Note: this is an unofficial version of the PG1/5 (95) note. This note has not been revised but the guidance itself is nevertheless extant. The note has been included within the set of more recently revised PG Notes to allow for the full set of extant Process Guidance to be available for electronic download.

PG1/5 95
December1995

Department of the Environment
The Scottish *Office*
Welsh Office

Environmental Protection Act 1990, Part I

Processes prescribed[1]
For air pollution control
by local enforcing authorities

Secretary of State's Guidance- Compression Ignition Engines, 20-50 MW Net Rated Thermal Input

NB. This Note amends and replaces PG 1/5(91), which was published in February 1991.

*NB. This Note may itself be amended from time-to-time in order to keep abreast with BATNEEC. Such changes may be issued in separate guidance published by HMSO (the "UG" note series), or alternatively may be notified in the form of ad hoc additional guidance notes to local enforcing authorities and to relevant trade associations and other interested parties. Steps will be taken by the Departments to ensure that those who need to know about changer are informed: however, **it is recommended** that operators and their advisors check with their local enforcing authority whether there haze been any changes before relying on this Note for the purpose of making an application or taking other significant action under the Act.*

This Note is issued by the Secretary of State as a guide to local enforcing authorities on the techniques appropriate for the control of air pollution in relation to compression ignition engines 20-50 MW net rated thermal-input in order to achieve the objective-set down in Section 7(2)(a) of the Environmental Protection Act 1990. It will also be of interest to operators of such processes. The objective in Section 7(2)(a) is:

> "ensuring that, in carrying on a prescribed process, the best available techniques not entailing excessive cost (BATNEEC) will be used -
>
> (i) for preventing the release of substances prescribed for any environmental medium into that medium or, where that is not practicable by such means, for reducing the release of such substances to a minimum and for rendering harmless any such substances which are so released and
>
> (ii) for rendering harmless any other substances which might cause harm if released into any environmental medium".

By virtue of Section 7(5) of the Act local enforcing authorities only have control over emissions into the air under Part I of' the Act.

This Note comprises guidance in relation to new and existing processes and is based on an assessment of best available techniques as qualified by the requirement not to entail excessive cost. (Background guidance on the meaning of BATNEEC is contained in General Guidance Note 1[2])

This Note also (where appropriate) gives information about any directions, limits, requirements, quality standards or quality objectives which were in force on the date of publication and which must be complied with ill carrying on these processes, in accordance with Section 7(2)(1)) and (c) of the Act.

Section 7(1)(a) of the Act requires that the specific conditions set in an authorisation, together with the implied general condition in Section 7(4), achieve all the objectives specified in Section 7(2), including that in Section 7(2)(a) given above.

In accordance with Section 7(11), enforcing authorities are required to have regard to any guidance issued to them by the Secretary of State when determining appropriate techniques in relation to the above-mentioned objective. The Secretary of State will also treat this guidance as one of the material considerations when determining any appeals made against a local enforcing authority decision.

The guidance contained in this Note was determined after full consultation with members of the HM Inspectorate of Pollution/Local Authority Enforcement Liaison Committee (IPLA) and interested bodies. It is based on the state of knowledge and understanding of these processes, their potential impact on the environment, and the available control techniques at the time of publication. The guidance will be updated regularly to reflect changes in knowledge and understanding; however, it will not always be possible to revise the Notes quickly enough to keep in absolute step with rapid changes. Further, the guidance cannot take into account individual process characteristics. in particular location, which may on occasion influence the nature of the conditions that are included in an authorisation.

Guidance on interpretation of the terms used in this Note is provided in General Guidance Note 4 (GG4) "Secretary of State's Guidance on Interpretation of Terms used in Process Guidance Notes".

Processes must be operated in order to protect persons at work as well as the environment, therefore conditions in the authorisation must not impose any requirement that would put at risk the health, safety or welfare of persons at work. Section 7(1) of the Act requires that no conditions are to be imposed which are designed *only* to secure the health of persons at work (as defined in Part I of the Health and Safety at Work etc Act 1974).

Wherever emission limits quoted in this Note *conflict with* occupational exposure limits set under the Health and Safety at Work etc Act 1974 to secure the health, safety or welfare of persons at work, the tighter limit should prevail.

