COMMISSION OF THE EUROPEAN COMMUNITIES

SEC(90) 1842 final

Brussels, 10 January 1990

SEC (89) 1942 final
See corrigendum on page 2.

COMMUNICATION FROM THE COMMISSION

First Annual Report from the Commission

on the Implementation of the Council Directive on a Limit Value for Lead in the Air (82/884/EEC)

COMMISSION OF THE EUROPEAN COMMUNITIES

SEC (89) 1842 final /2 Brussels, 17 January 1990

CORRIGENDUM
La cote du document diffusé
le 10.01.90 doit se lire
SEC(89) 1842 final au lieu
de SEC(90) 1842 final
(CONCERNE TOUTES LES VERSIONS LINGUISTIQUES)

COMMUNICATION FROM THE COMMISSION

First Annual Report from the Commission

on the Implementation of the Council Directive

on a Limit Value for Lead in the Air (82/884/EEC)

Prefatory Note

This report was drawn up on the basis of the information available on 1.2.1988. More recent data received by the Commission will be included in the next report on the implementation of the Directive

SUMMARY

Lead is a particularly persistent and toxic pollutant which may have a range of clinical effects including kidney and liver damage; prolonged exposure to lead pollution may induce neurological disorders, particularly in children.

Council Directive 82/884/EEC lays down a limit value for lead in the air in order to help protect the health of human beings.

The fixed limit value, which must not be exceeded, is 2 $\mu g/m^3$ determined on a filter sample of atmospheric particles. The limit value is expressed as an annual mean concentration and is calculated by dividing the sum of the valid daily values by the number of days on which valid values have been obtained.

Member States have to take all necessary measures to ensure that the concentration of Pb in the air is not greater than the limit value, in general before December 1987 and in derogation zones before December 1989.

Member States are obliged to monitor the Pb concentration in the air in areas where the limit vaue may not be observed by setting up sampling stations at places where individuals might be exposed continually for a long period.

The Annex to the Directive specifies characteristics with regard to the sampling strategy, the sampling method and the analytical method which have to be applied for the practical implementation.

This report is a compilation of the relevant information which the Commission has collected about the implementation of the Directive in the Member States during the first reference period.

The assessment of the data is fully detailed in the report; the main conclusions which can be drawn are that:

- the concentrations of lead in the air have been reduced substantially in recent years and are now below the limit value of the Directive, apart from a few "hot spots" (traffic oriented sites, industrial sites), in nearly the whole territory of Member States;

- a clear downward trend has been noted at traffic oriented sites for most cases, due to the reduction of lead conctent in petrol. However, it should be noted that the measured level depends significantly on the distance between the measuring point and the kerb;

- the monitoring philosophy, intensity and the targets differ from one Member State to another, the most crucial point being the siting of the monitor and, in particular, the distance from sources.

In the light of these results the Commission intends to concentrate its future efforts on the monitoring philosophy and on the practical implementation of the Directive in "hot spot" areas.

CONTENTS

0 PREFACE

The Council Directive 82/884/EEC concerning a limit value for lead in the air is, after Directive 80/779/EEC which concerns SO_2 and suspended particulates, the second Directive that lays down air quality standards.

It has therefore to be considered as an additional element of the Community's strategy to protect human health and the environment by a double approach which consists of: Air quality standards which are in no case allowed to be exceeded throughout the Member States, and emission standards for all major sources of these pollutants in accordance with the principles laid down in the Environmental Action Programmes and, for example, more specifically in the Directive on industrial plants.

The lead Directive can serve as an excellent example of the link between these two main elements because in parallel to the implementation of the air quality Directive, the Commission has implemented in cooperation with Member States effective measures to reduce lead emissions from motor vehicles.

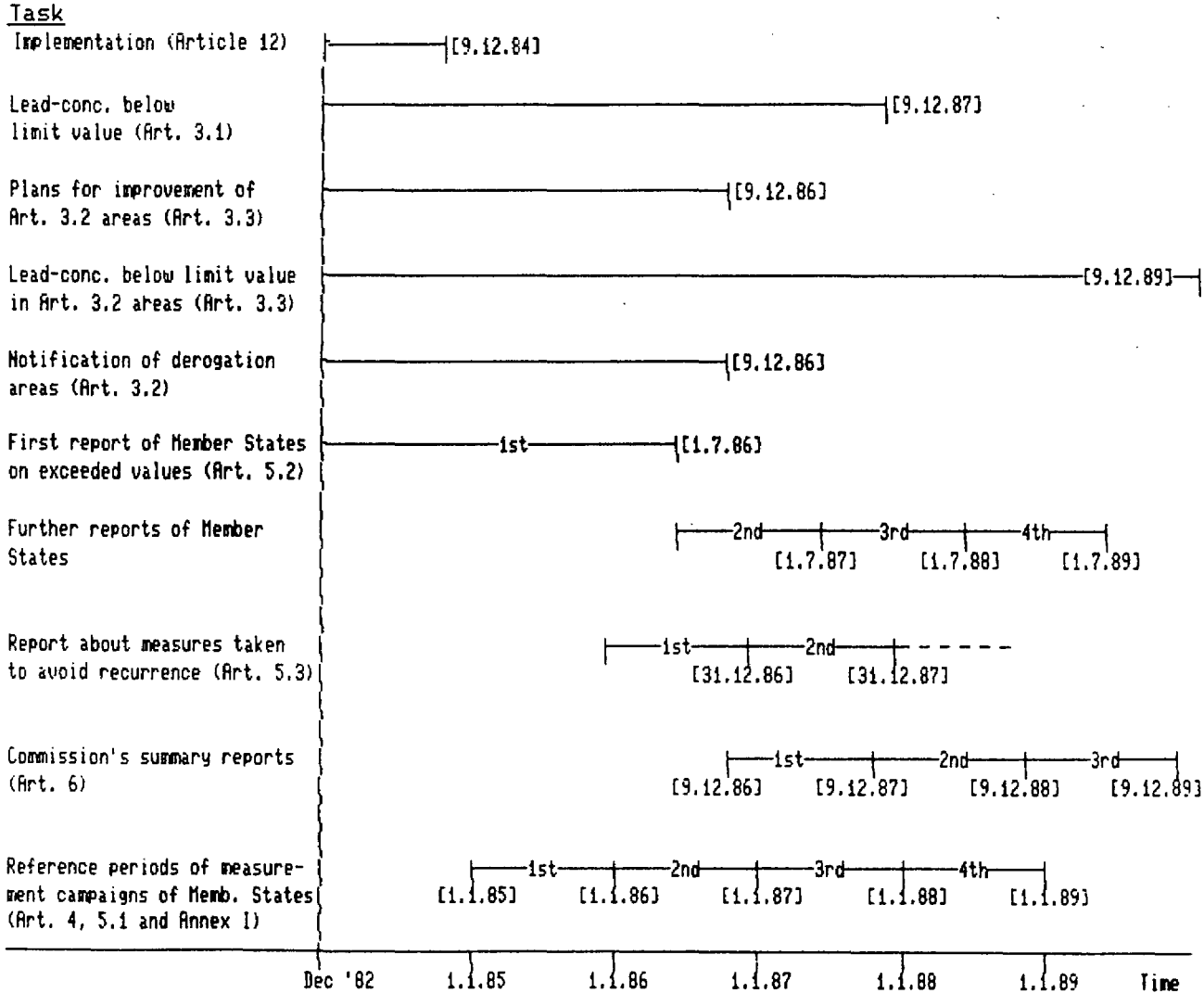
As a result of this double approach, the concentrations of lead in the air have been reduced substantially in recent years and, apart from a few hot spots, are now below the limit value of the Directive in nearly the whole territory of all Member States.

