sup>(1)</sup> Delete where inapplicable.

## ANNEX III

## 28. Section 2.3.1:

- Paragraphs 2 and 3 are deleted.
- Paragraph 2 (former paragraph 4) reads as follows:  
'Vehicles which do not attain the acceleration ...' (rest unchanged).

## 29. Section 6.1.3:

The first sentence reads as follows:

'A current of air of variable speed is blown over the vehicle.'

## 30. Section 6.2.2:

'The first cycle starts on the initiation of the engine start-up procedure.'

## Section 7.1:

'Sampling begins (BS) before or at the initiation of the engine start-up procedure and ends on conclusion of the final idling period in the extra-urban cycle (part two, end of sampling (ES)) or, in the case of test type VI of the final idling period of the last elementary cycle (part one).'

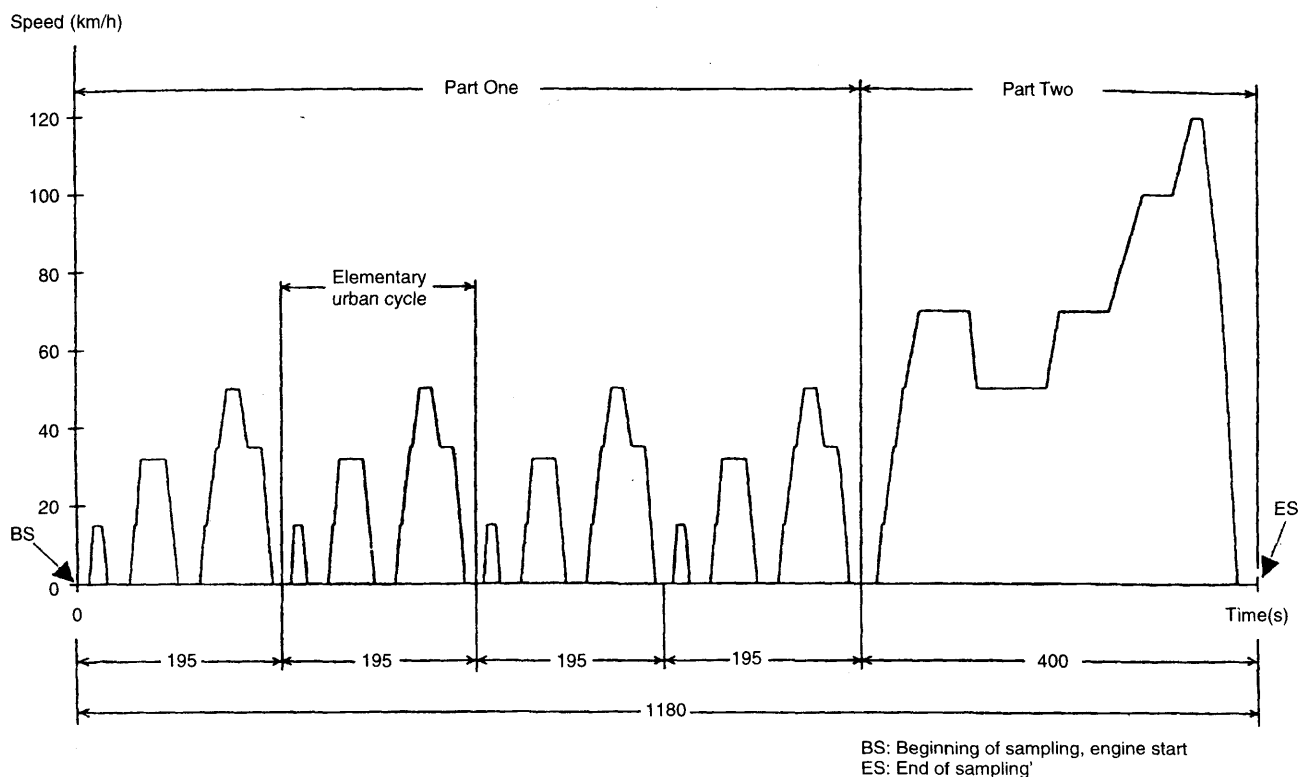
## Appendix 1

## 31. Section 1.1:

- Figure III.1.1 is replaced by the following new figure:

*Figure III.1.1*

Operating cycle for the Type I test



- In the English version in column 5 of Table III.1.2 (entitled: 'Speed (km/h)'); operation 23 reads as follows:

'35-10'

32. Sections 4 to 4.3 including Table III.1.4 and Figure III.1.4 are deleted.

### Appendix 3

33. Section 5.1.1.2.7:

In the English version, the formula reads as follows:

$$P = \frac{M V \Delta V}{500 T},$$

### ANNEX VI

34. Sections 1 to 6 read as follows:

#### 1. INTRODUCTION

This Annex describes the procedure for the Type IV test in accordance with section 5.3.4 of Annex I.

This procedure describes a method for a determination of the loss of hydrocarbons by evaporation from the fuel systems of vehicles with positive-ignition engines.

#### 2. DESCRIPTION OF TEST

The evaporative emission test (Figure VI.1) is designed to determine hydrocarbon evaporative emissions as a consequence of diurnal temperatures fluctuation, hot soaks during parking, and urban driving. The test consists of these phases:

- test preparation including an urban (Part One) and extra-urban (Part Two) driving cycle,
- hot soak loss determination,
- diurnal loss determination.

Mass emissions of hydrocarbons from the hot soak and the diurnal loss phases are added up to provide an overall result for the test.

#### 3. VEHICLE AND FUEL

##### 3.1. Vehicle

3.1.1. The vehicle must be in good mechanical condition and have been run in and driven at least 3 000 km before the test. The evaporative emission control system must be connected and have been functioning correctly over this period and the carbon canister(s) must have been subject to normal use, neither undergoing abnormal purging nor abnormal loading.

##### 3.2. Fuel

3.2.1. The appropriate reference fuel must be used, as defined in Annex IX to this Directive.

#### 4. TEST EQUIPMENT FOR EVAPORATIVE TEST

##### 4.1. Chassis dynamometer

The chassis dynamometer must meet the requirements of Annex III.

##### 4.2. Evaporative emission measurement enclosure

The evaporative emission measurement enclosure must be a gas-tight rectangular measuring chamber able to contain the vehicle under test. The vehicle must be accessible from all sides and the enclosure when sealed must be gas tight in accordance with Appendix 1. The inner surface of the enclosure must be impermeable and non-reactive to hydrocarbons. The temperature conditioning system must be capable of controlling the internal enclosure air temperature to follow the prescribed temperature versus time profile throughout the test, and an average tolerance of  $\pm 1$  K over the duration of the test.

The control system must be tuned to provide a smooth temperature pattern that has a minimum of overshoot, hunting, and instability about the desired long-term ambient temperature profile. Interior surface temperatures must not be less than 278 °K (5 °C) nor more than 320 °K (55 °C) at any time during the diurnal emission test. Wall design must be such as to promote good dissipation of heat. Interior surface temperatures must not be below 293 °K (20 °C), nor above 325 °K (52 °C) for the duration of the hot soak test.

To accommodate the volume changes due to enclosure temperature changes, either a variable-volume or fixed-volume enclosure may be used.

4.2.1. *Variable-volume enclosure*

The variable-volume enclosure expands and contracts in response to the temperature change of the air mass in the enclosure. Two potential means of accommodating the internal volume changes are movable panel(s), or a bellows design, in which an impermeable bag or bags inside the enclosure expand(s) and contract(s) in response to internal pressure changes by exchanging air from outside the enclosure. Any design for volume accommodation must maintain the integrity of the enclosure as specified in Appendix 1 over the specified temperature range.

Any method of volume accommodation must limit the differential between the enclosure internal pressure and the barometric pressure to a maximum value of  $\pm 5$  hPa.

The enclosure must be capable of latching to a fixed volume. A variable volume enclosure must be capable of accommodating a  $\pm 7\%$  change from its 'nominal volume' (see Appendix 1 section 2.1.1), taking into account temperature and barometric pressure variation during testing.

4.2.2. *Fixed-volume enclosure*

The fixed-volume enclosure must be constructed with rigid panels that maintain a fixed enclosure volume, and meet the requirements below.

4.2.2.1. The enclosure must be equipped with an outlet flow stream that withdraws air at a low, constant rate from the enclosure throughout the test. An inlet flow stream may provide make-up air to balance the outgoing flow with incoming ambient air. Inlet air must be filtered with activated carbon to provide a relatively constant hydrocarbon level. Any method of volume accommodation must maintain the differential between the enclosure internal pressure and the barometric pressure between 0 and  $-5$  hPa.

4.2.2.2. The equipment must be capable of measuring the mass of hydrocarbon in the inlet and outlet flow streams with a resolution of 0,01 gram. A bag sampling system may be used to collect a proportional sample of the air withdrawn from and admitted to the enclosure. Alternatively, the inlet and outlet flow streams may be continuously analysed using an on-line FID analyser and integrated with the flow measurements to provide a continuous record of the mass hydrocarbon removal.

4.3. **Analytical systems**

4.3.1. *Hydrocarbon analyser*

4.3.1.1. The atmosphere within the chamber is monitored using a hydrocarbon detector of the flame ionization detector (FID) type. Sample gas must be drawn from the mid-point of one side wall or roof of the chamber and any bypass flow must be returned to the enclosure, preferably to a point immediately downstream of the mixing fan.

4.3.1.2. The hydrocarbon analyser must have a response time to 90 % of final reading of less than 1,5 seconds. Its stability must be better than 2 % of full scale at zero and at  $80\% \pm 20\%$  of full scale over a 15-minute period for all operational ranges.

4.3.1.3. The repeatability of the analyser expressed as one standard deviation must be better than 1 % of full scale deflection at zero and at  $80\% \pm 20\%$  of full scale on all ranges used.

4.3.1.4. The operational ranges of the analyser must be chosen to give best resolution over the measurement, calibration and leak checking procedures.

4.3.2. *Hydrocarbon analyser data recording system*

4.3.2.1. The hydrocarbon analyser must be fitted with a device to record electrical signal output either by strip chart recorder or other data processing system at a frequency of at least once per minute. The recording system must have operating characteristics at least equivalent to the signal being recorded and must provide a permanent record of results. The record must show a positive indication of the beginning and end of the hot soak or diurnal emission test (including beginning and end of sampling periods along with the time elapsed between start and completion of each test).

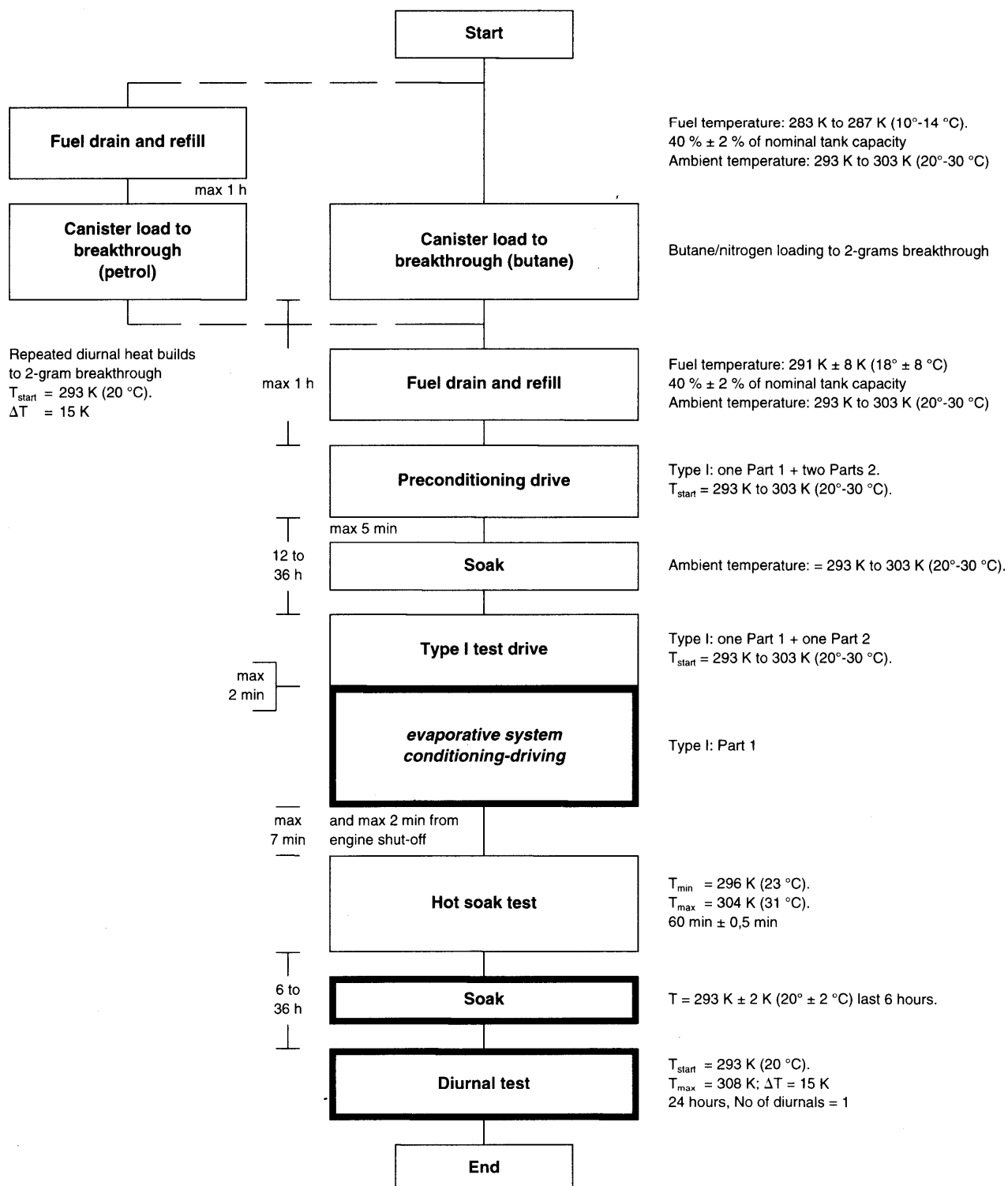
Figure VI.1

## Evaporative emission determination

3 000 km run-in period (no excessive purge/load)

Ageing of canister(s) verified

Steam clean of vehicle (if necessary)



- Note:
1. Evaporative emission control families — details clarified.
  2. Tailpipe emissions may be measured during type I test drive, but these are not used for legislative purposes. Exhaust emission legislative test remains separate.