Revised Guidance

1, This Note amends and replaces PG 1/5(91) ("the original guidance"), which was published in February 1991. Appendix 3 contains a summary of the changes that have been made. The revised guidance should be applied in accordance with paragraphs A, B and C below (as appropriate). (There may be cases where both paragraphs A and B apply.)

A.
Where this revised guidance specifies standards or requirements higher than or (subject to paragraph B) different from those in the original guidance, upgrading of existing processes[3] having regard to these higher or different standards or requirements should be completed in accordance with the timetable specified in Clause 14. Relevant authorisations should be varied (as may be necessary) having regard to the higher or different standards and the timetable in Clause 14. Any such variations should normally be able to be made as part of the review of authorisations required by section 6(6) of the Act.

B.

Where

a) standards or requirements in the original guidance have been deleted in this revised guidance, or

b) where this revised guidance specifies less stringent standards or requirements than those in the original guidance and the deadline for upgrading in the original guidance has been reached, relevant authorisations for existing processes[3], should be varied (as may be necessary) having regard to the revised guidance.

Variations to authorisations in these cases should be made as soon as reasonably practicable.

C.

In respect of any new processes[3], as from the first day of January 1996 standards or requirements should be included in authorisations having regard to the full standards of this revised note.

Introduction

2. This Note refers to processes for burning of any fuel, except waste oil or recovered oil, in a compression ignition engine where the net rated thermal input of the engine is 20 megawatts or more but less than 50 megawatts.

3. The compression ignition engine is an internal combustion engine which produces power by the controlled burning of fuel. The basic mechanism consists of one or more pistons moving up and down in closed cylinders. In the case of the large liquid fuel fired engines covered by the Note, fuel is generally introduced into the cylinder directly through a multi-hole injector nozzle. Two-stroke and four-stroke engines are available. In the four-stroke engine, as the piston moves down the cylinder, air is drawn in through the inlet valve. When the piston reaches the end of the stroke, the valve closes, trapping air in the cylinder.

The piston then moves back up the cylinder, compressing the trapped air until the compression ratio is high enough for the fuel to ignite. As the piston begins to travel down the cylinder again, it is pushed down by the hot gases above it which enable the piston to transmit power to the crankshaft. The fourth and final stroke in the cycle consists of an upwards stroke during which the spent hot gases are expelled through the exhaust valve.

4. Although much of the available energy is removed by the crankshaft, the exhaust gases are still hot. In combined heat and power (CHP) installations, the heat in the exhaust is used to generate steam or hot water in a waste heat boiler. Additional fuel can be fired in the engine exhaust and overall efficiencies of up to about 90% are possible.

5. Some compression ignition engines are fired with gas. Such engines are generally started and put on load using liquid fuel. When stable operating conditions are reached, the engine is switched over to gas firing with pilot liquid fuel providing around 7% of the heat input. This mode of operation is known as dual fuel firing.

6.These processes are prescribed for local air pollution control, under section 1.3 of Schedule 1 to the Environmental Protection (Prescribed Processes and Substances) Regulations 1991 (as amended). Section 1.3, as amended, is reproduced in Appendix 1.

7. Separate Guidance refers to gas turbines and the other combustion processes covered in a) to e) of the Part B definition in Appendix 1. In addition, requirements relating to utilisation of a compression ignition engine in a combined heat and power scheme are given in Appendix 2. Unless specifically stated in that Appendix, the guidance in the main body of this Note should be applied to combined heat and power schemes.

8. In the context of this Note, the figures of 20 to 50 megawatts refer to the individual thermal input of a compression ignition engine. Where more than one engine is operated on the same site and their aggregate thermal input is between >20MW and <50MW but each engine has an individual net rated thermal input of less than 20MW, no authorisation is required.

9. Where a compression ignition engine is used in a combined heat and power scheme, and the net rated thermal input of either the engine or the waste heat boiler exceeds 20 MW, an authorisation will be necessary. However, if the 20 MW threshold is only reached by aggregation of the net rated thermal inputs of the compression ignition engine and the waste heat boiler, then an authorisation will not be necessary. If there is more than one engine on site, and their aggregate net rated thermal inputs exceed 50 MW, or if there is more than one waste heat boiler on site and their net rated thermal inputs exceed 50 MW, or there is an individual waste heat boiler on site with a net rated thermal input in excess of 50 MW, then the whole installation will fall within the Part A definition set out in Appendix 1 to this Note.