The Commission will concentrate its efforts on ensuring that Member States clean up the remaining hot spots as soon as possible, so that the success of the Community policy will be completed.

I INTRODUCTION

Council Directive 82/884/EEC lays down a limit value for lead in the air in order to protect the health of human beings. The fixed limit value, which must not be exceeded, is 2 $\mu g/m^3$, determined on a filter sample of atmospheric particles. The limit value is expressed as an annual mean concentration and is calculated by dividing the sum of the valid daily values by the number of days on which valid values have been obtained. Member States and the Commission have to comply with a series of obligations laid down in the Directive. The most important tasks to be accomplished in 1986 are shown in Figure 1.

Figure 1: Dates and Periods for completing a particular obligation required by Directive 82/884/EEC



Article 6 of the Council Directive requires that the Commission shall publish a summary report on the application of this Directive every year. This report has been drafted by the Commission in order to comply with its obligation of annual reporting. It covers the period from the adoption of the Directive until 31.12.1987. It has been drafted taking into account answers to the Commission's questionnaire of 1986 and the following notifications of Member States:

II LEGAL IMPLEMENTATION OF THE DIRECTIVE

The Directive 82/884/EEC was adopted on December 3rd, 1982, and notified to governments of Member States on December 8th, 1982. Pursuant to Article 12 (1), Member States were required to bring into force the necessary laws, regulations, and administrative provisions within 24 months of the notification, i.e. by 9th December 1984 at the latest.

At the date of publication of this report, Member States had notified to the Commission the following measures taken for the legal implementation of the Directive:

United Kingdom:

- Control of Pollution Act 1974; Section 79
- Health and Safety at Work Act 1974; Section 55
- Health and Safety Regulations 1983; Schedule 1
- Public Health Act 1936 Section 92-100
- Public Health (Recurring Nuisances) Act 1969
- Clean Air Acts 1956 and 1968
- Control of Atmospheric Pollution (Research and Publicity) Regulations 1977

Comparable Northern Ireland Legislation:

- Article 57 Pollution Control and Local Government (NI) Order 1978
- Section 2 Alkali and Works Regulation Act 1906
- Schedule 2 Alkali and Works Order (NI) 1977
- Sections 107-127 Public Health (Ireland) Act 1878
- Article 70 Pollution Control and Local Government (NI) Order 1970
- Clean Air (NI) Order 1981
- No comparable Northern Ireland Legislation for Control of Atmospheric Pollution Regulations 1977

Italy:

- D.P.C.M. 28.3.1983

FRG:

- Das Gesetz (insbes. § 2) zur Verminderung von Luftverunreinigungen durch Bleiverbindungen in Ottokraftstoffen für Kraftfahrzeugmotoren (Benzinbleigesetz - BzBLG) vom 5. August 1971, BGBL I S. 1234, zuletzt geändert durch Art. 44 EGAO vom 14.12.1976, BGB I S. 3341, ber. BGBL 1977 I, S. 667

- Das Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge (Bundesimmissionsschutzgesetz - BImSchG) vom 15. März 1974, BGBL I S. 721, ber. S. 1193, zuletzt geändert durch Gesetz vom 4. März 1982, BGBL I, S. 281

- Die Erste Allgemeine Verwaltungsvorschrift zum Bundesimmissionsschutzgesetz (Technische Anleitung zur Reinhaltung der Luft - TA Luft) vom 28. August 1974, GMBL, S. 426, 525 geändert am 23. Februar 1983, GMBL, S. 94

France:

- Circulaire du 20 juin 1985

The Netherlands:

- Besluit van 25 januari 1987, houdende regels als bedoeld in artikel 2 van de wet inzake de Luchtverontreiniging (Besluit Luchtwaliteit koolstofmonoxide en Lood)

Luxembourg:

- Règlement grand-ducal du 20 décembre 1984 (Mémorial A no. 110 du 24.12.1984) portant application de la directive 82/884/CEE du Conseil des Communautés Européennes du 3 décembre 1982 concernant une valeur limite pour le plom dans l'atmosphère

Ireland:

- Air Pollution Act, 1987 (Commencement (no. 2) Order 1987)
- Control of Atmospheric Pollution (Licensing) Regulations 1985
- Air Pollution Act, 1987 (Air Quality Standards), Regulations 1987
- The European Communities (Lead Content of Petrol) Regulations 1985

Belgium:

- Royal Decree of 3.8.1984 (M.B. 13.10.1984)

Spain:

- Real Decreto 717/1987 of 27.5.1987 modifying partially
- Real Decreto 833/1975

Portugal:

- Despacho Normativo 29/87 of 27.2.1987

Denmark:

- Bekendtgørelse af Lov om miljobeskyttelse

On basis of its evaluation of the internal legislation which was communicated, the Commission has decided to initiate proceedings against the following Member States, on the basis of art. 164 of the Treaty:

Greece:
non-communication of internal legislation

United Kingdom:
a) Type of infraction: Incorrect implementation
b) Description of infraction: Absence of sufficiently corrective measures in a zone designated under Art. 3.2 of Directive
c) Stage of procedure: Reasoned opinion sent on 8.1.88