**4.4. Fuel tank heating (only applicable for gasoline canister load option)**

- 4.4.1. The fuel in the vehicle tank(s) must be heated by a controllable source of heat; for example a heating pad of 2 000 W capacity is suitable. The heating system must apply heat evenly to the tank walls beneath the level of the fuel so as not to cause local overheating of the fuel. Heat must not be applied to the vapour in the tank above the fuel.
- 4.4.2. The tank heating device must make it possible to heat the fuel in the tank evenly by 14 °K from 289 °K (16 °C) within 60 minutes, with the temperature sensor position as in 5.1.1. The heating system must be capable of controlling the fuel temperature to  $\pm 1,5$  °K of the required temperature during the tank heating process.

**4.5. Temperature recording**

- 4.5.1. The temperature in the chamber is recorded at two points by temperature sensors which are connected so as to show a mean value. The measuring points are extended approximately 0,1 m into the enclosure from the vertical centre line of each side wall at a height of  $0,9 \pm 0,2$  m.
- 4.5.2. The temperatures of the fuel tank(s) are recorded by means of the sensor positioned in the fuel tank as in 5.1.1 in the case of use of the gasoline canister load option (5.1.5).
- 4.5.3. Temperatures must, throughout the evaporative emission measurements, be recorded or entered into a data processing system at a frequency of at least once per minute.
- 4.5.4. The accuracy of the temperature recording system must be within  $\pm 1,0$  °K and the temperature must be capable of being resolved to  $\pm 0,4$  °K.
- 4.5.5. The recording or data processing system must be capable of resolving time to  $\pm 15$  seconds.

**4.6. Pressure recording**

- 4.6.1. The difference  $\Delta p$  between barometric pressure within the test area and the enclosure internal pressure must, throughout the evaporative emission measurements, be recorded or entered into a data processing system at a frequency of at least once per minute.
- 4.6.2. The accuracy of the pressure recording system must be within  $\pm 2$  hPa and the pressure must be capable of being resolved to  $\pm 0,2$  hPa.
- 4.6.3. The recording or data processing system must be capable of resolving time to  $\pm 15$  seconds.

**4.7. Fans**

- 4.7.1. By the use of one or more fans or blowers with the SHED door(s) open it must be possible to reduce the hydrocarbon concentration in the chamber to the ambient hydrocarbon level.
- 4.7.2. The chamber must have one or more fans or blowers of likely capacity  $0,1$  to  $0,5 \text{ m}^3\text{s}^{-1}$  with which to thoroughly mix the atmosphere in the enclosure. It must be possible to attain an even temperature and hydrocarbon concentration in the chamber during measurements. The vehicle in the enclosure must not be subjected to a direct stream of air from the fans or blowers.

**4.8. Gases**

- 4.8.1. The following pure gases must be available for calibration and operation:
- purified synthetic air (purity:  $< 1$  ppm  $C_1$  equivalent  $\leq 1$  ppm CO,  $\leq 400$  ppm CO<sub>2</sub>,  $\leq 0,1$  ppm NO); oxygen content between 18 % and 21 % by volume,
  - hydrocarbon analyser fuel gas (40 %  $\pm 2$  % hydrogen, and balance helium with less than 1 ppm  $C_1$  equivalent hydrocarbon, less than 400 ppm CO<sub>2</sub>),
    - propane (C<sub>3</sub>H<sub>8</sub>), 99,5 % minimum purity,
    - butane (C<sub>4</sub>H<sub>10</sub>), 98 % minimum purity,
    - nitrogen (N<sub>2</sub>), 98 % minimum purity.
- 4.8.2. Calibration and span gases must be available containing mixtures of propane (C<sub>3</sub>H<sub>8</sub>) and purified synthetic air. The true concentrations of a calibration gas must be within  $\pm 2$  % of stated figures. The accuracy of the diluted gases obtained when using a gas divider must be to within  $\pm 2$  % of the true value. The concentrations specified in Appendix 1 may also be obtained by the use of a gas divider using synthetic air as the diluent gas.

**4.9. Additional equipment**

4.9.1. The absolute humidity in the tests area must be measurable to within  $\pm 5\%$ .

**5. TEST PROCEDURE****5.1. Test preparation**

5.1.1. The vehicle is mechanically prepared before the test as follows:

- the exhaust system of the vehicle must not exhibit any leaks,
- the vehicle may be steam cleaned before the test,
- in the case of use of the gasoline canister load option (5.1.5) the fuel tank of the vehicle must be equipped with a temperature sensor to enable the temperature to be measured at the mid-point of the fuel in the fuel tank when filled to 40 % of its capacity,
- additional fittings, adapters or devices may be fitted to the fuel system in order to allow a complete draining of the fuel tank. For this purpose it is not necessary to modify the shell of the tank,
- the manufacturer may propose a test method in order to take into account the loss of hydrocarbons by evaporation coming only from the fuel system of the vehicle.

5.1.2. The vehicle is taken into the test area where the ambient temperature is between 293 °K and 303 °K (20 and 30 °C).

5.1.3. The ageing of the canister(s) has to be verified. This may be done by demonstrating that it has accumulated a minimum of 3 000 km. If this demonstration is not given, the following procedure is used. In the case of a multiple canister system each canister must undergo the procedure separately.

5.1.3.1. The canister is removed from the vehicle. Special care must be taken during this step to avoid damage to components and the integrity of the fuel system.

5.1.3.2. The weight of the canister must be checked.

5.1.3.3. The canister is connected to a fuel tank, possibly an external one, filled with reference fuel, to 40 % volume of the fuel tank(s).

5.1.3.4. The fuel temperature in the fuel tank must be between 283 °K (10 °C) and 287 °K (14 °C).

5.1.3.5. The (external) fuel tank is heated from 288 °K to 318 °K (15 ° to 45 °C) (1 °C increase every 9 minutes).

5.1.3.6. If the canister reaches breakthrough before the temperature reaches 318 °K (45 °C), the heat source must be turned off. Then the canister is weighed. If the canister did not reach breakthrough during the heating to 318 °K (45 °C), the procedure from 5.1.3.3 must be repeated until breakthrough occurs.

5.1.3.7. Breakthrough may be checked as is described in 5.1.5 and 5.1.6 of this Annex, or with the use of another sampling and analytical arrangement capable of detecting the emission of hydrocarbons from the canister at breakthrough.

5.1.3.8. The canister must be purged with  $25 \pm 5$  litres per litre of charcoal and per minute with the emission laboratory air until 300 bed volume exchanges are reached.

5.1.3.9. The weight of the canister must be checked.

5.1.3.10. The steps of the procedure in 5.1.3.4 to 5.1.3.9 must be repeated nine times. The test may be terminated prior to that, after not less than three ageing cycles, if the weight of the canister after the last cycles has stabilized.

5.1.3.11. The evaporative emission canister is reconnected and the vehicle restored to its normal operating condition.

5.1.4. One of the methods specified in 5.1.5 and 5.1.6 must be used to precondition the evaporative canister. For vehicles with multiple canisters, each canister must be preconditioned separately.

5.1.4.1. Canister emissions are measured to determine breakthrough.

Breakthrough is here defined as the point at which the cumulative quantity of hydrocarbons emitted is equal to 2 grams.

5.1.4.2. Breakthrough may be verified using the evaporative emission enclosure as described in 5.1.5 and 5.1.6 respectively. Alternatively, breakthrough may be determined using an auxiliary evaporative canister connected downstream of the vehicle's canister. The auxiliary canister must be well purged with dry air prior to loading.



- 5.1.4.3. The measuring chamber must be purged for several minutes immediately before the test until a stable background is obtained. The chamber air mixing fan(s) must be switched on at this time.

The hydrocarbon analyser must be zeroed and spanned immediately before the test.

5.1.5. *Canister loading with repeated heat builds to breakthrough*

- 5.1.5.1. The fuel tank(s) of the vehicle(s) is (are) emptied using the fuel tank drain(s). This must be done so as not to abnormally purge or abnormally load the evaporative control devices fitted to the vehicle. Removal of the fuel cap is normally sufficient to achieve this.

- 5.1.5.2. The fuel tank(s) is (are) refilled with test fuel at a temperature of between 283 °K to 287 °K (10 to 14 °C) to 40 %  $\pm$  2 % of the tank's normal volumetric capacity. The fuel cap(s) of the vehicle must be fitted at this point.

- 5.1.5.3. Within one hour of being refuelled the vehicle must be placed, with the engine shut off, in the evaporative emission enclosure. The fuel tank temperature sensor is connected to the temperature recording system. A heat source must be properly positioned with respect to the fuel tank(s) and connected to the temperature controller. The heat source is specified in 4.4. In the case of vehicles fitted with more than one fuel tank, all the tanks must be heated in the same way as described below. The temperatures of the tanks must be identical to within  $\pm$  1,5 °K.

- 5.1.5.4. The fuel may be artificially heated to the starting diurnal temperature of 293 °K (20 °C)  $\pm$  1 °K.

- 5.1.5.5. When the fuel temperature reaches at last 292 °K (19 °C), the following steps must be taken immediately: the purge blower must be turned off; enclosure doors closed and sealed; and measurement initiated of the hydrocarbon level in the enclosure.

- 5.1.5.6. When the fuel temperature of the fuel tank reaches 293 °K (20 °C) a linear heat build of 15 °K (15 °C) begins. The fuel must be heated in such a way that the temperature of the fuel during the heating conforms to the function below to within  $\pm$  1,5 °K. The elapsed time of the heat build and temperature rise is recorded.

$$T_r = T_0 + 0,2333 \times t$$

where:

$T_r$  = required temperature (K);

$T_0$  = initial temperature (K);

$t$  = time from start of the tank heat build in minutes.

- 5.1.5.7. As soon as breakthrough occurs or when the fuel temperature reaches 308 °K (35 °C), whichever occurs first, the heat source is turned off, the enclosure doors unsealed and opened, and the vehicle fuel tank cap(s) removed. If breakthrough has not occurred by the time the fuel temperature 308 °K (35 °C), the heat source is removed from the vehicle, the vehicle removed from the evaporative emission enclosure and the entire procedure outlined in 5.1.7 repeated until breakthrough occurs.

5.1.6. *Butane loading to breakthrough*

- 5.1.6.1. If the enclosure is used for the determination of the breakthrough (see 5.1.4.2) the vehicle must be placed, with the engine shut off, in the evaporative emission enclosure.

- 5.1.6.2. The evaporative emission canister must be prepared for the canister loading operation. The canister must not be removed from the vehicle, unless access to it in its normal location is so restricted that loading can only reasonably be accomplished by removing the canister from the vehicle. Special care must be taken during this step to avoid damage to the components and the integrity of the fuel system.

- 5.1.6.3. The canister is loaded with a mixture composed of 50 % butane and 50 % nitrogen by volume at a rate of 40 grams butane per hour.

- 5.1.6.4. As soon as the canister reaches breakthrough, the vapour source must be shut off.

- 5.1.6.5. The evaporative emission canister must then be reconnected and the vehicle restored to its normal operating condition.

5.1.7. *Fuel drain and refill*

- 5.1.7.1. The fuel tank(s) of the vehicle(s) is (are) emptied using the fuel tank drain(s). This must be done so as not to abnormally purge or abnormally load the evaporative control devices fitted to the vehicle. Removal of the fuel cap is normally sufficient to achieve this.