10. "Thermal input" is the rate at which fuel can be burned, at maximum continuous rating, multiplied by the net calorific value of the fuel and expressed as megawatts thermal (MW th).

11. In the context of this Note, "process" comprises the whole process including the treating, handling and storage of any materials used in and the products and wastes produced by the process.

12. This Note applies to all new processes, to replacement processes, to substantial changes to existing processes and the upgrading of existing processes to meet the standards of this Note.

13. Section 79(10) of the Environmental Protection Act allows statutory nuisance action to be taken only in limited cases in relation to authorised processes-in particular, as regards noise nuisance. However, even Part I authorisation will implicitly impose on operators the general duty to use BATNEEC. The BATNEEC duty includes minimisation of offence to any of man's senses (although this does not cover noise because of the definition of "substance" in section 1(13) of the Act).

Upgrading of Existing Processes

14. Existing processes[2] should be upgraded to the standards of this Note whenever the opportunity arises. The timetable for upgrading should take into account the criteria included in Articles 4, 12 and 13 of the European Community Directive "On the Combating of Air Pollution from Industrial Plants" (84/360/EEC).2 Only in exceptional circumstances should upgrading be completed later than a) 1 April 1998, or b) in the case of Clause 22 and paragraph 7 of Appendix 2 the specified earlier dates.

15. The conditions contained in all authorisations should be reviewed by the local enforcing authority at intervals of not more than 4 years in accordance with section 6(6) of the Act.

Where complaint is attributable to operation of the process and is, in the opinion of the local enforcing authority, justified, or if new knowledge develops on the potential for harmful effects from emissions, immediate review of the process should be undertaken. Any new requirements and compliance time-scales should be specified by the local enforcing authority.

Emission Limits and Controls

16. All emissions to air, other than steam or water vapour, should be free from persistent mist. All emissions to air should be free from persistent fume and free from droplets.

17. The aim should be that all emissions are free from offensive odour outside the site boundary, as perceived by the local enforcing authority Inspector or authorised person.

18. Emissions from combustion processes should in normal operation be free from visible smoke and in any case should not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742:1969.

19. All pollutant concentrations should be expressed at reference conditions, 273K, 101.3 kPa, normalised for 15% oxygen content by volume, dry gas.

20. No result obtained from annual monitoring for particulates, carbon monoxide, nitrogen oxides and hydrocarbons should exceed the specified emission concentration limits.

21. The emission concentration limits for nitrogen oxides are:

Fuel	Emission Limits (mg/m^3) expressed as NO_2	
	Existing processes from date of initial authorisation	New processes from date of authorisation and existing processes from 1 April 1998
Distillate oil	1800	1300
Heavy fuel oil	1800	1-100
Gas (dual fuel)	750	500

In areas where air quality standards currently in force[6] or any future statutory standards are being breached or are at serious risk of breach, it may be necessary to set more stringent emission limits than those specified above. In particular, the use of selective catalytic reduction (SCR), selective non-catalytic reduction (SNCR), or similarly effective NO_X abatement techniques should be considered.

22. The emission concentration limits for other pollutants are:

Fuel	Emission Limits (mg/m^3)		Non-methane hvdrocarbons (expressed as carbon)
	Particulates	Carbon Monoxide	
Heavv fuel oil and distillate oil	100 [1+4]	150 [1+2]	150[3]
Gas (dual fuel)	100[1] 50[2]	450[1+2]	200[3]

1. for existing processes from I October 1996
2. for new processes from date of authorisation
3. for existing processes from I April 1998 and for new processes from the date of authorisation
4. for new processes consideration should be given at the time of application for authorisation to whether 5Omg/m^3 is achievable.

23. The emission limits in Clauses 21 and 22 above are based on an engine efficiency of 40%. For more. efficient engines, the emission limit may be calculated using the following formula:

$$\text{Corrected emission limit } (mg/m^3) = \frac{\text{emission limit } (mg/m^3)}{40} \times \text{ISO net base efficiency}$$

ISO Net Base Efficiency is calculated according to ISO 3046 Part 1.