France:
a) Type of infraction: Nonconformity of national implementation measures
b) Description of infraction: France transposed the Directive by way of administrative circular, which does not comply with the requirement of legal security: a circular is always subject to modification at the administration's discretion.
c) Stage of procedure: Letter of formal notice sent on 15.12.87

Germany:
a) Type of infraction: Partial conformity of national implementation measures
b) Description of infraction: Art. 1 and 2: Absence of a general limit value for lead; Art. 4: Absence of measuring stations
c) Stage of procedure: Letter of formal notice sent on 1.2.88

Italy:
a) Type of infraction: Incomplete transposition into national law; incorrect implementation
b) Description of infraction: Art. 3, 4 and 5 of Directive 82/884/EEC have not been transposed into national legislation; Very few controls appear to be executed: Only data concerning Roma and Bologna are available; measuring instruments are not in conformity with the requirement of the Directive.
c) Stage of procedure: Letter of formal notice sent on 8.1.88

III APPLICATION OF THE DIRECTIVE

III.1 Application of Article 3

III.1.1 Information received in accordance with Article 3

Article 3 of the Directive requires in its paragraph 1 that:

> "Member States shall take the necessary measures to ensure that five years after notification of this Directive, the concentration of lead in the air, ... is not greater than the limit value ..."

However, paragraph 2 allows derogations because it is laid down that:

> "where a Member State considers that the limit value fixed in Article 2 (2) may be exceeded in certain places four years after notification of this Directive, it shall inform the Commission thereof."

Finally, it is said in paragraph 3 that those Member States which make use of the derogations:

> "shall, within two years of the implementation of this Directive, forward to the Commission plans for the progressive improvement of the quality of the air in such places. These plans, drawn up on the basis of relevant information as to the nature, origin and development of the pollution, shall in particular describe the measures already taken or envisaged and the procedures implemented or planned by the Member States concerned. The objective of these measures and procedures must be to bring the concentration of lead in the air in those places below the level of the limit value fixed in Article 2 (2) or down to that level, as soon as possible and at the latest seven years after notification of this Directive. These measures and procedures must take into account the provisions of Directive 78/611/EEC and the results of its application."

Only three Member States made use of Article 3 (2) and notified derogation zones (see Table 2).

Table 2: List of zones in the Member States of the European Community in which the limit value for lead of Directive 82/884/EEC is likely to be approached or exceeded after December 9th, 1987, as notified by Member States before December 9th, 1986

Member State	Zones
Belgium	Hoboken (Antwerpen) Beerse (Antwerpen)
F.R. Germany [1]	Braubach (Rheinland-Pfalz)
United Kingdom	Walsall (West Midlands)

[1] Germany nominated this zone in January 1987, but withdrew it officially from the list in July 1987, indicating that the measures taken had decreased the measured lead concentrations below the limit value already in 1986. However, additional information on measured values has not been submitted. The Commission therefore retains this zone on the list until evidence of non-exceedances has been given by the German government.

Three other Member States officially stated that they do not make use of Article 3 (2): Denmark, Ireland, and Luxembourg.

Finally, no written statement concerning Article 3 (2) has been forwarded by: Greece, Italy, the Netherlands, Portugal, and Spain. However, at an expert meeting held in Brussels in October 1987, the Netherlands explained that it does not need to apply Article 3 (2).

With regard to these countries it should be noted that some monitoring results are available only from Greece, Italy, and Spain. As far as Portugal is concerned, no information on the present concentration of lead in ambient air is available at all.

In France, the limit value was exceeded in 1985 in two cities (Paris and Grenoble) at stations located directly at the kerbside of busy streets. However, France explained that it will not give a final statement concerning Article 3 (2) as long as the Commission has not provided clear and detailed indication on how the measurement sites should be selected. The Italian delegation supported this point at the expert meeting of October 1987. The background of this statement has to be seen in the light of the fact that traffic-oriented measurements are carried out in France in many cases directly at the kerbside of busy streets with inlet heights of 2 - 4 m. The French government has the impression that other countries do not measure directly at the kerbside of streets, but at a greater distance from the traffic flow and assumes that the results are biased and not comparable. The French government therefore considers the two stations at which exceedances occurred as not falling under the provision of the Directive. In order to learn more about the dispersion of lead in the polluted space and the exposure of the people living in the vicinity, the French government plans to launch a study. If this study comes to the conclusion that there is a risk of exposure to an annually averaged level of lead above 2 $\mu g/m^3$, the necessary steps to reduce the pollution will be taken. Finally, the French government informed the Commission that no breaches of the limit value were identified in 1986 at industrial sites.

All four nominated zones are close to specific industrial sources in which lead or lead-containing metals are smelted and processed. The concentrations measured in the surroundings of these industries are in the range of 2.1 - 3.3 $\mu g/m^3$ (see Tables 3 and 4).

Table 3: Measurement stations in Member States at which the lead limit value of Directive 82/884/EEC has been exceeded in the 1st reference period 01.01.1985 - 31.12.1985

Member State	Town/Zone	station number	number of single measurements	measured concentration of lead in [$\mu g/m^3$]
Belgium	Hoboken	7 HOB 16	352	2.09
F.R. Germany	Braubach	3	n.c. [1]	3.09
		4	n.c. [1]	3.30
		5	n.c. [1]	2.55
		7	n.c. [1]	2.63
United Kingdom	Walsall	S 2	n.c. [2]	3.29

n.c. = not communicated

[1] : The results cover only the period October to December 1985.

[2] : The results cover the period June 1985 to June 1986.

Table 4: Measurement stations in Member States at which the lead limit value of Directive 82/884/EEC has been exceeded in the 2nd reference period 01.01.1986 - 31.12.1986

Member State	Town/Zone	station number	number of single measurements	measured concentration of lead in [µg/m³]
Belgium	Hoboken	7 HOB 16	331	n.a. [1]
F.R. Germany	Braubach	4	n.c. [2]	2.26
United Kingdom	Walsall	S 2	n.c.	2.6

n.c. = not communicated

[1] : Annual average has not been indicated because the required number of measurements per month was not achieved in one or more months.

[2] : The results cover only the period January to July 1986.

Lead concentrations at Beerse (B), which has also been declared a derogation zone, did not exceed the limit value in the reference periods 1985 and 1986. The maximum annual averages measured were 1.96 µg/m³ in 1985 and 1.33 µg/m³ in 1986 at station no. OBEE01.