- 5.1.7.2. The fuel tank(s) is (are) refilled with test fuel at a temperature of between  $291\text{ °K} \pm 8\text{ °K}$  ( $18 \pm 8\text{ °C}$ ) to  $40 \pm 2\%$  of the tank's normal volumetric capacity. The fuel cap(s) of the vehicle must be fitted at this point.
- 5.2. **Preconditioning drive**
- 5.2.1. Within one hour from the completing of canister loading in accordance with 5.1.5 or 5.1.6 the vehicle is placed on the chassis dynamometer and driven through one Part One and two Part Two driving cycles of Type I test as specified in Annex III. Exhaust emissions are not sampled during this operation.
- 5.3. **Soak**
- 5.3.1. Within five minutes of completing the preconditioning operation specified in 5.2.1 the engine bonnet must be completely closed and the vehicle driven off the chassis dynamometer and parked in the soak area. The vehicle is parked for a minimum of 12 hours and a maximum of 36 hours. The engine oil and coolant temperatures must have reached the temperature of the area or within  $\pm 3\text{ °K}$  of it at the end of the period.
- 5.4. **Dynamometer test**
- 5.4.1. After conclusion of the soak period the vehicle is driven through a complete Type I test drive as described in Annex III (cold start urban and extra urban test). Then the engine is shut off. Exhaust emissions may be sampled during this operation but the results must not be used for the purpose of exhaust emission type-approval.
- 5.4.2. Within two minutes of completing the Type I test drive specified in 5.4.1 the vehicle is driven a further conditioning drive consisting of one urban test cycle (hot start) of a Type I test. Then the engine is shut off again. Exhaust emissions need not be sampled during this operation.
- 5.5. **Hot soak evaporative emissions test**
- 5.5.1. Before the completion of the conditioning drive the measuring chamber must be purged for several minutes until a stable hydrocarbon background is obtained. The enclosure mixing fan(s) must also be turned on at this time.
- 5.5.2. The hydrocarbon analyser must be zeroed and spanned immediately prior to the test.
- 5.5.3. At the end of the conditioning drive the engine bonnet must be completely closed and all connections between the vehicle and the test stand disconnected. The vehicle is then driven to the measuring chamber with a minimum use of the accelerator pedal. The engine must be turned off before any part of the vehicle enters the measuring chamber. The time at which the engine is switched off is recorded on the evaporative emission measurement data recording system and temperature recording begins. The vehicle's windows and luggage compartments must be opened at this stage, if not already opened.
- 5.5.4. The vehicle must be pushed or otherwise moved into the measuring chamber with the engine switched off.
- 5.5.5. The enclosure doors are closed and sealed gas-tight within two minutes of the engine being switched off and within seven minutes of the end of the conditioning drive.
- 5.5.6. The start of a  $60 \pm 0,5$  minute hot soak period begins when the chamber is sealed. The hydrocarbon concentration, temperature and barometric pressure are measured to give the initial readings  $C_{HC,i}$ ,  $P_i$  and  $T_i$  for the hot soak test. These figures are used in the evaporative emission calculation, section 6. The ambient SHED temperature  $T$  must not be less than  $296\text{ °K}$  and nor more than  $304\text{ °K}$  during the 60-minute hot soak period.
- 5.5.7. The hydrocarbon analyser must be zeroed and spanned immediately before the end of the  $60 \pm 0,5$  minute test period.
- 5.5.8. At the end of the  $60 \pm 0,5$  minute test period the hydrocarbon concentration in the chamber must be measured. The temperature and the barometric pressure are also measured. These are the final readings  $C_{HC,f}$ ,  $P_f$  and  $T_f$  for the hot soak test used for the calculation in section 6.
- 5.6. **Soak**
- 5.6.1. The test vehicle must be pushed or otherwise moved to the soak area without use of the engine and soaked for not less than 6 hours and not more than 36 hours between the end of the hot soak test and the start of the diurnal emission test. For at least 6 hours of this period the vehicle must be soaked at  $293\text{ °K} \pm 2\text{ °K}$  ( $20\text{ °C} \pm 2\text{ °C}$ ).

## 5.7. Diurnal test

- 5.7.1. The test vehicle must be exposed to one cycle of ambient temperature according to the profile specified in Appendix 2 with a maximum deviation of  $\pm 2^\circ\text{K}$  at any time. The average temperature deviation from the profile, calculated using the absolute value of each measured deviation, must not exceed  $1^\circ\text{K}$ . Ambient temperature must be measured at least every minute. Temperature cycling begins when time  $t_{\text{start}} = 0$ , as specified in 5.7.6.
- 5.7.2. The measuring chamber must be purged for several minutes immediately before the test until a stable background is obtainable. The chamber mixing fan(s) must also be switched on at this time.
- 5.7.3. The test vehicle, with the engine shut off and the test vehicle windows and luggage compartment(s) opened must be moved into the measuring chamber. The mixing fan(s) must be adjusted in such a way as to maintain a minimum air circulation of 8 km/h under the fuel tank of the test vehicle.
- 5.7.4. The hydrocarbon analyser must be zeroed and spanned immediately before the test.
- 5.7.5. The enclosure doors must be closed and gas-tight sealed.
- 5.7.6. Within 10 minutes of closing and sealing the doors, the hydrocarbon concentration, temperature and barometric pressure are measured to give the initial readings  $C_{\text{HC},i}$ ,  $P_i$  and  $T_i$  for the diurnal test. This is the point where time  $t_{\text{start}} = 0$ .
- 5.7.7. The hydrocarbon analyser must be zeroed and spanned immediately before the end of the test.
- 5.7.8. The end of the emission sampling period occurs 24 hours  $\pm 6$  minutes after the beginning of the initial sampling, as specified in 5.7.6. The time elapsed is recorded. The hydrocarbon concentration, temperature and barometric pressure are measured to give the final readings  $C_{\text{HC},f}$ ,  $P_f$  and  $T_f$  for the diurnal test used for the calculation in section 6. This completes the evaporative emission test procedure.

## 6. CALCULATION

- 6.1. The evaporative emission tests described in section 5 allow the hydrocarbon emissions from the diurnal and hot soak phases to be calculated. Evaporative losses from each of these phases is calculated using the initial and final hydrocarbon concentrations, temperatures and pressures in the enclosure, together with the net enclosure volume.

The formula below is used:

$$M_{\text{HC}} = k \cdot V \cdot 10^{-4} \cdot \left( \frac{C_{\text{HC},f} \cdot P_f}{T_f} - \frac{C_{\text{HC},i} \cdot P_i}{T_i} \right) + M_{\text{HC}, \text{out}} - M_{\text{HC}, i}$$

where:

$M_{\text{HC}}$  = hydrocarbon mass in grams

$M_{\text{HC}, \text{out}}$  = mass of hydrocarbon exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing (grams).

$M_{\text{HC}, i}$  = mass of hydrocarbon entering the enclosure, in the case of fixed-volume enclosures for diurnal emission testing (grams).

$C_{\text{HC}}$  = measured hydrocarbon concentration in the enclosure (ppm (volume)  $C_1$  equivalent),

$V$  = net enclosure volume in cubic metres corrected for the volume of the vehicle, with the windows and the luggage compartment open. If the volume of the vehicle is not determined a volume of  $1,42 \text{ m}^3$  is subtracted.

$T$  = ambient chamber temperature, in  $^\circ\text{K}$ ,

$P$  = barometric pressure in kPa,

$\text{H/C}$  = hydrogen to carbon ration,

$k$  =  $1,2 \cdot (12 + \text{H/C})$ ;

where:

$i$  is the initial reading,

$f$  is the final reading,

$\text{H/C}$  is taken to be 2,33 for diurnal test losses,

$\text{H/C}$  is taken to be 2,20 for hot soak losses.

## 6.2. Overall results of test

The overall hydrocarbon mass emission for the vehicle is taken to be:

$$M_{\text{total}} = M_{\text{DI}} + M_{\text{HS}}$$

where:

- $M_{\text{total}}$  = overall mass emissions of the vehicle (grams),
- $M_{\text{DI}}$  = hydrocarbon mass emission for diurnal test (grams),
- $M_{\text{HS}}$  = hydrocarbon mass emission for the hot soak (grams).'

## Appendix 1

35. Sections 1 and 2 read as follows:

### 1. CALIBRATION FREQUENCY AND METHODS

- 1.1. All equipment must be calibrated before its initial use and then calibrated as often as necessary and in any case in the month before type-approval testing. The calibration methods to be used are described in this Appendix.
- 1.2. Normally the series of temperatures which are mentioned firstly must be used. The series of temperatures within square brackets may alternatively be used.

### 2. CALIBRATION OF THE ENCLOSURE

#### 2.1. Initial determination of enclosure internal volume

- 2.1.1. Before its initial use, the internal volume of the chamber must be determined as follows. The internal dimensions of the chamber are carefully measured, allowing for any irregularities such as bracing struts. The internal volume of the chamber is determined from these measurements.

For variable-volume enclosures, the enclosure must be latched to a fixed volume when the enclosure is held at an ambient temperature of 303 °K (30 °C) [(302 °K (29 °C))]. This nominal volume must be repeatable within  $\pm 0,5$  % of the reported value.

- 2.1.2. The net internal volume is determined by subtracting 1,42 m<sup>3</sup> from the internal volume of the chamber. Alternatively the volume of the test vehicle with the luggage compartment and windows open may be used instead of the 1,42 m<sup>3</sup>.
- 2.1.3. The chamber must be checked as in 2.3. If the propane mass does not agree with the injected mass to within  $\pm 2$  % then corrective action is required.

#### 2.2. Determination of chamber background emissions

This operation determines that the chamber does not contain any materials that emit significant amounts of hydrocarbons. The check must be carried out at the enclosure's introduction to service, after any operations in the enclosure which may affect background emissions and at a frequency of at least once per year.

- 2.2.1. Variable-volume enclosures may be operated in either latched or unlatched volume configuration, as described in 2.1.1. Ambient temperatures must be maintained at 308 °K  $\pm 2$  °K (35°  $\pm 2$  °C) [309 °K  $\pm 2$  °K (36°  $\pm 2$  °C)], throughout the 4-hour period mentioned below.
- 2.2.2. Fixed volume enclosures must be operated with inlet and outlet flow streams closed. Ambient temperatures must be maintained at 308 °K  $\pm 2$  °K (35°  $\pm 2$  °C) [309 °K  $\pm 2$  °K (36°  $\pm 2$  °C)] throughout the four-hour period mentioned below.
- 2.2.3. The enclosure may be sealed and the mixing fan operated for a period of up to 12 hours before the four-hour background sampling period begins.
- 2.2.4. the analyser (if required) must be calibrated, then zeroed and spanned.
- 2.2.5. The enclosure must be purged until a stable hydrocarbon reading is obtained, and the mixing fan turned on if not already on.

- 2.2.6. The chamber is then sealed and the background hydrocarbon concentration, temperature and barometric pressure are measured. These are the initial readings  $C_{HC,i}$ ,  $P_i$  and  $T_i$  used in the enclosure background calculation.
- 2.2.7. The enclosure is allowed to stand undisturbed with the mixing fan on for a period of four hours.
- 2.2.8. At the end of this time the same analyser is used to measure the hydrocarbon concentration in the chamber. The temperature and the barometric pressure are also measured. These are the final readings  $C_{HC,f}$ ,  $P_f$  and  $T_f$ .
- 2.2.9. The change in mass of hydrocarbons in the enclosure must be calculated over the time of the test in accordance with 2.4. The background emission of the enclosure must not exceed 0,05 g.

2.3. **Calibration and hydrocarbon retention test of the chamber**

The calibration and hydrocarbon retention test in the chamber provides a check on the calculated volume in 2.1 and also measures any leak rate. The enclosure leak rate must be determined at the enclosure's introduction to service, after any operations in the enclosure which may affect the integrity of the enclosure, and at least monthly thereafter. If six consecutive monthly retention checks are successfully completed without corrective action, the enclosure leak rate may be determined quarterly thereafter as long as no corrective action is required.