24. For all new and existing engines fired with heavy fuel oil (residual oil), the sulphur content of the fuel should not exceed 2% w/w. For engines fired with distillate oil, the sulphur content of the fuel should not exceed 0.2% w/w. These requirements should be complied with from the date of initial authorisation.

Monitoring, Sampling and Measurement of Emissions

25. As part of proper supervision the operator should monitor emissions and make tests and inspections of the process. The need for and scope of testing and the frequency and time of sampling, will depend on local circumstances, operational practice, and the scale of operation.

26. Emissions should be monitored for nitrogen oxides at least every six months.

The value to be monitored should either be the sum of the concentration of nitric oxide and nitrogen dioxide or the concentration of nitric oxide alone, to which is then added an agreed increment, established by analysis, to represent the appropriate proportion of nitrogen dioxide.

27. Emissions should be continuously indicatively monitored for particulate matter. The monitoring equipment should be checked daily.

28. If three or more periodic monitoring exercises, carried out over a period of at least two years, indicate consistent compliance with emission limits, local enforcing authorities should consider allowing an increased interval between future monitoring exercises. Such a relaxation should be considered sooner it' the monitoring is supported by continuous indicative monitoring which shows consistent compliance. (In determining "consistent compliance" regard should be had to the variability, of monitoring results and how close the results are to the specified emission limit. Thus, results which range from 10--18mg/m^3, against an emission limit of SOmg/m^3 might not qualify for a reduction in monitoring.)

Any dispensation granted should be reviewed in the event of the process being altered in any way which might arise to increased emissions of the pollution to be monitored.

29. At least fourteen days before any periodic monitoring exercise is undertaken. the local enforcing authority should be notified giving details of the times when monitoring will take place, the pollutants to be monitored, and the sampling techniques to be employed.

30. Annual emission testing should be carried out for carbon monoxide and hydrocarbons. and to establish quantitatively the emission of' particulate matter ; this is to demonstrate compliance with the emission limits in Clause 22 above.

All annual emission testing should be carried out when the engine is operating at a single load point, within 30%, of its maximum continuous rating.

31. Visual and olfactory assessments of' emissions should be made frequently, and at least once a day. Remedial action should be taken immediately in the case of abnormal emissions.

32. The results of all monitoring and inspections should be recorded in a log book, retained by the operator for a minimum of 2 years and made available for examination by the local enforcing authority. Adverse results should be investigated immediately and in all cases should be recorded in the log book. The operator should ensure that the cause has been identified and corrective action taken, and this action recorded in the log book.

33. In any case where the continuous emission measurement of nitrogen oxides at loads in excess of 70% of the maximum continuous rating, exceeds the concentration limits specified in Clause 21 above, the results should be forwarded to the local enforcing authority. Where any emission concentration is more than twice the specified emission concentration limit, the local enforcing authority should be advised immediately.

34. The results of all non-continuous emission testing should be forwarded to the local enforcing authority within 8 weeks of the completion of the sampling.

35. Adequate, safe facilities for sampling should be provided on vents or ducts. Care is needed in the design and location of sampling systems in order to obtain representative samples.[4]

36. The reference test method for particulate matter emissions in chimneys or ducts is that of British Standard BS 3405:1983, arid tests should be carried out according to the main procedural requirements of that standard.

For the measurement of the concentration of other pollutants, methods approved by the local enforcing authority should be used.

Materials Handling

37. The receipt, handling and storage of liquid fuel should be carried out so as to minimise the emission of offensive odours to the air, by means approved by the local enforcing authority.

38. Above-ground fuel storage tanks should be completely contained by bunding which is impervious and resistant to the fuels in storage and capable of holding 110% of the capacity of all storage tanks within the bund. All spillage's should be cleared as soon as possible and to this end a supply of a suitable absorption material should be available.