It should be noted that the measurements on the ambient air concentrations of lead have not always been carried out in compliance with the requirements of the Directive, at least as far as reference period and number of samples are concerned. (With regard to other aspects, see chapter III.2)

The three countries which nominated derogation zones also submitted, as required by Article 3 (3), plans for the progressive improvement of the quality of the air in the areas concerned. Table 5 summarizes these activities:

Table 5: Counter measures taken, planned, or under way in order to decrease pollution levels in zones of Article 3 (2)

Member State	Zone	Counter measure	
		taken	planned or under way
Belgium	Hoboken	Installation of additional sprinkler and sweeping systems; Removal of storages; Installation of new bag filters and additional extraction systems	Installation of an antidust system for the pugmill; Installation of additional bag filters; Replacement of two old furnaces by a new one. Modernization of two blast furnaces; Replacement of sinter transport by an enclosed conveyor system.
	Beerse	Usage of mobile extractor hoods in order to remove waste gases emitted in some discontinuous process steps; Installation of a new filter unit to a 70 t melting furnace; Use of best available antipollution technology for second 70 t furnace built in 1984	Enclosure of 2 slag furnaces and installation of new filters; Construction of a new stack; Installation of an enclosed conveyor system for the transport of zinc oxide; Installation of an extractor hood for furnace no. 1
F.R. Germany	Braubach	A part of these measures (not further specified) has been carried out in 1986; the rest was planned for 1986/1987. However, the present state of the work is not known.	Reduction of emission from diffuse sources by installation of several additional filter units and hoods; Improvement of recovery processes for batteries with the aim to reduce emissions from transport and charging processes. Due to these measures the total emissions of the plant will be reduced from 7.5 to 5.2 t per year. Moreover, the monitoring of emissions will be improved.
United Kingdom	Walsall	Installation of additional extraction and filtration system; Commissioning of a briquetting plant; Erection and commissioning of a wet conditioning plant for a variety of finely divided materials arising throughout the plant; Both reverbatory furnaces have been fitted with improved doors and hoods, the filtration system has been modified, the extraction ducting has been replaced.	Reduction of diffusive emissions by progressive utilization of: - Briquetting of fuel material; - Improvement of transport of hot metal from furnace to converter; - Study to examine ways of endoring the smelter building; - Experimental work to improve the handling of fine dust; - Revision of process operations carried out within the anode furnace in order to minimize fume generation. Reduction of process emissions by: - Installation of additional extraction systems in order to double the extraction volume of the converters - Modifications at the scrap-charging system; - Rerouting of emissions to tall stacks via improved filtration systems and erection of a plant for wet conditioning of fumes and dust collected in the filters; - Modification of the gas cooling/conditioning - Complete survey of the performance of all bag filters - Assessment of the hot metal heating practice

Obviously, diffusive low-level emission from smelting, charging, and transfer processes caused difficulties in all cases and require additional measures.

All three Member States are optimistic that the measures taken, under way or planned will reduce the concentration of lead in ambient air to a level below the limit value within the timeframe given by the Directive.

III.1.2 Assessment of the application of Article 3

The most important point of Article 3 is paragraph 1, which requires that concentrations of lead in the air must not be greater than 2 $\mu g/m^3$. Since only very few derogations have been applied for, according to Article 3 (2), the question is whether the limit value is respected throughout the rest of the territories of the Member States.

This question is somewhat difficult to answer for several reasons:

i) Not all Member States publish annual reports on measured lead concentrations. In fact, regular reporting takes place only in Belgium, Denmark, Luxembourg, and the Netherlands. France started to publish special reports on the implementation of the EC air quality Directive in 1987, so that a complete annual picture will be available in the future. Some information, but not always about the last two reference periods, is available for all other Member States but Portugal.

ii) Even if all data were available, the Commission does not know whether

- all relevant areas are covered by the national monitoring programmes,
- the monitoring philosophies meet the requirements of the Directive and are comparable (see for example the complaint of France concerning the monitoring of lead close to busy roads).

The Commission is fully aware of these problem areas and, in November 1985, distributed a questionnaire to Member States in order to close the identified gaps in the information (see also chapter IV). The results obtained in the study, relevant for the two points mentioned above, are:

<u>With regard to point (i):</u>

The Pb concentrations measured in 1984 indicate that no violations of the limit values occurred in Belgium, Denmark, France, Greece, Ireland, the Netherlands, Luxembourg, the United Kingdom and those parts of F.R. Germany and Italy for which information has been provided. With regard to France, breaches of the limit value occurred in 1983 at traffic-oriented sites in Paris, but not at industrial sites covered by the national monitoring programme.

Portugal and Spain have not been included in the investigation.

It cannot be totally excluded that violations did occur in the past with regard to traffic-oriented sites in Belgium, Italy, Luxembourg, Portugal, Spain, France and Greece (excluding Athens) because the concentrations of lead in petrol were in the range of 0.4 g/l or more. With regard to industrial sites, exceedances might have occurred, in particular in countries with important industrial activities in which lead is involved like Belgium, F.R. Germany, France, Italy, the United Kingdom and Spain.

With regard to traffic-oriented sites, breaches will decrease more and more after 1.1.1987 in Belgium and Luxembourg, due to the reduction of lead in petrol. Consequently, attention has still to be paid to the evolution of lead concentrations at traffic-oriented sites in Italy, Spain, Portugal, France and parts of Greece and in the vicinity of some industrial sites.

With regard to point (ii):

The monitoring philosophy, intensity and the targets differ from one Member State to the other. The most crucial point for potential difficulties in comparing results obtained in different Member States seems to be the siting of the monitor and in particular the distance from potential sources, e.g. traffic and industrial plants. Possible differences in the measured concentrations, due to differences in siting, can be approximately as large as a factor of 1.5 to 2. However, a final assessment of the actual biases in the results reported from Member States cannot be made.

Moreover, the Commission intends to take appropriate measures in order to harmonize the monitoring philosophies and the siting criteria of the monitors among Member States.

Because it believes that in the vicinity of busy streets lead concentrations may still approach or even exceed the limit value of the Directive as long as the lead content of petrol is not reduced, the Commission's efforts will be focused on those Member States which have not yet lowered the lead content of leaded gasoline to 0.15 g/ltr.

In the light of these results, the Commission will concentrate its future efforts in the framework of the practical implementation of the Directive on those Member States with substantial industrial activities which could result in lead emissions and will ask them to provide, or to continue to provide, reliable information about measured Pb concentrations in critical zones identified by the local authorities.