- 2.3.1. The enclosure must be purged until a stable hydrocarbon concentration is reached. The mixing fan is turned on, if not already switched on. The hydrocarbon analyser is zeroed, calibrated if required, and spanned.
- 2.3.2. On variable-volume enclosures the enclosure must be latched to the nominal volume position. On fixed-volume enclosures the outlet and inlet flow streams must be closed.
- 2.3.3. The ambient temperature control system is then turned on (if not already on) and adjusted for an initial temperature of 308 °K (35 °C) [309 °K (36 °C)].
- 2.3.4. When the enclosure stabilizes at 308 °K  $\pm$  2 °K (35°  $\pm$  2 °C) [309 °K  $\pm$  2 °K (36°  $\pm$  2 °C)], the enclosure is sealed and the background concentration, temperature and barometric pressure measured. These are the initial readings  $C_{HC,i}$ ,  $P_i$  and  $T_i$  used in the enclosure calibration.
- 2.3.5. A quantity of approximately 4 grams of propane is injected into the enclosure. The mass of propane must be measured to an accuracy and precision of  $\pm$  02, % of the measured value.
- 2.3.6. The contents of the chamber must be allowed to mix for five minutes and then the hydrocarbon concentration, temperature and barometric pressure are measured. These are the final readings  $C_{HC,f}$ ,  $P_f$  and  $T_f$  for the calibration of the enclosure as well as the initial readings  $C_{HC,i}$ ,  $P_i$  and  $T_i$  for the retention check.
- 2.3.7. On the basis of the readings taken in 2.3.4 and 2.3.6 and the formula in 2.4, the mass of propane in the enclosure is calculated. This must be within  $\pm$  2 % of the mass of propane measured in 2.3.5..
- 2.3.8. For variable-volume enclosures the enclosure must be unlatched from the nominal volume configuration. For fixed-volume enclosures, the outlet and inlet flow streams must be opened.
- 2.3.9. The process is then begun of cycling the ambient temperature from 308 °K (35 °C) to 293 °K (20 °C) and back to 308 °K (35 °C) [308,6 °K (35,6 °C) to 295,2 °K (22,2 °C) and back to 308,6 °K (35,6 °C)] over a 24-hour period according to the profile [alternative profile] specified in Appendix 2 within 15 minutes of sealing the enclosure. (Tolerances as specified in section 5.7.1 of Annex VI).
- 2.3.10. At the completion of the 24-hour cycling period, the final hydrocarbon concentration, temperature and barometric pressure are measured and recorded. These are the final readings  $C_{HC,f}$ ,  $T_f$  and  $P_f$  for the hydrocarbon retention check.
- 2.3.11. Using the formula in 2.4, the hydrocarbon mass is then calculated from the readings taken in 2.3.10 and 2.3.6. The mass may not differ by more than 3 % from the hydrocarbon mass given by 2.3.7.

2.4. **Calculations**

The calculation of net hydrocarbon mass change within the enclosure is used to determine the chamber's hydrocarbon background and leak rate. Initial and final readings of hydrocarbon concentration, temperature and barometric pressure are used in the following formula to calculate the mass change.

$$M_{HC} = k \cdot V \cdot 10^{-4} \cdot \left( \frac{C_{HC, f} \cdot P_f}{T_f} - \frac{C_{HC, i} \cdot P_i}{T_i} \right) + M_{HC, out} - M_{HC, i}$$

where:

$M_{HC}$  = hydrocarbon mass in grams

$M_{HC, out}$  = mass of hydrocarbon exiting the enclosure, in the case of fixed-volume enclosures for diurnal emission testing (grams)

$M_{HC, i}$  = mass of hydrocarbon entering the enclosure, in the case of fixed volume enclosures for diurnal emission testing (grams)

$C_{HC}$  = hydrocarbon concentration in the enclosure (ppm carbon (NB: ppm carbon = ppm propane x 3))

$V$  = enclosure volume in cubic metres as measured in section 2.1.1.

$T$  = ambient temperature in the enclosure in K,

$P$  = barometric pressure in kPa,

$k$  = 17,6;

where:

$i$  is the initial reading.

$f$  is the final reading'

## Appendix 2

36. The following new Appendix 2 is added:

### 'Appendix 2

Diurnal ambient temperature profile for the calibration of the enclosure and the diurnal emission test

Time (hours)		Temperature (°C <sub>i</sub> )
calibration	test	
16	0	20
17	1	20,2
18	2	20,5
19	3	21,2
20	4	23,1
21	5	25,1
22	6	27,2
23	7	29,8
24	8	31,8
0	9	33,3
1	10	34,4
2	11	35
3	12	34,7
4	13	33,8
5	14	32
6	15	30
7	16	28,4
8	17	26,9
9	18	25,2
10	19	24
11	20	23
12	21	22
13	22	20,8
14	23	20,2
15	24	20

Alternative diurnal ambient temperature profile for the calibration of the enclosure in accordance with Appendix 1, sections 1.2 and 2.3.9

Time (hours)	Temperature (°C <sub>i</sub> )
0	35,6
1	35,3
2	34,5
3	33,2
4	31,4
5	29,7
6	28,2
7	27,2
8	26,1
9	25,1
10	24,3
11	23,7
12	23,3
13	22,9
14	22,6
15	22,2
16	22,5
17	24,2
18	26,8
19	29,6
20	31,9
21	33,9
22	35,1
23	35,4
24	35,6

## ANNEX VII

37. A new Annex VII is introduced as follows:

**'ANNEX VII****TYPE VI TEST**

(Verifying the average low ambient temperature carbon monoxide and hydrocarbon tailpipe emissions after a cold start)

**1. INTRODUCTION**

This Annex applies only to vehicles with positive-ignition engines. It describes the equipment required and the procedure for the Type VI test defined in section 5.3.5 of Annex I in order to verify the emissions of carbon monoxide and hydrocarbons at low ambient temperatures. Topics addressed in this Annex include:

1. Equipment requirements;
2. Test conditions;
3. Test procedures and data requirements.

**2. TEST EQUIPMENT****2.1. Summary**

- 2.1.1. This chapter deals with the equipment needed for low ambient temperature exhaust emission tests on positive-ignition M<sub>1</sub> vehicles. Equipment required and specifications are equivalent with the requirements for the Type I test as specified in Annex III, with appendices, if specific requirements for the Type VI test are not prescribed. Sections 2.2 to 2.6 describe deviations applicable to Type VI low ambient temperature testing.

**2.2. Chassis dynamometer**

- 2.2.1. The requirements of section 4.1 of Annex III apply. The dynamometer must be adjusted to simulate the operation of a vehicle on the road at 266 °K (-7 °C). Such adjustment may be based on a determination of the road load force profile at 266 °K (-7 °C). Alternatively the driving resistance determined according to Appendix 3 of Annex III may be adjusted for a 10 % decrease of the coast-down time. The technical service may approve the use of other methods of determining the driving resistance.
- 2.2.2. For calibration of the dynamometer the provisions of Appendix 2 of Annex III apply.

**2.3. Sampling system**

- 2.3.1. The provisions of section 4.2 of Annex III and Appendix 5 of Annex III apply. Section 2.3.2 in Appendix 5 is modified to read: "The piping configuration, flow capacity of the CVS, and the temperature and specific humidity of the dilution air (which may be different from the vehicle combustion air source) must be controlled so as to virtually eliminate water condensation in the system (a flow of 0,142 to 0,165 m<sup>3</sup>/s is sufficient for most vehicles)."

**2.4. Analytical equipment**

- 2.4.1. The provisions of section 4.3 of Annex III apply, but only for carbon monoxide, carbon dioxide, and hydrocarbon testing.
- 2.4.2. For calibrations of the analytical equipment the provisions of Appendix 6 of Annex III apply.

**2.5. Gases**

- 2.5.1. The provisions of section 4.5 of Annex III apply, where they are relevant.

**2.6. Additional equipment**

- 2.6.1. For equipment used for the measurement of volume, temperature, pressure and humidity the provisions in sections 4.4 and 4.6 of Annex III apply.

**3. TEST SEQUENCE AND FUEL****3.1. General requirements**

- 3.1.1. The test sequence in Figure VII.1 shows the steps encountered as the test vehicle undergoes the procedures for the Type VI test. Ambient temperature levels encountered by the test vehicle must average: 266 °K (-7 °C) ± 3 °K and must:

not be less than 260 °K (-13 °C), no more than 272 °K (-1 °C).

The temperature may:

not fall below 263 °K (-10 °C), or exceed 269 °K (-4 °C)

for more than three consecutive minutes.

- 3.1.2. The test cell temperature monitored during testing must be measured at the output of the cooling fan (section 5.2.1 of this Annex). The ambient temperature reported must be an arithmetic average of the test cell temperatures measured at constant intervals no more than one minute apart.

### 3.2. Test procedure

The part one urban driving cycle according to Figure III.1.1 in Annex III – Appendix 1, consists of four elementary urban cycles which together makes a complete part one cycle.

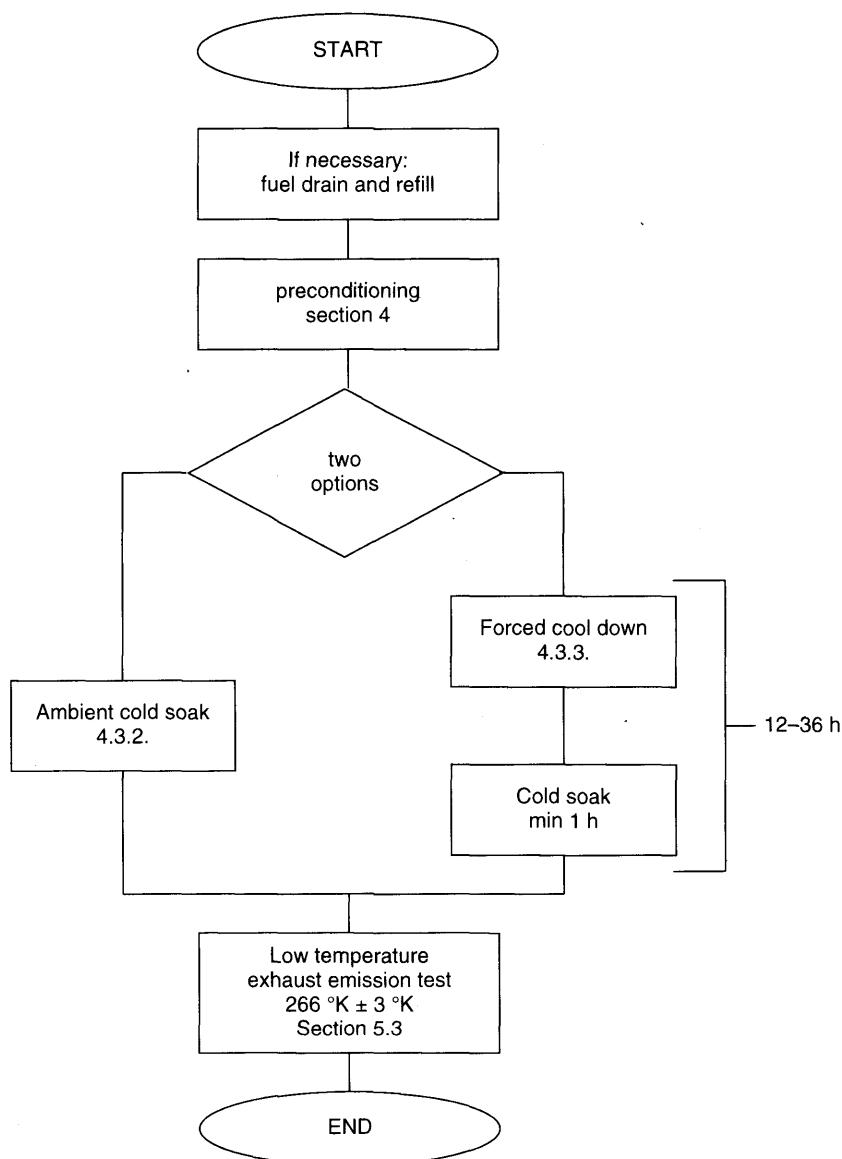
- 3.2.1. Start of engine, start of the sampling and the operation of the first cycle must be in accordance with Table III.1.2 and Figure III.1.2.

### 3.3. Preparation for the test

- 3.3.1. For the test vehicle the provisions of section 3.1 of Annex III apply. For setting the equivalent inertia mass on the dynamometer the provisions of section 5.1 of Annex III apply.

Figure VII.1

#### Procedure for low ambient temperature test





### 3.4. Test fuel

- 3.4.1. The test fuel used must have the specification that follows from the provisions in section 3 of Annex IX. A manufacturer may choose to use the test fuel specified in section 1 of Annex IX.

## 4. VEHICLE PRECONDITIONING

### 4.1. Summary

- 4.1.1. To ensure reproducible emission tests, the test vehicles must be conditioned in a uniform manner. The conditioning consists of a preparatory drive on a chassis dynamometer followed by a soak period before the emission test according to 4.3.

### 4.2. Preconditioning

- 4.2.1. The fuel tank(s) must be filled with the specified test fuel. If the existing fuel in the fuel tank(s) does not meet the specifications contained in 3.4.1, the existing fuel must be drained prior to the fuel fill. The test fuel must be at a temperature less than or equal to 289 °K (+ 16 °C). For the above operations the evaporative emission control system must neither be abnormally purged nor abnormally loaded.
- 4.2.2. The vehicle is moved to the test cell and placed on the chassis dynamometer.
- 4.2.3. The preconditioning consists of the driving cycle according to Annex III — Appendix 1 Figure III.1.1, parts one and two. At the request of the manufacturer, vehicles with a positive-ignition engine may be preconditioned with one Part I and two Part II driving cycles.
- 4.2.4. During the preconditioning the test cell temperature must remain relatively constant and not be higher than 303 °K (30 °C).
- 4.2.5. The drive-wheel tyre pressure must be set in accordance with the provisions of section 5.3.2 of Annex III.
- 4.2.6. Within ten minutes of completion of the preconditioning, the engine must be switched off.
- 4.2.7. If requested by the manufacturer and approved by the technical service, additional preconditioning may in exceptional cases be allowed. The technical service may also choose to conduct additional preconditioning. The additional preconditioning consists of one or more driving schedules of the part one cycle as described in Annex III — Appendix 1. The extent of such additional preconditioning must be recorded in the test report.