Chimneys, Vents and Process Exhaust

39. The height of chimneys and vents from process and arrestment plant should be assessed on the basis of estimated ground level concentrations of the emitted residual pollutants. The chimney height so obtained should be adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structures.[5]

40. The assessment should also take into account the relevant air quality standards and criteria that apply for the emitted pollutants.[6]

41. Chimneys or vents should not be fitted with any restriction at the final opening such as a plate, cap or cowl. A cone designed to achieve the efflux velocity required by Clause 42 below is exempted from this.

42. Chimneys or vents should normally be designed for an efflux velocity of not less than 15 m/sec at full load operation. Care should be taken to avoid generating positive pressure zones within the chimney unless the chimney wall is impervious or lined.

43. Chimney flues rind ductwork leading to the chimney should be adequately insulated to minimise the cooling of waste gases and prevent liquid condensation on internal surfaces. Chimney flues and ductwork should be cleaned regularly to prevent accumulation of material.

General Operations

44. Effective control of emissions requires the maintenance and proper use of equipment, and the proper supervision of process operations. Effective preventive maintenance should be employed on all plant and the equipment concerned with the control of emissions to the air. Essential spares and consumables should be held on site or be available at short notice from a supplier so that plant breakdowns can be rectified rapidly.

45. Any malfunction or breakdown leading to abnormal emissions should be dealt with promptly and process operations adjusted until normal operations can be restored. All such malfunctions should be recorded in the log book. If there is likely to be an effect on the local community the local enforcing authority should be informed without delay. The local enforcing authority may need to identify key arrestment plant the failure of which should be notified to them immediately.

46. Staff at all levels should receive the necessary formal training and instruction in their duties relating to control of the process and emissions to air. Particular emphasis should be given to training for start-up, shut down and abnormal conditions.

47. A high standard of housekeeping should be maintained.

1. as prescribed in Regulations under section 2/1 of the Environmental Protection Act 1990.
2. General Guidance Note 1 (GG1) - Introduction to Part I of the Act- includes general guidance on the interpretation of"' best as available techniques not entailing excessive cost", the requirements of Articles 4. 12 and 13 of EC Directive 84/360/EEC, and the meaning of existing processes".
3. for the purposes of this clause (clause 1) "existing process" should be taken to have the following meaning (which is based on paragraph l4 of Schedule 3 to SI 1991/4721)

i) a process which was being carried on at some time in the 12 months immediately preceding the first day of the month following publication of this guidance note:

ii) a process which is to be carried on at a works, plant or factory or by means of mobile plant which was under construction or in the Course of manufacture or in the course of commission on the first day of the month following publication of this guidance note, or the construction or supply of which was the subject of a Contract entered into before that date.

"New processes" Should be taken to have a corresponding meaning.

4. HMIP Technical Guidance Note (Monitoring) M1 "Sampling Facility Requirements for the Monitoring of Particulates in Gaseous Releases to Atmosphere", **HMSO ISBN** 0 11 752 777 7
5. Guidance for the determination of chimney heights is given in HMIP Technical Guidance Note (Dispersion) DI "Guidelines on Discharge Stack Heights for Polluting Emissions". HMSO, ISBN 0 11 752794 7
6. The Air Qualitv Standards Regulations 1989 (SI 1989 No 317) specify current .standards.

APPENDIX 1

DEFINITION OF COMBUSTION PROCESSES IN SCHEDULE 1 OF THE ENVIRONMENTAL PROTECTION (PRESCRIBED PROCESSES AND SUBSTANCES) REGULATIONS, (AS AMENDED)* (See Clause 2 in this Note)

(The processes for air pollution control are listed under **"Part B".** The "Part A" processes are for HM Inspectorate of Pollution control.)

1.3 Combustion processes

Part A

(a) burning any fuel in a boiler or furnace with a net rated thermal input of 50 megawatts or more or, when the process is carried on by the same person at the same location, burning any fuel in any of two or more boilers or furnaces with an aggregate net rated thermal input of 50 megawatts or more (disregarding any boiler or furnace with a net rated thermal input of less than *3* megawatts);

(b) burning any fuel in a gas turbine or compression ignition engine with a net rated thermal input of 50 megawatts or more or, when the process is carried on by the same person at the same location, burning any fuel in any of two or more such turbines or engines with an aggregate net rated thermal input of 50 megawatts or more (disregarding any such turbine or engine with a net rated thermal input of less than *3* megawatts);

(c) burning any of the following in an appliance with a net rated thermal input of *3* megawatts or more otherwise than as a process which is related to a Part B process-

(i) waste oil;

(ii) recovered oil;

(iii) any fuel manufactured from, or comprising, anv other waste.