However, it should be stressed that in the study mentioned above none of the measured values was above the limit value and that about 90 % of the values were below 1 $\mu g/m^3$, so that even an error in the order of a factor of two would not bring the concentrations above the limit value. Therefore, there is no doubt that, apart from a few "hot spots", the air quality requirements of the Directive are met (see also chapter III.2).

III.2 Application of Article 4

Article 4 of the Directive requires that:

> "Member States shall ensure that sampling stations are installed and operated at places where individuals may be exposed continually for a long period and where they consider that Articles 1 and 2 are likely not to be observed."

III.2.1 Information received in accordance with Article 4

In answer to the Commission's questionnaire, Member States provided information concerning the network they installed; the information has been partly updated in 1987. Table 6 provides an overview about the national networks in operation:

Table 6: Number of stations which monitor the lead concentration in Member States and their allocation to different site-categories

Country	Reference year	total number of stations	number of stations per capita	Industrial sites	Urban & sub-urban sites	Traffic-oriented sites	others
B	1985	50	1 / 214 000	34	7	1	8
DK [2]	1984	33	1 / 155 000	-	33	-	-
FRG	1983	126	1 / 476 000	n.c.	n.c.	n.c.	n.c.
	1985	NRW 29	1 / 600 000	8	19	2	-
	1985	Hamburg 2	1 / 809 000	2	-	-	-
F	1987	52	1 / 1 480 000	32	-	20 [1]	-
GR	1984	3	1 / 3 267 000	2	-	1	-
I	1986	10	1 / 5 684 000	-	10	-	-
IRL	1988	11	1 / 310 000	3	1 [6]	6 [7]	1 [8]
L [2]	1984	4	1 / 92 000	-	2	1	1
NL [3]	1985	11	1 / 1 300 000	2	-	5	4
P [4]	1986	n.c.	- / ---	-	-	-	-
E [5]	1987	5	1 / 7 677 000	-	-	-	-
UK	1985	46 [9]	1 / 2 233 000	44	-	2	-

n.c. = not communicated

[1] : Located in major cities of France

[2] : Sites are located in urban areas but are also influenced by pollution coming from residential areas, traffic and industry. All sites are placed on pavements along streets.

[3] : In 1986/87, ten additional measuring sites have been set up at traffic-influenced places where high lead levels are expected

[4] : Some monitoring seems to take place in industrial areas. An extention of the network is in planning phase; Pb stations are foreseen in Porto and Lisboa

[5] : Extention of the network is in planning phase. The five stations in operation are located in industrial and/or urban areas.

[6] : Residential traffic

[7] : 4 stations in heavy traffic streets, 2 stations in light traffic zones

[8] : Loading of lead ore from stockpiles

[9] : In addition, lead is monitored at about 63 stations for various purposes.

The situation in Portugal is still somewhat unclear. However, it is very likely that extended monitoring will start soon.

III.2.2 Assessment of the application of Article 4

Lead is monitored to a certain extent in all Member States. However, the intensity of monitoring and the targets differ considerably between Member States.

Although the criterion "number of stations per capita" is a quite vague indicator for the monitoring intensity and has no bearing at all on the completeness and quality of the survey (which depends on many parameters), it is of interest to note the relatively large number of stations/capita in Belgium, Luxembourg, Ireland and Denmark. In comparison to these netwoks, the intensity of monitoring is about 10 times smaller in Spain, Greece, Italy and, most likely, Portugal.

Obviously, Member States emphasize different monitoring targets. Some concentrate more or less all their efforts on urban areas (Denmark, Italy), others mainly on industrial sites (Belgium, United Kingdom), depending on where each Member State sees the greatest risk of exceedances. France, the Netherlands and Ireland put much emphasis on the monitoring at traffic-related sites.

This setting of priorities does not always correspond to the risk of exceedances identified in the study mentioned above (ZIEROCK 1986), e.g. one would expect more traffic-oriented sites in Italy, Portugal and Spain and more industrial sites in Italy. However, as outlined above, the national monitoring philosophy is a very sensitive field which needs further considerations.

III.3 Application of Article 5

Articles 5 (2) and 5 (3) require that:

> "Member States shall inform the Commission not later than 1 July of each year, beginning in the calendar year following the implementation of this Directive, of the places in which the limit value fixed in Article 2 (2) has been exceeded in the previous calendar year and of the concentrations recorded."

and that:

> "They shall also notify the Commission, not later than during the calendar year following that in which the limit values were exceeded, of the measures they have taken to avoid recurrence."

III.3.1 Information received in accordance with Article 5

No information on exceedances of the limit value outside the derogation zones of Article 3 (2) has been forwarded by Member States.

III.3.2 Assessment of the application of Article 5

The Commission assumes that exceedances outside the derogation zones did not occur in the Member States in 1986. However, a complete set of measured data was only available from a few countries. In particular, there is a lack of data from industrial sites, and it seems that continuous monitoring is not carried out at all industrial sites where exceedances are likely.

III.4 Application of Article 8

Article 8 of the Directive requires that:

> "For the purposes of applying this Directive, Member States shall comply with the characteristics laid down in the Annex for choosing the sampling method: for analyzing the samples taken, Member States shall use the reference method mentioned in the Annex or any other method which they prove to the Commission beforehand produces equivalent results."

III.4.1 Information received in accordance with Article 8

A quite comprehensive data base concerning the methods of sampling and analysis used by Member States for the implementation of this Directive has been obtained with the help of the questionnaires. Some Member States provided additional information in their official notifications. However, only F.R. Germany, Ireland, and the United Kingdom officially state that the methods of sampling and analysis are equal or equivalent to the reference methods. Furthermore, Ireland and the United Kingdom informed the Commission that the duration of the measurements is one week instead of one day as required by the Directive, and carried out continuously over the whole year and not at only 10 working days per month. A decision on whether such derogations from the wording of the Directive can be accepted by the Commission has not been taken yet. Other countries, e.g. France and Portugal, have incorporated the provisions of the Directive concerning sampling and analysis completely into the national legislation, but did not officially state that the methods which are actually used comply with Article 8.

III.4.2 Assessment of the application of Article 8

In the Annex of the Directive, the characteristics to be complied with for choosing the sampling method are laid down:

1) Filter: The filter shall have a collection efficiency at the face velocity used in the sampling of not less than 99 % for all particles of a mean aerodynamic diameter of 0.3 µm.