### 4.3. Soak methods

- 4.3.1. One of the following two methods, to be selected by the manufacturer, must be utilized to stabilize the vehicle before the emission test.
- 4.3.2. *Standard method.* The vehicle is stored for not less than 12 hours nor for more than 36 hours prior to the low ambient temperature tailpipe emission test. The ambient temperature (dry bulb) during this period must be maintained at an average temperature of:
- 266 °K (-7 °C) ± 3 °K during each hour of this period and must not be less than 260 °K (-13 °C) nor more than 272 °K (-1 °C). In addition, the temperature may not fall below 263 °K (-10 °C) nor more than 269 °K (-4 °C) for more than three consecutive minutes.
- 4.3.3. *Forced method* <sup>(1)</sup>. The vehicle must be stored for not more than 36 hours prior to the low ambient temperature tailpipe emission test.
- 4.3.3.1. The vehicle must not be stored at ambient temperatures which exceed 303 °K (30 °C) during this period.
- 4.3.3.2. Vehicle cooling may be accomplished by force-cooling the vehicle to the test temperature. If cooling is augmented by fans, the fans must be placed in a vertical position so that the maximum cooling of the drive train and engine is achieved and not primarily the sump. Fans must not be placed under the vehicle.

<sup>(1)</sup> The provisions concerning "forced cool down methods" must be re-examined without delay in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.

- 4.3.3.3. The ambient temperature need only be stringently controlled after the vehicle has been cooled to:

266 °K (-7 °C)  $\pm$  2 °K,

as determined by a representative bulk oil temperature. A representative bulk oil temperature is the temperature of the oil measured near the middle of the oil, not at the surface or at the bottom of the oil sump. If two or more diverse locations in the oil are monitored, they must all meet the temperature requirements.

- 4.3.3.4. The vehicle must be stored for at least one hour after it has been cooled to 266 °K (-7 °C)  $\pm$  2 °K, prior to the low ambient temperature tailpipe emission test. The ambient temperature (dry bulb) during this period must average 266 °K (-7 °C)  $\pm$  3 °K, and must:

not be less than 260 °K (-13 °C) nor more than 272 °K (-1 °C),

In addition, the temperature may:

not fall below 263 °K (-10 °C) or exceed 269 °K (-4 °C),

for more than three consecutive minutes.

- 4.3.4. If the vehicle is stabilized at 266 °K (-7 °C), in a separate area and is moved through a warm area to the test cell, the vehicle must be restabilized in the test cell for at least six times the period the vehicle is exposed to warmer temperatures. The ambient temperature (dry bulb) during this period

must average 266 °K (-7 °C)  $\pm$  3 °K and must not be less than 260 °K (-13 °C) nor more than 272 °K (-1 °C).

In addition, the temperature may:

not fall below 263 °K (-10 °C) or exceed 269 °K (-4 °C), for more than three consecutive minutes.

## 5. DYNAMOMETER PROCEDURE

### 5.1. Summary

- 5.1.1. The emission sampling is performed over a test procedure consisting of the part one cycle (Annex III — Appendix 1 Figure III.1.1). Engine start-up, immediate sampling, operation over the part one cycle and engine shut-down make a complete low ambient temperature test, with a total test time of 780 seconds. The tailpipe emissions are diluted with ambient air and a continuously proportional sample is collected for analysis. The exhaust gases collected in the bag are analysed for hydrocarbons, carbon monoxide, and carbon dioxide. A parallel sample of the dilution air is similarly analysed for carbon monoxide, hydrocarbons and carbon dioxide.

### 5.2. Dynamometer operation

#### 5.2.1. *Cooling fan*

- 5.2.1.1. The test must be carried out with the bonnet raised, unless this is technically impossible. A cooling fan is positioned so that cooling air is appropriately directed to the radiator (water cooling) or to the air intake (air-cooling) and to the vehicle.

- 5.2.1.2. For front-engined vehicles, the fan must be positioned in front of the vehicle, within 300 mm of it. In the case of rear-engined vehicles or if the above arrangement is impractical, the cooling fan must be positioned so that sufficient air is supplied to cool the vehicle.

- 5.2.1.3. The fan speed must be such that, within the operating range of 10 km/h to at least 50 km/h, the linear velocity of the air at the blower outlet is within  $\pm$  5 km/h of the corresponding roller speed. The final selection of the blower must have the following characteristics:

— area: at least 0,2 m<sup>2</sup>

— height of the lower edge above ground: approximately 20 cm

— distance from the front of the vehicle: approximately 30 cm.

As an alternative the blower speed must be at least 6 m/s (21,6 km/h). At the request of the manufacturer, for special vehicles (e.g. vans, off-road) the height of the cooling fan may be modified.

- 5.2.1.4. The vehicle speed as measured from the dynamometer roll(s) must be used (section 4.1.4.4 of Annex III)..
- 5.2.3. Preliminary testing cycles may be carried out if necessary, to determine how best to actuate the accelerator and brake controls so as to achieve a cycle approximating to the theoretical cycle within the prescribed limits, or to permit sampling system adjustment. Such driving must be carried out before "START" according to Figure VII.1.
- 5.2.4. Humidity in the air must be kept low enough to prevent condensation on the dynamometer roll(s).
- 5.2.5. The dynamometer must be thoroughly warmed as recommended by the dynamometer manufacturer, and using procedures or control methods that assure stability of the residual frictional horsepower.
- 5.2.6. The time between dynamometer warming and the start of the emission test must be no longer than 10 minutes if the dynamometer bearings are not independently heated. If the dynamometer bearings are independently heated, the emission test must begin no longer than 20 minutes after dynamometer warming.
- 5.2.7. If the dynamometer horsepower must be adjusted manually, it must be set within one hour prior to the tailpipe emission test phase. The test vehicle may not be used to make the adjustment. The dynamometer, using automatic control of preselectable power settings, may be set at any time prior to the beginning of the emission test.
- 5.2.8. Before the emission test driving schedule may begin, the test cell temperature must be  $266\text{ }^{\circ}\text{K} (-7\text{ }^{\circ}\text{C}) \pm 2\text{ }^{\circ}\text{K}$ , as measured in the air stream of the cooling fan with a maximum distance of 1 m-1,5 m from the vehicle.
- 5.2.9. During operation of the vehicle the heating and defrosting devices must be shut off.
- 5.2.10. The total driving distance or roller revolutions measured are recorded.
- 5.2.11. A four-wheel drive vehicle must be tested in a two-wheel drive mode of operation. The determination of the total road force for dynamometer setting is performed while operating the vehicle in its primary designed driving mode.
- 5.3. **Performing the test**
- 5.3.1. The provisions of sections 6.2 to 6.6, excluding 6.2.2, of Annex III apply in respect of starting the engine, carrying out the test and taking the emission samples. The sampling begins before or at the initiation of the engine start-up procedure and ends on conclusion of the final idling period of the last elementary cycle of the part one (urban driving cycle), after 780 seconds.
- The first driving cycle starts with a period of 11 seconds idling as soon as the engine has started.
- 5.3.2. For the analysis of the sampled emissions the provisions of section 7.2 of Annex III apply. In performing the exhaust sample analysis the technical service must exercise care to prevent condensation of water vapour in the exhaust gas sampling bags.
- 5.3.3. For the calculations of the mass emissions the provisions of section 8 of Annex III apply.
6. **OTHER REQUIREMENTS**
- 6.1. **Irrational emission control strategy**
- 6.1.1. Any irrational emission control strategy which results in a reduction in effectiveness of the emission control system under normal operating conditions at low temperature driving, so far as not covered by the standardized emission tests, may be considered a defeat device."

Annexes VII, VIII and IX become Annexes VIII, IX and X.

## ANNEX VIII

38. The first subparagraph of section 6 reads as follows:

"At the start of the test (0 km), and every 10 000 km ( $\pm 400$  km) or more frequently, at regular intervals until having covered 80 000 km, tailpipe emissions are measured in accordance with the type I test as defined in section 5.3.1 of Annex I. The limit values to be complied with are those laid down in section 5.3.1.4 of Annex I."

## ANNEX IX

39. Annex IX is replaced by the following text:

## ‘ANNEX IX

## SPECIFICATIONS OF REFERENCE FUELS

## 1. TECHNICAL DATA OF THE REFERENCE FUEL TO BE USED FOR TESTING VEHICLES EQUIPPED WITH POSITIVE-IGNITION ENGINES

Type: petrol, unleaded (regular, premium, super)

Parameter	Unit	Limits <sup>(1)</sup>		Test Method	Publication
		Minimum	Maximum		
Research octane number, RON		95,0	—	EN 25164	1993
Motor octane number, MON		85,0	—	EN 25163	1993
Density at 15 °C	kg/l	0,748	0,762	ISO 3675	1995
Reid vapour pressure, — summer period	kPa	56,0	60,0	EN 12	1993
Distillation:					
— initial boiling point	°C	24	40	EN-ISO 3405	1988
— evaporated at 100 °C	% v/v	49,0	57,0	EN-ISO 3405	1988
— evaporated at 150 °C	% v/v	81,0	87,0	EN-ISO 3405	1988
— final boiling point	°C	190	215	ASTM D 86	
Residue	%	—	2	ASTM D 86	
Hydrocarbon analysis:					
— olefins	% v/v	—	10	ASTM D 1319	1995
— aromatics	% v/v	28,0	40,0	ASTM D 1319	1995
— benzene	% v/v	—	1,0	pr EN 12177	[1998] (*)
— saturates		—	balance	ASTM D 1319	1995
Carbon/hydrogen ratio		ratio			
Oxidation stability <sup>(2)</sup>	Min.	480	—	EN-ISO 7536	1996
Oxygen content	% m/m	—	1,5	EN 1601	[1997] (*)
Existent gum	mg/ml	—	0,04	EN-ISO 6246	[1997] (*)
Sulphur content	mg/kg	—	100	pr EN-ISO/DIS 14596	[1998] (*)
Copper corrosion at 50 °C		—	1	EN-ISO 2160	1995
Lead content	g/l	—	0,005	EN 237	1996
Phosphorus content	g/l	—	0,0013	ASTM D 3231	1994

(\*) The month of publication will be completed in due course

<sup>(1)</sup> The values quoted in the specification are ‘true values’. In establishment of their limit values the terms of ISO 4259 ‘Petroleum products — Determination and application of precision data in relation to methods of test’ have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility).

Notwithstanding this measure, which is necessary for statistical reasons, the manufacturer of fuels should nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify the question as to whether a fuel meets the requirements of the specifications, the terms of ISO 4259 should be applied.

<sup>(2)</sup> The fuel may contain oxidation inhibitors and metal deactivators normally used to stabilize refinery gasoline streams, but detergent/dispersant additives and solvent oils must not be added.

## 2. TECHNICAL DATA OF THE REFERENCE FUEL TO BE USED FOR TESTING VEHICLES EQUIPPED WITH A DIESEL ENGINE

Type: Diesel fuel

Parameter	Unit	Limits <sup>(1)</sup>		Test Method	Publication
		Min	Max		
Cetane number <sup>(2)</sup>		52,0	54	EN-ISO 5165	1998 (*)
Density at 15 °C	kg/m <sup>3</sup>	833	837	EN-ISO 3675	1995
Distillation					
— 50 % point	°C	245	—	EN-ISO 3405	1988
— 95 % point	°C	345	350	EN-ISO 3405	1988
— final boiling point	°C	—	370	EN-ISO 3405	1988
Flash point	°C	55	—	EN 22719	1993
CFPP	°C	—	-5	EN 116	1981
Viscosity at 40 °C	mm <sup>2</sup> /s	2,5	3,5	EN-ISO 3104	1996
Polycyclic aromatic hydrocarbons	% m/m	3	6,0	IP 391 (**)	1995
Sulphur content	mg/kg	—	300	pr EN-ISO/DIS 14596	1998 (*)
Copper corrosion		—	1	EN-ISO 2160	1995
Conradson carbon residue (10 % DR)	% m/m	—	0,2	EN-ISO 10370	1995
Ash content	% m/m	—	0,01	EN-ISO 6245	1995
Water content	% m/m	—	0,05	EN-ISO 12937	[1998] (*)
Neutralization (strong acid) number	mg KOH/g	—	0,02	pm	
Oxidation stability <sup>(3)</sup>	mg/ml	—	0,025	EN-ISO 12205	1996
(**) New and better method for polycyclic aromatics under development	% m/m	—	—	EN 12916	[1997] (*)

(\*) The month of publication will be completed in due course.

<sup>(1)</sup> The values quoted in the specification are 'true values'. In establishment of their limit values the terms of ISO 4259 'Petroleum products — Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility).

Notwithstanding this measure, which is necessary for statistical reasons, the manufacturer of fuels should nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify the question as to whether a fuel meets the requirements of the specifications, the terms of ISO 4259 should be applied.

<sup>(2)</sup> The range for cetane number is not in accordance with the requirement of a minimum range of 4R. However, in the case dispute between fuel supplier and fuel user, the terms in ISO 4259 may be used to resolve such disputes provided replicate measurements of sufficient number to achieve the necessary precision, are made in preference to single determinations.

<sup>(3)</sup> Even though oxidation stability is controlled, it is likely that shelf life will be limited. Advice should be sought from the supplier as to storage conditions and life.

### 3. TECHNICAL DATA OF THE REFERENCE FUEL TO BE USED FOR TESTING VEHICLES EQUIPPED WITH POSITIVE-IGNITION ENGINES AT LOW AMBIENT TEMPERATURE TYPE VI TEST (\*)

Type: Unleaded premium petrol

Parameter	Unit	Limits <sup>(1)</sup>		Test Method	Publication <sup>(**)</sup>
		Min	Max		
Research octane number, RON		95,0	—	EN 25164	1993
Motor octane number, MON		85,0	—	EN 25163	1993
Density at 15 °C	kg/l	0,748	0,775	ISO 3675	1995
Reid vapour pressure	kPa	56,0	95,0	EN 12	1993
Distillation					
— initial boiling point	°C	24	40	EN-ISO 3405	1988
— evaporated at 100 °C	% v/v	49,0	57,0	EN-ISO 3405	1988
— evaporated at 150 °C	% v/v	81,0	87,0	EN-ISO 3405	1988
— final boiling point	°C	190	215	ASTM D 86	
Residue	%	—	2	ASTM D 86	
Hydrocarbon analysis:					
— olefins	% v/v	—	10	ASTM D 1319	1995
— aromatics	% v/v	28,0	40,0	ASTM D 1319	1995
— benzene	% v/v	—	1,0	pr EN 12177	[1998] <sup>(**)</sup>
— saturates		—	balance	ASTM D 1319	1995
Carbon/hydrogen ratio		ratio			
Oxidation stability <sup>(2)</sup>	mn.	480	—	EN-ISO 7536	1996
Oxygen content	% m/m	—	2,3	EN 1601	[1997] <sup>(**)</sup>
Existent gum	mg/ml	—	0,04	EN-ISO 6246	[1997] <sup>(**)</sup>
Sulphur content	mg/kg	—	100	pr EN-ISO/DIS 14596	[1998] <sup>(**)</sup>
Copper corrosion at 50 °C		—	1	EN-ISO 2160	1995
Lead content	g/l	—	0,005	EN 237	1996
Phosphorous content	g/l	—	0,0013	ASTM D 3231	1994

(\*) Petrol having the specification in the above table must be used in low ambient temperature Type VI testing, if the manufacturer does not specifically choose the fuel in section 1 of this Annex in accordance with section 3.4 of Annex VII.

(\*\*) The month of publication will be completed in due course.

<sup>(1)</sup> The values quoted in the specification are 'true values'. In establishment of their limit values the terms of ISO 4259 'Petroleum products — Determination and application of precision data in relation to methods of test' have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility).

Notwithstanding this measure, which is necessary for statistical reasons, the manufacturer of fuels should nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify the question as to whether a fuel meets the requirements of the specifications, the terms of ISO 4259 should be applied.

<sup>(2)</sup> The fuel may contain oxidation inhibitors and metal deactivators normally used to stabilize refinery gasoline streams, but detergent/dispersant additives and solvent oils must not be added.

## ANNEX X

40. Section 1.8 of the Appendix is replaced by the following:

‘1.8. Test results: .....

Type I	CO (g/km)	HC <sup>(3)</sup>	NO <sub>x</sub> <sup>(3)</sup>	HC + NO <sub>x</sub> (g/km)	Particulates <sup>(2)</sup> (g/km)
measured					
with DF					

Type II: ..... %

Type III: .....

Type IV: ..... g/test

Type V: — Durability type: 80 000 km, not applicable <sup>(1)</sup>

— Deterioration factor DF: calculated, fixed <sup>(1)</sup>

— Specify the values:

.....

Type VI	CO (g/km)	HC (g/km)
Measured value		

1.8.1. Written description and/or drawing of the MI:

.....

1.8.2. List and function of all components monitored by the OBD system:

.....

1.8.3. Written description (general working principles) for:

.....

1.8.3.1. Misfire detection <sup>(4)</sup>:

.....

1.8.3.2. Catalyst monitoring <sup>(4)</sup>:

.....

1.8.3.3. Oxygen sensor monitoring <sup>(4)</sup>:

.....

- 1.8.3.4. Other components monitored by the OBD system <sup>(4)</sup>:  
.....
- 1.8.3.5. Catalyst monitoring <sup>(5)</sup>:  
.....
- 1.8.3.6. Particulate trap monitoring <sup>(5)</sup>:  
.....
- 1.8.3.7. Electronic fuelling system actuator monitoring <sup>(5)</sup>:  
.....
- 1.8.3.8. Other components monitored by the OBD system <sup>(5)</sup>:  
.....
- 1.8.4. Criteria for MI activation (fixed number of driving cycles or statistical method):  
.....
- 1.8.5. List of all OBD output codes and formats used (with explanation of each):  
.....

<sup>(1)</sup> Delete where inapplicable.  
<sup>(2)</sup> For compression-ignition engined vehicles.  
<sup>(3)</sup> For vehicles equipped with positive-ignition engines.  
<sup>(4)</sup> In the case of positive-ignition engines.  
<sup>(5)</sup> In the case of compression-ignition engines.

41. A new section 1.9 of the Appendix is added as follows:

‘1.9. Emissions data required for roadworthissess testing

Test	CO value (% vol)	Lambda <sup>(1)</sup>	Engine speed (min <sup>-1</sup> )	Engine oil temperature (°C)
Low idle test		N/A		
High idle test				

<sup>(1)</sup> Lambda formula: see Annex I, section 5.3.7.3, footnote 1.’

ANNEX XI

42. A new Annex XI is added to read as follows:

‘ANNEX XI

ON-BOARD DIAGNOSTICS (OBD) FOR MOTOR VEHICLES

1. INTRODUCTION

This Annex applies to the functional aspects of on-board diagnostic (OBD) system for the emission control of motor vehicles.



## 2. DEFINITIONS

For the purposes of this Annex:

- 2.1. 'OBD' means an on-board diagnostic system for emission control which must have the capability of identifying the likely area of malfunction by means of fault codes stored in computer memory.
- 2.2. 'Vehicle type' means a category of power-driven vehicles which do not differ in such essential engine and OBD system characteristics as defined in Appendix 2.
- 2.3. 'Vehicle family' means a manufacturer's grouping of vehicles which, through their design, are expected to have similar exhaust emission and OBD system characteristics. Each engine of this family must have complied with the requirements of this Directive.
- 2.4. 'Emission control system' means the electronic engine management controller and any emission-related component in the exhaust or evaporative system which supplies an input to or receives an output from this controller.
- 2.5. 'Malfunction indicator (MI)' means a visible or audible indicator that clearly informs the driver of the vehicle in the event of a malfunction of any emission-related component connected to the OBD system, or the OBD system itself.
- 2.6. 'Malfunction' means the failure of an emission-related component or system that would result in emissions exceeding the limits in section 3.3.2.
- 2.7. 'Secondary air' refers to air introduced into the exhaust system by means of a pump or aspirator valve or other means that is intended to aid in the oxidation of HC and CO contained in the exhaust gas stream.
- 2.8. 'Engine misfire' means lack of combustion in the cylinder of a positive-ignition engine due to absence of spark, poor fuel metering, poor compression or any other cause. In terms of OBD monitoring it is that percentage of misfires out of a total number of firing events (as declared by the manufacturer) that would result in emissions exceeding the limits given in section 3.3.2 or that percentage that could lead to an exhaust catalyst, or catalysts, overheating causing irreversible damage.
- 2.9. 'Type I test' means the driving cycle (Parts One and Two) used for emission approvals, as detailed in Annex III, Appendix 1.
- 2.10. 'A driving cycle' consists of engine start-up, driving mode where a malfunction would be detected if present, and engine shut-off.
- 2.11. 'A warm-up cycle' means sufficient vehicle operation such that the coolant temperature has risen by at least 22 °K from engine starting and reaches a minimum temperature of 343 °K (70 °C).
- 2.12. 'Fuel trim' refers to feedback adjustments to the base fuel schedule. Short-term fuel trim refers to dynamic or instantaneous adjustments. Long-term fuel trim refers to much more gradual adjustments to the fuel calibration schedule than short-term trim adjustments. These long-term adjustments compensate for vehicle differences and gradual changes that occur over time.
- 2.13. 'Calculated load value' refers to an indication of the current airflow divided by peak airflow, where peak airflow is corrected for altitude, if available. This definition provides a dimensionless number that is not engine specific and provides the service technician with an indication of the proportion of engine capacity that is being used (with wide open throttle as 100 %);

$$CLV = \frac{\text{Current airflow}}{\text{Peak airflow (at sea level)}} \times \frac{\text{Atmospheric pressure (at sea level)}}{\text{Barometric pressure}}$$

- 2.14. 'Permanent emission default mode' refers to a case where the engine management controller permanently switches to a setting that does not require an input from a failed component or system where such a failed component or system would result in an increase in emissions from the vehicle to a level above the limits given in section 3.3.2.
- 2.15. 'Power take-off unit' means an engine-driven output provision for the purposes of powering auxiliary, vehicle mounted, equipment.

## 3. REQUIREMENTS AND TESTS

- 3.1. All vehicles must be equipped with an OBD system so designed, constructed and installed in a vehicle as to enable it to identify types of deterioration or malfunction over the entire life of the vehicle. In achieving this objective the approval authority must accept that vehicles which have travelled distances in excess of the Type V durability distance, referred to in 3.3.1, may show some deterioration in OBD system performance such that the emission limits given in 3.3.2 may be exceeded before the OBD system signals a failure to the driver of the vehicle.

- 3.2. The OBD system must be so designed, constructed and installed in a vehicle as to enable it to comply with the requirements of this Annex during conditions of normal use.

3.2.1. *Temporary disablement of the OBD system*

- 3.2.1.1. A manufacturer may disable the OBD system if its ability to monitor is affected by low fuel levels. Disablement must not occur when the fuel tank level is above 20 % of the nominal capacity of the fuel tank.

- 3.2.1.2. A manufacturer may disable the OBD system at ambient engine starting temperatures below 266 °K (-7 °C) or at elevations over 2 500 metres above sea level provided the manufacturer submits data and/or an engineering evaluation which adequately demonstrate that monitoring would be unreliable when such conditions exist. A manufacturer may also request disablement of the OBD system at other ambient engine starting temperatures if he demonstrates to the authority with data and/or an engineering evaluation that misdiagnosis would occur under such conditions.

- 3.2.1.3. For vehicles designed to accommodate the installation of power take-off units, disablement of affected monitoring systems is permitted provided disablement occurs only when the power take-off unit is active.

3.2.2. *Engine misfire — vehicles equipped with positive-ignition engines*

- 3.2.2.1. Manufacturers may adopt higher misfire percentage malfunction criteria than those declared to the authority, under specific engine speed and load conditions where it can be demonstrated to the authority that the detection of lower levels of misfire would be unreliable.

- 3.2.2.2. Manufacturers who can demonstrate to the authority that the detection of higher levels of misfire percentages is still not feasible may disable the misfire monitoring system when such conditions exist.

3.3. *Description of tests*

- 3.3.1. The test are carried out on the vehicle used for the Type V durability test, given in Annex VIII, and using the test procedure in Appendix I to this Annex. Tests are carried out at the conclusion of the Type V durability testing. When no Type V durability testing is carried out, or at the request of the manufacturer, a suitably aged and representative vehicle may be used for these OBD demonstration tests.

- 3.3.2. The OBD system must indicate the failure of an emission-related component or system when that failure results in an increase in emissions above the limits given below:

Engine type	CO (g/km)	HC (g/km)	NO <sub>x</sub> (g/km)	PM <sup>(1)</sup> (g/km)
Positive-ignition	3,2	0,4	0,6	—
Compression-ignition	3,2	0,4	1,2	0,18

<sup>(1)</sup> for compression-ignition engines only.