2) Sampler efficiency: The sampler efficiency is defined as the ratio of the mass concentration of the particles in the air, as collected on the filter, to the concentration in the atmosphere. The efficiency of a sampler may not be less than the values given in the following table and must be independent of wind direction.

Minimum acceptable efficiencies [%] for a sampler:

Wind speed	Particle size (aerodynamic diameter)	
	5 µm	10 µm
2 ms^{-1}	95	65
4 ms^{-1}	95	60
6 ms^{-1}	85	40

3) Aspiration flow rate of sampling:

The aspiration flow rate of sampling must remain constant to within ± 5 % of the nominal value throughout a sampling period.

All Member States have at least one national method for sampling lead particles; two countries (F.R. Germany and the Netherlands) even have more methods. Table 7 provides an overview of the methods used and their compliance with the Article 8 provisions.

Table 7: Methods of sampling for the measurement of lead in ambient air used in Member States

Memb. State	Sampler used	equivalence with Art.8 requirements tested	test was successful/ not successful	not tested sampler complies most likely with Art. 8 as shown in literature	Reference
B	IHE-sampler [1]	yes	successful		BARRETT et al.
D	Danish LMP sampler	no		yes	KEMP
F [2]	PPR 60-sampler	yes	successful		BARRETT
FRG	LIB-Filterverfahren	no		doubtful	VDI 2463, Bl.4
	Kleinfiltergerät GS 0503	yes	successful		VDI 2463, Bl. 7
	LIB/P-Filterverfahren	yes	successful		VDI 2463, Bl. 9
GR	US-HiVol sampler	no		yes	US-FEDERAL REGISTER
IRE	M-type sampler	yes	successful		BARRETT
I	method "Annex II of DPCM of 28.3.83"	yes	not successf.		ISTISAN
LUX	IHE-sampler	yes	successful		BARRETT et al.
NL	National Medium Volume Sampler (10 m³/day)	no		unknown	VAN DER MEULEN
	National High Volume Sampler (3500 m³/day)	no		yes	
P	US HiVol sampler	no [3]		yes	COMMISSION Doc. XI 477,87-EN and US-FEDERAL REGISTER
E	National High Volume Sampler (800-1000 m³/day)	no [3]		unknown	
UK	M-type sampler	yes	successful		BARRETT

[1] The IHE sampler has been slightly modified after the study of BARRETT et al. in order to improve its inlet efficiency.

[2] At 10 French stations, an instrument called "FI 15" is used which does not meet the requirements of the Annex of the Directive. However, these instruments will be replaced by PPR 60 samplers.

[3] Since Spain and Portugal have joined the Commission only recently, no testing of the instruments could be carried out yet.

The samplers used in Belgium, Luxembourg, France, Ireland and the United Kingdom have been shown to meet the requirements of the Directive. This is also true for the German Kleinfiltergerät and the LIS/P-Filterverfahren. The Italian instrument failed in the tests to meet the requirements of the Directive. The German LIB-Filtergerät, the Danish LMP sampler, the Spanish sampler and the two methods used in the Netherlands have not been tested in detail under wind tunnel conditions with mono-dispersed aerosols.

There are indications that for higher wind speeds, the LIB-instrument samples significantly less particles (only 75 - 80 % of the mass collected with the LIS/P). It is therefore difficult to assess whether the LIB-sampler does always meet the requirements of the Directive, in particular for higher wind speeds.

The design of the Danish sampler is quite similar to that of the LIB sampler. KEMP ran the instrument under field conditions in parallel to the German Kleinfiltergerät and obtained systematically higher readings for lead as well as for the total mass sampled for the Danish instrument. LASKUS carried out similar experiments and found systematically lower readings with the Danish instrument. Thus, it remains to be proved under wind tunnel conditions whether or not the Danish sampler meets the requirements of the Directive. However, there are strong indications that the sampler would pass this test successfully.

The US-HiVol sampler is used for sampling lead in Greece and Portugal. The performance characteristics of this instrument are very well known from investigations carried out in the United States, and there is no doubt that it meets the inlet efficiency requirements of the Directive.

In the Netherlands, two samplers are used: a medium volume sampler with a flowrate of 10 m^3/day and a high volume sampler which aspirates 3500 m^3/day. Results obtained under wind tunnel conditions are not available so that little can be said about the compliance with the requirements of the Directive. However, the HiVol sampler most likely meets them, but a question mark remains behind the medium volume sampler.

The Spanish sampler is not known in detail yet, so that no assessment on its performance characteristics can be made.

The requirement concerning the constancy of the aspiration flow has not been investigated systematically for all the samplers mentioned above. The German VDI-Richtlinien 2463, Bl.4, Bl.7, Bl. 8 which are relevant for the two German samplers listed above, also require that the flowrate should not decrease by more than 5 % within the 24 hours sampling period. The US-HiVol should meet this requirement if it is used with a flow controller.

For the Italian sampler, an allowed decrease in flow rate of 25 % (from 20 l/min to 15 l/min) is laid down in the description of the method (Annex II of DPCM of 28.3.83). This, of course, is not in accordance with the Directive. However, there is no indication that such a decrease in flowrate actually happens during measurements.

For the other instruments, no detailed description of the flow control devices has been submitted, so that no final assessment with regard to compliance or non-compliance with the provisions of the Directive can be made. However, inofficial information indicates that the Belgian, French, Danish, and the Dutch HiVol sampler should have no difficulties in keeping the flow rate constant within ± 5 %.

in the Annex of the Directive, Atomic Absorption Spectrometry (AAS) is laid down as a reference method of analysis. Moreover, it is said that the analytical error of the determination of lead in the collected particles should be less than 5 % of the limit value, which corresponds to 0.1 µg Pb/m³.

Finally, the Directive allows the use of any other analytical method if it produces equivalent results; the evidence has to be submitted to the Commission before the method can be applied.

Destructive and non-destructive analytical methods are in use for the determination of the lead content. Atomic Absorption Spectroscopy (AAS), which requires that the sample is first oxidized to destroy all organic matter, is an example of the former one; X-ray Fluorescence (XRFA) may serve as an example of the latter. However, a major obstacle to the application of XRFA is the profound matrix effect of the substances being analyzed. Non-destructive methods have therefore to be calibrated against a reference method, in most cases AAS.