3.3.3. *Monitoring requirements for vehicles equipped with positive-ignition engines*

In satisfying the requirements of 3.3.2 the OBD system must, at a minimum, monitor for:

- 3.3.3.1. reduction in the efficiency of the catalytic converter with respect to the emissions of HC only;
- 3.3.3.2. the presence of engine misfire in the engine operating region bounded by the following lines:
- (a) a maximum speed of 4 500min<sup>-1</sup> or 1 000 min<sup>-1</sup> greater than the highest speed occurring during a Type I test cycle, whichever is the lower;
  - (b) the positive torque line (i. e. engine load with the transmission in neutral);
  - (c) a line joining the following engine operating points: the positive torque line at 3 000 min<sup>-1</sup> and a point on the maximum speed line defined in (a) above with the engine's manifold vacuum at 13,33 kPa lower than that at the positive torque line.
- 3.3.3.3. oxygen sensor deterioration
- 3.3.3.4. other emission control system components or systems, or emission-related powertrain components or systems which are connected to a computer, the failure of which may result in tailpipe emissions exceeding the limits given in 3.3.2;

- 3.3.3.5. any other emission-related powertrain component connected to a computer must be monitored for circuit continuity;
- 3.3.3.6. the electronic evaporative emission purge control must, at a minimum, be monitored for circuit continuity.
- 3.3.4. *Monitoring requirements for vehicles equipped with compression-ignition engines*
- In satisfying the requirements of 3.3.2 the OBD system must monitor:
- 3.3.4.1. Where fitted, reduction in the efficiency of the catalytic converter;
- 3.3.4.2. Where fitted, the functionality and integrity of the particulate trap;
- 3.3.4.3. The fuel-injection system electronic fuel quantity and timing actuator(s) is/are monitored for circuit continuity and total functional failure;
- 3.3.4.4. Other emission control system components or systems, or emission-related powertrain components or systems, which are connected to a computer, the failure of which may result in tailpipe emissions exceeding the limits given in 3.3.2. Examples of such systems or components are those for monitoring and control of air mass-flow, air volumetric flow (and temperature), boost pressure and inlet manifold pressure (and relevant sensors to enable these functions to be carried out).
- 3.3.4.5. Any other emission-related powertrain component connected to a computer must be monitored for circuit continuity.
- 3.3.5. Manufacturers may demonstrate to the approval authority that certain components or systems need not be monitored if, in the event of their total failure or removal, emissions do not exceed the emission limits given in 3.3.2.
- 3.4. A sequence of diagnostic checks must be initiated at each engine start and completed at least once provided that the correct test conditions are met. The test conditions must be selected in such a way that they all occur under normal driving as represented by the Type I test.
- 3.5. **Activation of malfunction indicator (MI)**
- 3.5.1. The OBD system must incorporate a malfunction indicator readily perceivable to the vehicle operator. The MI must not be used for any other purpose except to indicate emergency start-up or limp-home routines to the driver. The MI must be visible in all reasonable lighting conditions. When activated, it must display a symbol in conformity with ISO 2575<sup>(1)</sup>. A vehicle must not be equipped with more than one general purpose MI for emission-related problems. Separate specific purpose telltales (e. g. brake system, fasten seat belt, oil pressure, etc.) are permitted. The use of red for an MI is prohibited.
- 3.5.2. For strategies requiring more than two preconditioning cycles for MI activation, the manufacturer must provide data and/or an engineering evaluation which adequately demonstrates that the monitoring system is equally effective and timely in detecting component deterioration. Strategies requiring on average more than 10 driving cycles for MI activation are not accepted. The MI must also activate whenever the engine control enters a permanent emission default mode of operation if the emission limits given in 3.3.2 are exceeded. The MI must operate in a distinct warning mode, e. g. a flashing light, under any period during which engine misfire occurs at a level likely to cause catalyst damage, as specified by the manufacturer. The MI must also activate when the vehicle's ignition is in the 'key-on' position before engine starting or cranking and de-activate after engine starting if no malfunction has previously been detected.
- 3.6. **Fault code storage**
- The OBD system must record code(s) indicating the status of the emission-control system. Separate status codes must be used to identify correctly functioning emission control systems and those emission control systems which need further vehicle operation to be fully evaluated. Fault codes that cause MI activation due to deterioration or malfunction or permanent emission default modes of operation must be stored and that fault code must identify the type of malfunction.

(<sup>1</sup>) International Standard ISO 2575-1982 (E), entitled 'Road vehicles — Symbols for controls indicators and tell-tales', Symbol Number 4.36.

- 3.6.1. The distance travelled by the vehicle since a fault code is stored must be available at any instant through the serial port on the standard link connector <sup>(1)</sup>.
- 3.6.2. In the case of vehicles equipped with positive-ignition engines, misfiring cylinders need not be uniquely identified if a distinct single or multiple cylinder misfire fault code is stored.
- 3.7. **Extinguishing the MI**
- 3.7.1. For misfire malfunctions at levels likely to cause catalyst damage (as specified by the manufacturer), the MI may be switched to the normal mode of activation if the misfire is not present any more, or if the engine is operated after changes to speed and load conditions where the level of misfire will not cause catalyst damage.
- 3.7.2. For all other malfunctions, the MI may be de-activated after three subsequent sequential driving cycles during which the monitoring system responsible for activating the MI ceases to detect the malfunction and if no other malfunction has been identified that would independently activate the MI.
- 3.8. **Erasing a fault code**
- 3.8.1. The OBD system may erase a fault code and the distance travelled and freeze-frame information if the same fault is not re-registered in at least 40 engine warm-up cycles.

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#### Appendix 1

### FUNCTIONAL ASPECTS OF ON-BOARD DIAGNOSTIC (OBD) SYSTEMS

#### 1. INTRODUCTION

This Appendix describes the procedure of the test according to section 5 of this Annex. The procedure describes a method for checking the function of the on-board diagnostic (OBD) system installed on the vehicle by failure simulation of relevant systems in the engine management or emission control system. It also sets procedures for determining the durability of OBD systems.

The manufacturer must make available the defective components and/or electrical devices which would be used to simulate failures. When measured over the Type I test cycle, such defective components or devices must not cause the vehicle emissions to exceed the limits of section 3.3.2 by more than 20 %.

When the vehicle is tested with the defective component or device fitted, the OBD system is approved if the MI is activated.

#### 2. DESCRIPTION OF TEST

##### 2.1. The testing of OBD systems consists of the following phases:

- simulation of malfunction of a component of the engine management or emission control system,
- preconditioning of the vehicle with a simulated malfunction over preconditioning specified in section 6.2.1,
- driving the vehicle with a simulated malfunction over the Type I test cycle and measuring the emissions of the vehicle,
- determining whether the OBD system reacts to the simulated malfunction and indicates malfunction in an appropriate manner to the vehicle driver.

##### 2.2. Alternatively, at the request of the manufacturer, malfunction of one or more components may be electronically simulated according to the requirements of section 6.

##### 2.3. Manufacturers may request that monitoring take place outside the Type I test cycle if it can be demonstrated to the authority that monitoring during conditions encountered during the Type I test cycle would impose restrictive monitoring conditions when the vehicle is used in service.

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<sup>(1)</sup> This requirement is only applicable to vehicles with an electronic speed input to the engine management provided the ISO standards are completed within a lead time compatible with the application of the technology. It applies to all vehicles entering into service from 1 January 2005.

3. TEST VEHICLE AND FUEL

3.1. Vehicle

The test vehicle must meet the requirements of section 3.1 of Annex III.

3.2. Fuel

The appropriate reference fuel as described in Annex IX must be used for testing.

4. TEST TEMPERATURE AND PRESSURE

4.1. The test temperature and pressure must meet the requirements of the Type I test as described in Annex III.

5. TEST EQUIPMENT

5.1. Chassis dynamometer

The chassis dynamometer must meet the requirements of Annex III.

6. OBD TEST PROCEDURE

6.1. The operating cycle on the chassis dynamometer must meet the requirements of Annex III.

6.2. Vehicle preconditioning

6.2.1. According to the engine type and after introduction of one of the failure modes given in 6.3, the vehicle must be preconditioned by driving at least two consecutive Type I tests (Parts One and Two). For compression-ignition engines an additional preconditioning of two Part Two cycles is permitted.

6.2.2. At the request of the manufacturer, alternative preconditioning methods may be used.

6.3. Failure modes to be tested

6.3.1. *Positive-ignition engines:*

6.3.1.1. Replacement of the catalyst with a deteriorated or defective catalyst or electronic simulation of such a failure.

6.3.1.2. Engine misfire conditions according to the conditions for misfire monitoring given in section 3.3.3.2 of this Annex.

6.3.1.3. Replacement of the oxygen sensor with a deteriorated or defective oxygen sensor or electronic simulation of such a failure.

6.3.1.4. Electrical disconnection of any other emission-related component connected to a powertrain management computer.

6.3.1.5. Electrical disconnection of the electronic evaporative purge control device (if equipped). For this specific failure mode, the Type I test must not be performed.

6.3.2. *Compression-ignition engines:*

6.3.2.1. Where fitted, replacement of the catalyst with a deteriorated or defective catalyst or electronic simulation of such a failure.

6.3.2.2. Where fitted, total removal of the particulate trap or, where sensors are an integral part of the trap, a defective trap assembly.

6.3.2.3. Electrical disconnection of any fuelling system electronic fuel quantity and timing actuator.

6.3.2.4. Electrical disconnection of any other emission-related component connected to a powertrain management computer.

6.3.2.5. In meeting the requirements of 6.3.2.3 and 6.3.2.4, and with the agreement of the approval authority, the manufacturer must take appropriate steps to demonstrate that the OBD system will indicate a fault when disconnection occurs.

**6.4. OBD system test****6.4.1. *Vehicles fitted with positive-ignition engines:***

6.4.1.1. After vehicle preconditioning according to 6.2, the test vehicle is driven over a Type I test (Parts One and Two). The MI must activate before the end of this test under any of the conditions given in 6.4.1.2 to 6.4.1.5. The technical service may substitute those conditions by others in accordance with 6.4.1.6. However, the total number of failures simulated must not exceed 4 for the purpose of type-approval.

6.4.1.2. Replacement of a catalyst with a deteriorated or defective catalyst or electronic simulation of a deteriorated or defective catalyst that results in emissions exceeding the HC limit given in section 3.3.2 of this Annex.

6.4.1.3. An induced misfire condition according to the conditions for misfire monitoring given in section 3.3.3.2 of this Annex that results in emissions exceeding any of the limits given in 3.3.2.

6.4.1.4. Replacement of an oxygen sensor with a deteriorated or defective oxygen sensor or electronic simulation of a deteriorated or defective oxygen sensor that results in emissions exceeding any of the limits given in section 3.3.2 of this Annex.

6.4.1.5. Electrical disconnection of the electronic evaporative purge control device (if equipped).

6.4.1.6. Electrical disconnection of any other emission-related powertrain component connected to a computer that results in emissions exceeding any of the limits given in section 3.3.2 of this Annex.

**6.4.2. *Vehicles fitted with compression-ignition engines:***

6.4.2.1. After vehicle preconditioning according to 6.2, the test vehicle is driven over a Type I test (Parts One and Two). The MI must activate before the end of this test under any of the conditions given in 6.4.2.2 to 6.4.2.5. The technical service may substitute those conditions by others in accordance with 6.4.2.5. However, the total number of failures simulated must not exceed four for the purposes of type approval.

6.4.2.2. Where fitted, replacement of a catalyst with a deteriorated or defective catalyst or electronic simulation of a deteriorated or defective catalyst that results in emissions exceeding limits given in section 3.3.2 of this Annex.

6.4.2.3. Where fitted, total removal of the particulate trap or replacement of the particulate trap with a defective particulate trap meeting the conditions of 6.3.2.2 that results in emissions exceeding the limits given in section 3.3.2 of this Annex.

6.4.2.4. With reference to 6.3.2.5, disconnection of any fuelling system electronic fuel quantity and timing actuator that results in emissions exceeding any of the limits given in section 3.3.2 of this Annex.

6.4.2.5. With reference to 6.3.2.5, disconnection of any other emission-related powertrain component connected to a computer that results in emissions exceeding any of the limits given in section 3.3.2 of this Annex.

**6.5. Diagnostic signals**

6.5.1.1. Upon determination of the first malfunction of any component or system, 'freeze-frame' engine conditions present at the time must be stored in computer memory. Should a subsequent fuel system or misfire malfunction occur, any previously stored freeze-frame conditions must be replaced by the fuel system or misfire conditions (whichever occurs first). Stored engine conditions must include, but are not limited to calculated load value, engine speed, fuel trim value(s) (if available), fuel pressure (if available), vehicle speed (if available), coolant temperature, intake manifold pressure (if available), closed- or open-loop operation (if available) and the fault code which caused the data to be stored. The manufacturer must choose the most appropriate set of conditions facilitating effective repairs for freeze-frame storage. Only one frame of data is required. Manufacturers may choose to store additional frames provided that at least the required frame can be read by a generic scan tool meeting the specifications of 6.5.3.2 and 6.5.3.3. If the fault code causing the conditions to be stored is erased in accordance with section 3.7 of this Annex, the stored engine conditions may also be erased.

- 6.5.1.2. If available, the following signals in addition to the required freeze-frame information must be made available on demand through the serial port on the standardized data link connector, if the information is available to the on-board computer or can be determined using information available to the on-board computer: diagnostic trouble codes, engine coolant temperature, fuel control system status (closed-loop, open-loop, other), fuel trim, ignition timing advance, intake air temperature, manifold air pressure, air flow rate, engine speed, throttle position sensor output value, secondary air status (upstream, downstream or atmosphere), calculated load value, vehicle speed and fuel pressure.

The signals must be provided in standard units based on the specifications given in 6.5.3. Actual signals must be clearly identified separately from default value or limp-home signals. In addition, the capability to perform bi-directional diagnostic control based on the specifications given in 6.5.3 must be made available on demand through the serial port on the standardized data link connector according to the specifications given in 6.5.3.