In recent years, multi-element analysis techniques like X-ray-Fluorescence Analysis (XRFA) and Proton Induced X-ray Emission Analysis (PIXE) are used widely. However, despite the fact that lead in filter samples is analyzed by several methods other than AAS within the monitoring programmes, for most of the laboratories AAS is still considered to be the routine reference method. It should be noted that only F.R. Germany and the United Kingdom have officially notified the Commission that they use an analytical method different from AAS.

Table 8 displays the information available to the Commission concerning the methods of analysis used in Member States. It should be noted that Belgium, Denmark, F.R. Germany, the Netherlands, and the United Kingdom do not use the reference method. However, the methods used by these countries, if properly applied, performed in ringtests as well as AAS. Moreover, regular parallel checks against AAS are performed by the laboratories. There is therefore little reason to believe that the methods applied by Member States are not equivalent.

Table 8: Analytical methods for the determination of lead in the sample used by Member States

AAS = Atomic Absorption Spectroscopy
XRFA = X-ray fluorescence
PIXE = Proton-induced X-ray emission spectroscopy

Country	Sample pretreatment	Method of analysis	Remarks
B	not necessary	XRFA	regular parallel checks against AAS
DK	not necessary	PIXE	comparison to AAS has been carried out
F	wet decomposition in HNO_3 - HCl	AAS	
FRG	wet decomposition in HNO_3 - HF - H_2O_2 [2]	AAS	see VDI 2267, Bl. 3
		XRFA	see VDI 2267, Bl. 2
GR	ultrasonic extraction in HNO_3 - HCl	AAS	
IRE	wet decomposition in HNO_3 - HCl	AAS	see AMERICAN PUBLIC HEALTH ASSOCIATION
I	wet decomposition in HNO_3	AAS	
LUX	not necessary	XRFA	regular parallel checks against AAS
NL	- wet decomposition in HNO_3 - HCl	AAS	see NEDERLANDSE NORM
	- not necessary	XRFA	regular parallel checks against AAS
P	n.c.	AAS	
E	wet decomposition in HNO_3	AAS	
UK	not necessary	XRFA	regular parallel checks against AAS [1]

n.c. = not communicated

[1] All samples at risk of exceeding the limit value are re-analyzed using AAS.

[2] The analytical method most used is AAS.

IV PRESENT AMBIENT AIR SITUATION WITH REGARD TO LEAD

This chapter briefly describes and assesses the present ambient air situation with regard to lead in Member States. The information displayed was taken from different sources and not necessarily from official notifications of Member States.

IV.1 Lead concentrations measured in Member States

In Table 9, concentration ranges of lead in ambient air as measured in recent years in Member States are shown. As already mentioned in previous chapters, the information is not complete. Moreover, some of the results shown in the Table have not been obtained in compliance with the requirements of the Directive. However, the results displayed show quite clearly that in nearly all cases the measured lead concentrations are fairly well below the limit value of 2 µg/m³.

Table 9: Results of measurements of the lead-concentration in ambient air in EC Member States

Country	Number of sites considered	Site characteristics	Range of measured lead concentrations in [µg/m³]			
			1983	1984	1985	1986
B	6	urban		0.38 - 0.51	0.32 - 0.61	
	1 - 2	traffic	1.06 - 1.21	1.07 - 1.24	1.25	
	26 - 34	industrial	0.25 - 2.48	0.24 - 1.75	0.14 - 2.09	
DK	33	urban	0.08 - 0.87	0.07 - 0.72		
		traffic	0.08 - 0.87	0.07 - 0.72		
		industrial	0.08 - 0.87	0.07 - 0.72		
FRG	29 - 48	urban	0.17 - 0.61	0.17 - 0.53		
	1 - 4	traffic		0.38 - 1.36	0.61	0.59
	2 - 10	industrial		0.39 - 0.77		0.16 - 2.26
F		urban				
	4 - 20	traffic	0.4 - 3.9		0.41 - 1.81	0.51 - 3.07
	1 - 12	industrial		0.53	0.23 - 1.03	0.17 - 1.3
GR	2	urban		0.37 - 0.54		
	1	traffic		0.85		
	2	industrial				
IRL	1	urban		0.13	0.17	
	4	traffic		1.04 - 1.60	0.99 - 1.81	
	1	industrial		1.36	1.05	
I	3	urban		0.24 - 0.40		
	1 - 7	traffic		0.36 - 1.06	0.55	
	2	industrial		0.10 - 0.12		
LUX	2	urban [1]		0.20 - 0.31	0.16 - 0.25	0.17 - 0.25
	1	traffic	0.95	1.24	0.88	0.69
		industrial				
NL		urban				
	5	traffic		0.2 - 0.41	0.25 - 0.35	
	2	industrial		0.19 - 0.25	0.20 - 0.25	
P		urban				
		traffic	---- no data available ----			
		industrial				
E	5	urban [2]				
		traffic		≈ 0.6	0.7	0.6
		industrial				
UK	9	urban			0.15 - 0.35	
	2 - 3	traffic	0.55 - 0.66	0.57	0.65 - 0.80	
	1 - 17	industrial			0.19 - 2.38	0.2 - 2.6

[1] The site characteristics are structured in a simplified way. In reality, industrial and urban sites are nearly always also under the influence of traffic. The indication "traffic" used in this table means that the stations are located very close to the traffic flow.

[2] Urban-industrial site

IV.2 Assessment of the situation

Exceedances of the limit value are very rare and can be expected only at hot spots at traffic-oriented and industrial sites.

Within the last decade, a clear downward trend can be noticed at traffic-oriented sites due to the reduction of the lead content in gasoline (see for example JENSEN et al., THIESSEN et al., JOST et al., MC INNES).

However, it should be noted that the amount of lead measured depends, inter alia, significantly on the distance between the inlet of the sampler and the kerbside of the street.

The results indicate that exceedances are possible if the lead content in petrol is still in the range of 0.4 g/l and the site is placed close to the kerbside of a busy street. If the lead content is about 0.15 g/l, exceedances are very unlikely, even if the sample is taken under such conditions. Table 10 shows the current lead content of petrol in Member States, and one could conclude that exceedances at traffic-oriented sites might occur in France, Italy, Portugal, Spain, and parts of Greece other than Athens.

Table 10: Lead content of petrol marketed in EC-Member States (as of July 1987)

Member State	current lead content in [g/l]
B	0.15
DK	0.15
F	0.40
FRG	0.15
GR [1]	0.15
IRL	0.15
I	0.40
L	0.15
NL	0.15
P	0.40
E	0.40
UK	0.15

1: For the Athens area only; 0.40 g/l in all other parts of Greece

With regard to industrial sites, decreases in ambient lead concentrations can only be expected if the production and processing of lead is reduced or if appropriate emission reduction measures are implemented. The production of lead has increased in some countries, and in the Community in total, by about 20 % (see Table 11). This may also result in higher lead emissions from some industrial sources. Detailed information on reduction measures taken by Member States is not available to the Commission. Therefore, exceedances of the limit value might occur at some hot spots. However, a complete picture of where these hot spots are located does not exist in the files of the Commission.

Table 11: Production of Lead in Member States in [1000 kt], as published by Eurostat

Country	1982	1984	Change from 1982 to 1984 in [%]
B	93.7	119.6	+ 27.6
Dk	17.9	13.1	- 26.8
FRG	350.5	357.2	+ 1.9
GR	3.2	11.6	+ 262.5
ESP	131.6	147.6	+ 12.2
F	208.6	205.7	- 1.4
IRL	10.0	9.1	- 9.0
I	133.7	140.5	+ 5.1
L	---	---	---
NL	32.9	33.6	+ 2.1
P	40	6.0	+ 50.0
UK	306.2	338.4	+ 10.5
EUR 10	1032	1229	+ 19.1
EUR 12	1168	1382	+ 18.3

REFERENCES

AMERICAN PUBLIC HEALTH ASSOCIATION (1977). Methods of Air Sampling and Analysis. 2nd Edition Interdisciplinary Books and Periodicals, ISBN 0-87553-070-6

BARRETT, C.I. / CARROLL, J.D. / IRWIN, J.U. / RALPH, M.O. / UPTON S.L. (1985). A wind tunnel study and field comparison of three samplers of suspended particulate matter. Warren Spring Laboratory (UK) report LR 544 (AP) M, ISBN 0 85624 399 X

COMMISSION OF THE EUROPEAN COMMUNITIES (1982). Council Directive of 3. December 1982 on a limit value for lead in the air (82/884/EEC). Official Journal L 378 of 31.12.82, page 15 to 19

COMMISSION OF THE EUROPEAN COMMUNITIES (1984). Council Directive of 28 June 1984 on the Combating of air pollution from industrial plants. O.J. L 188, pages 20 - 25

COMMISSION OF THE EUROPEAN COMMUNITIES (1984).Wind tunnel measurements of the inlet efficiency of four samples of suspended particulate matter. EC-report EUR 9378 EN

COMMISSION OF THE EUROPEAN COMMUNITIES (1985). Council Directive of 20. March 1985 on the approximation of the laws of the Member States concerning the lead content of petrol (85/210/EEC). Official Journal L 96 of 3.4.85, page 25 to 29

COMMISSION OF THE EUROPEAN COMMUNITIES (1987). Internal Document XI 477 (87) EN

EUROSTAT (1984). Basic Statistics of the Community. ISBN 92-825-5123-7

EUROSTAT (1987).Basic Statistics of the Community. ISBN 92-825-6861-X

ISTISAN (1981). Metodi die prelievo e di analisi degli inquinanti dell'aria. Appendice 2 - Determinazione del materiale particellare in sospensione nell'aria. Istituto Superiore di Sanita, Roma

JENSEN, R.A. / LAXEN, D.P.H. (1987). The effect of the phase-down of lead in petrol on levels of lead in air. The Science of the Total Environment 59 / 1-8

JOST, D. / SATORIUS, R. (1979). Improved air quality due to lead in petrol regulation. Atmos. Environm. 13 / 1463 - 1465

KEMP, K. (1985).Report on the joint measurement programme, undertaken by Denmark in cooperation with the Commission during 1984-85. Risø National Laboratory MST LUFT-A 100

LASKUS, L. (1987).Personal Communication (see Ref. ZIEROCK 1987)

MC INNESS (1986). Airborne lead concentrations and the effect of reductions in the lead content of petrol. Warren Spring Laboratory Report No. LR 587 (AP) M

MC INNESS (1987). The impact of the reduction in the lead content of petrol on airborne lead concentrations in the United Kingdom from January 1986. Warren Spring Laboratory Report No. LR 633 (AP) M

NEDERLANDSE NORM (1981). Water en Lucht- Monstervoorbehandeling von slib, slibhoudend water en Luchtstof voor de bepaling von elementen met atomaire - absorptic spectrometrie - outsluiting met salpeterzuur en sootzuur. NEN 6405

THIESSEN, L. / HALLEZ, S. / DEROUANE, A. / VERDUYN, G. (1986). Evolution des concentration au plomb dans l'air ambient a Bruxelles. The Science of the Total Environment 58 / 255 - 261

US-FEDERAL REGISTER (1971).Reference method for the determination of suspended particulates in the atmosphere (High Volume Method). Vol. 36, pp. 81 to 91

US-FEDERAL REGISTER (1982). National Ambient Air Quality Measurement Methodology. Vol. 47, No. 234, 40 CFR, Part 50

VAN DER MEULEN (1985). Determination of airborne lead. Internal report No. 84 202 0002 of the National institute of Public health and Environmental Hygiene.

VAN DER MEULEN (1986). Explanatory letter to report 84 202 0002

VEREIN DEUTSCHER INGENIEURE (1976). Messen von Partikeln. Messen der Massenkonzentration von Partikeln in der Außenluft; LIB-Filterverfahren. VDI 2463, Blatt 4

VEREIN DEUTSCHER INGENIEURE (1979). Stoffbestimmung an Partikeln der Außenluft. Messen der Bleimassenkonzentration mit Hilfe der Atomabsorptionsspektrometrie. VDI 2267, Blatt 3

VEREIN DEUTSCHER INGENIEURE (1981). Messen von Partikeln. Messen der Massenkonzentration von Partikeln in der Außenluft; Filterverfahren, LIS/P Filtergerät. VDI 2463, Blatt 9

VEREIN DEUTSCHER INGENIEURE (1982). Messen von Partikeln. Messen der Massenkonzentration (Immission); Filterverfahren, Kleinfiltergerät GS 050. VDI 2463, Blatt 7

ZIEROCK (1986). Technical implementation of Directive 82/884/EEC. Internal report of the Commission, DG XI

ZIEROCK (1987). Preparation of a report to the Council on the implementation of Articles 10 (2) and 10 (3) of Directive 80/779/EEC. Report to EEC study 86-B-6612-11-002-11-S