- 6.5.1.3. For all emission control systems for which specific on-board evaluation tests are conducted (catalyst, oxygen sensor, etc.), except misfire detection, fuel system monitoring and comprehensive component monitoring, the results of the most recent test performed by the vehicle and the limits to which the system is compared must be made available through the serial data port on the standardized data link connector according to the specifications given in 6.5.3. For the monitored components and systems excepted above, a pass/fail indication for the most recent test results must be available through the data link connector.

- 6.5.1.4. The OBD requirements to which the vehicle is certified (i. e. this Annex or the alternative requirements specified in section 5 of Annex I) and the major emission control systems monitored by the OBD system consistent with 6.5.3.3 must be available through the serial data port on the standardized data link connector according to the specifications given in 6.5.3.

- 6.5.2. The emission control diagnostic system is not required to evaluate components during malfunction if such evaluation would result in a risk to safety or component failure.

- 6.5.3. The emission control diagnostic system must provide for standardized access and conform with the following ISO and/or SAE standards. Some of the ISO standards have been derived from Society of Automotive Engineers Standards and Recommended Practices. Where this is the case, the appropriate SAE reference appears in parentheses.

- 6.5.3.1. One of the following standards with the restrictions as described must be used as the on-board to off-board communications link:

ISO 9141-2 'Road Vehicles — Diagnostic Systems — CARB Requirements for the Interchange of Digital Information';

ISO 11519-4 'Road Vehicles — Low Speed Serial Data Communication — Part 4: Class B Data Communication Interface (SAE J1850)'. Emission-related messages must use the cyclic redundancy check and the three-byte header and not use inter-byte separation or checksums.

ISO DIS 14230 — Part 4 'Road Vehicles — Diagnostic Systems — Keyword Protocol 2000'.

- 6.5.3.2. Test equipment and diagnostic tools needed to communicate with OBD systems must meet or exceed the functional specification given in ISO DIS 15031-4.

- 6.5.3.3. Basic diagnostic data, (as specified in 6.5.1) and bi-directional control information must be provided using the format and units described in ISO DIS 15031-5 and must be available using a diagnostic tool meeting the requirements of ISO DIS 15031-4.

- 6.5.3.4. When a fault is registered, the manufacturer must identify the fault using the most appropriate fault code consistent with those given in section 6.3 of ISO DIS 15031-6, relating to 'Section C — Powertrain system diagnostic trouble codes'. The fault codes must be fully accessible by standardized diagnostic equipment complying with the provisions of 6.5.3.2.

The note in section 6.3 of ISO DIS 15031-6 immediately preceding the list of fault codes in the same section does not apply.

- 6.5.3.5. The connection interface between the vehicle and the diagnostic tester must meet all the requirements of ISO DIS 15031-3. The installation position must be subject to agreement of the approval authority such that it is readily accessible by service personnel but protected from tampering by non-qualified personnel.

- 6.5.3.6. The manufacturer must also make accessible, where appropriate upon payment, to repairers who are not undertakings within the distribution system, the technical information required for the repair or maintenance of motor vehicles unless that information is covered by an intellectual property right or constitutes essential, secret know-how which is identified in an appropriate form; in such case, the necessary technical information must not be withheld improperly.
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## Appendix 2

### ESSENTIAL CHARACTERISTICS OF THE VEHICLE FAMILY

#### 1. PARAMETERS DEFINING THE OBD FAMILY

The OBD family may be defined by basic design parameters which must be common to vehicles within the family. In some cases there may be interaction of parameters. These effects must also be taken into consideration to ensure that only vehicles with similar exhaust emission characteristics are included within an OBD family.

2. To this end, those vehicle types whose parameters described below are identical are considered to belong to the same engine-emission control/OBD system combination.

##### *Engine:*

- combustion process (i. e. positive-ignition, compression-ignition, two-stroke, four-stroke),
- method of engine fuelling (i. e. carburettor or fuel injection).

##### *Emission control system:*

- type of catalytic converter (i. e. oxidation, three-way, heated catalyst, other),
- type of particulate trap,
- secondary air injection (i. e. with or without),
- exhaust gas recirculation (i. e. with or without)

##### *OBD parts and functioning:*

- the methods of OBD functional monitoring, malfunction detection and malfunction indication to the vehicle driver.
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## STATEMENT OF THE COUNCIL'S REASONS

### I. INTRODUCTION

1. On 29 August 1996 the Commission submitted a proposal, based on Article 100a of the EC Treaty, relating to measures to be taken against air pollution by emissions from motor vehicles and amending Directives 70/156/EEC and 70/220/EEC.
2. The European Parliament delivered its opinion on 10 April 1997 and proposed 88 amendments to the Commission proposal. In the light of that opinion, the Commission submitted an amended proposal on 6 June 1997, incorporating 22 of the European Parliament's amendments, 16 of which were accepted in full and 6 in part.
3. The Economic and Social Committee delivered its opinion on 27 April 1995.
4. On 7 October 1997, the Council adopted a common position on the Commission proposal in accordance with Article 189b of the Treaty.

### II. OBJECTIVE

5. The proposed Directive, together with the Directive relating to the quality of petrol and diesel fuels and amending Directive 93/12/EEC (Interinstitutional File No 96/0163 (COD)), are the first two items of legislation to be adopted under the Auto/Oil Programme. The purpose of the Directive is to make substantial new reductions in the pollutant emissions from passenger cars in two stages, the first in the year 2000 and the second in 2005. In view of the urgent need to have these new measures in place at the earliest possible date, the Council has not yet taken a decision on the Commission's amended proposal which seeks to incorporate measures concerning light commercial vehicles into the current proposal. The Council intends to adopt a common position on this amended proposal at a later stage.

The Commission proposal adopts an evolutionary approach, involving:

- an initial series of measures and emission limit values which will be compulsory from the year 2000,
- a second series of more stringent limit values, indicative for the time being, which will apply from 2005. These values will be confirmed or amended following a new study to be completed by the Commission in the coming months.

It also contains a number of improvements in the methods to be used for measuring tailpipe and evaporative emissions as well as new standards designed to ensure the durability of the anti-pollution systems, specifically through the introduction of:

- the on-board diagnostic system (OBD) which detects malfunctions in the anti-pollution equipment, indicates them to the driver, and also records them so as to enable vehicle testing stations to check that the anti-pollution system is working properly and identify any repairs which may be necessary,
- provisions on the conformity of in-service vehicles. The aim of these is to ensure that a vehicle complies with the anti-pollution measures laid down in the Directive over 80 000 km or 5 years.

### III. ANALYSIS OF THE COMMON POSITION

#### 6. PRELIMINARY COMMENT

The actual title of the Directive has been changed, since it now covers only the amendment of Directive 70/220/EEC. The Commission proposal referred also to the amendment of the framework Directive 70/156/EEC, adding a number of horizontal provisions on the conformity of in-service vehicles to that Directive. The Council felt that it was inappropriate, in a Directive aimed primarily at reducing pollutant emissions from motor vehicles, to lay down general provisions on the conformity of in-service vehicles. Such a move would, in its view, require a thorough study of the implications of such provisions for all the other vehicle components to be examined for the purposes of EC type-approval. The Council preferred at this stage to include specific provisions on the conformity of in-service vehicles within the framework of Directive 70/220/EEC only. It has therefore deleted Article 1 of the Commission proposal and added sections 7.1 and 7.1.7, and also Appendices 3 and 4 which lay down the rules on the conformity of in-service vehicles, to Annex I to Directive 70/220/EEC.

#### 7. ENACTING TERMS

##### (a) Article 3 (Article 5 of the Commission proposal)

Article 3 follows very closely the line taken in the Commission proposal. However, the Council thought it best to put back the deadline for the Commission to submit proposals on a further tightening of emission standards from 31 December 1998 to 30 June 1999.

On the one hand, the Council has broadened the criteria to be taken into account in the methodology to be used in drawing up the new proposal, stipulating that the Commission should adopt only those measures which can reasonably be expected to be effective in 2010.

Secondly, it has deleted the reference to the introduction of a new low-temperature test from the list of criteria, as such a test has already been established to this Directive, under section 5.3.5 of Annex I and in Annex VII.

##### (b) Article 4 (new)

Article 4 has been added as a reminder of the need to establish procedures, within an appropriate legal instrument, to make sure that the introduction of the OBD system (on-board diagnostic system — Annex XI to the Directive) does not lead to a restriction of the market in replacement parts for anti-pollution devices. The Council felt that this could not be covered in the present Directive because the necessary data were lacking.

##### (c) Article 5 (Article 4 of the Commission proposal)

Article 5 provides the framework for the granting of tax incentives by the Member States. To a very large extent it echoes the Commission's proposed text, but stipulates that tax incentives linked to the limit values for 2005 will not apply until the year 2000, among other reasons to avoid the obvious administrative problems of having two sets of tax incentives in force at the same time.

#### 8. THE ANNEXES

##### (a) Annex I

A number of amendments have been made to Annex I in order to clarify the text of the Directive or improve its structure by following the logic of the current version of

Directive 70/220/EEC and grouping together the administrative provisions relating to EC type-approval in a coherent fashion.

To clarify matters, therefore, the Council has added three new definitions (sections 2.14, 2.15 and 2.16), the last of which corresponds to the European Parliament's amendment 42.

Section 3 of Annex I has been extended to include the provisions concerning applications for EC type-approval in respect of an OBD system (transferred from the new Annex XI in the Commission proposal) so as to include all the administrative provisions relating to EC type-approval applications in the same chapter.

Section 5 of Annex I also concerns the OBD system and has been transferred from Annex XI (section 8) of the Commission proposal. It enables manufacturers to obtain EC type-approval on the basis of alternative standards to those laid down in the Directive, provided that their annual production is less than 10 000 units. Other manufacturers are therefore obliged to apply the standards laid down in the Directive if they wish to obtain EC type-approval. The Council has thus followed the pattern of other Directives in this sector, the most recent being Directive 91/441/EEC.

Section 5.1.4 has been transferred from Annex XI (section 5.9) of the Commission proposal (more logical layout of the text, with section 5.1 new containing all the general requirements concerning pollutant emissions).

The footnote to the table in section 5.3.1.4 has been deleted. It was already covered by the text of Articles 3 and 5 of the Directive and was therefore superfluous.

Section 5.3.5 is new. It covers the low-temperature test already referred to in the last paragraph of 7 (a) above and corresponds closely to the European Parliament's amendment 48.

Section 6.4 has been transferred from Annex XI (section 6.1) in the Commission proposal and groups together in a single chapter all the administrative provisions concerning extension of EC type-approval.

Sections 7.1 and 7.1.7 and Appendices 3 and 4 are new and contain all the provisions on the conformity of in-service vehicles (see preliminary comment in paragraph 6 above).

Sections 7.1.4.1 to 7.1.4.4 have been transferred from Annex XI (section 7) in the Commission proposal and group together in a single chapter all the administrative provisions concerning production conformity.

The new section 8 corresponds to section 9 in the Commission proposal with the addition of two further sections: section 8.2, providing for the mandatory fitting of an OBD system to vehicles with compression-ignition engines from 1 January 2005; and section 8.3, which introduces the optional fitting of an OBD system on vehicles not covered by 8.1 and 8.2. If such a system is fitted, it must however comply with the provisions of Annex XI to the Directive.

#### **(b) Annex II**

This Annex, concerning the information document which must be submitted by a manufacturer in support of his application for EC type-approval, has had a number of sections added to it, notably to cover the introduction of the OBD system. The Council has transferred these provisions from Appendix 5 of Annex XI in the Commission proposal so that all the information to be provided by the manufacturer now appears in a single document.

(c) **Annex VII**

This new Annex contains the provisions describing the procedure for the low-temperature test. It broadly corresponds to the European Parliament's amendment 59 (see also the final paragraph of 7 (a) above).

(d) **Annex VIII**

Annex VIII (former Annex VII) has had to be amended following the deletion of section 8 from Annex I.

(e) **Annex IX** (former Annex VIII)

The specifications of reference fuels have been adapted as regards the hydrocarbons (olefins, aromatics, benzene) in unleaded petrol in line with the provisions of common position No 39/97 adopted by the Council with a view to adopting the Directive relating to the quality of petrol and diesel fuels and amending Directive 93/12/EEC. In addition, the Council has updated the test methods and added a column giving the date when the test methods were published.

(f) **Annex X** (former Annex IX)

This Annex, which contains the EC type-approval certificate, has also been expanded to cover the introduction of the OBD system and the low-temperature test. The Council has transferred these provisions from Appendix 7 of Annex XI in the Commission proposal.

(g) **Annex XI**

This Annex, which concerns the OBD system, has been considerably simplified by:

- transferring several provisions to other Annexes (see 8 (a), (e) and (f) above),
- deleting Appendices 2, 3 and 4, which have been replaced by references to the relevant ISO standards in sections 6.5.3.3, 6.5.3.2 and 6.5.3.4 respectively of Appendix 1.

Section 6.5.3.6 of Appendix 1 is new. Its aim is to ensure that the market remains open by obliging a manufacturer to make accessible to repairers who are not undertakings within the distribution system the technical information required for the repair or maintenance of motor vehicles, without which such repairers would be unable to offer breakdown or repair services.

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