Nothing in this Part of this Section applies to the burning of any fuel in a boiler, furnace or other appliance with a net rated thermal input rating of less than *3* megawatts.

Part B

The following processes unless carried on in relation to and as part of any Part A process-

(a) burning any fuel in a boiler or furnace with a net rated thermal input of not less than 20 megawatts (but less than 50 megawatts);

(b) burning any fuel in a gas turbine or compression ignition engine with a net rated thermal input of not less than 20 megawatts (but less than 50 megawatts);

(c) burning as fuel in an appliance with a net rated thermal input of less than *3* megawatts waste oil or recovered oil;

(d) burning in an appliance with a net rated thermal input of less than *3* megawatts solid fuel which has been manufactured from waste by a process involving the application of heat;

(e) burning, in any appliance, fuel manufactured from, or including, waste (other than waste oil or recovered oil or such fuel as is mentioned in paragraph (d)) if the appliance has a net rated thermal input of less than *3* megawatts but at least 0.-f megawatts or is used together with (whether or not it is operated simultaneously with) other appliances which each have a net rated thermal input of less than 3 megawatts and the ` aggregate net rated thermal input of all the appliances is at least 0.4 megawatts.

In paragraph (c) of Part A and paragraph (e) of Part B, "fuel" does not include gas produced by biological degradation of waste; and for the purposes of this Section-

"net rated thermal input" is the rate at which fuel can be burned at the maximum continuous rating of the appliance multiplied by the net calorific value of the fuel and expressed as megawatts thermal; and

"waste oil" means any mineral based lubricating or industrial oil which has become unfit for the use for which it was intended and, in particular, used combustion engine oil, gearbox oil, mineral lubricating oil, oil for turbines and hydraulic oil; and

"recovered oil" means waste oil which has been processed before being used.

* Every effort has been taken to ensure that this Appendix is correct at the beginning of November1995, but readers should note that the Regulations are likely to be subject to periodic amendment, and this Appendix should not therefore be relied upon as representing the up-to-date position after the publication date.

APPENDIX 2

SECRETARY OF STATE'S GUIDANCE-COMPRESSION IGNITION ENGINES, 20-50 MW NET RATED THERMAL INPUT

GUIDANCE ON COMBINED HEAT AND POWER SCHEMES

1. The following should apply where a compression ignition engine is utilised as the prime mover in a combined heat and power scheme, whether or not additional heat is added to the engine exhaust by way of supplementary firing, either prior to, or in, a waste heat boiler.

Emission Limits

2. Clauses 16, 17 & 18 in the main body of this Note should be applied.

3. Where supplementary firing is utilised, the concentration of particulates in the flue gases should be expressed at reference conditions 273K, 101.3kPa, and normalised for 3% oxygen content by volume, and dry gas. Where supplementary firing is not utilised the reference conditions in Clause 19 in the main body of this Note should apply.

4. Where supplementary firing is not utilised, no result obtained from monitoring for carbon monoxide, nitrogen oxides, particulates and hydrocarbons, arising from the compression ignition engine, should exceed the limits specified in Clause 21 & 22 in the main body of this Note, and corrected. where appropriate, for efficiency, in accordance with Clause 23 above.

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5. Where supplementary firing is utilised. it will be necessary to calculate the allowable nitrogen oxides emission limit for the whole combined heat and power scheme, since. the stack emission will contain products of combustion arising both from the compression ignition engine and the supplementary burners). This should done as set out in Clauses 6, 7 and 8 below. (Clauses 21 – 23 in the main body of this Note should not be applied where supplementary firing is utilised.)

6. The emission limits in milligrams per megajoule (mg/MJ) for compression ignition engines used in combined heat and power schemes (where supplementary firing is utilised) are as follows. These limits should be inserted in the equation in Clause 8 of this Appendix.

Fuel	Emission Limits (mg/MJ) expressed as NO_2	
	Existing processes from date of initial authorisation	New processes from date of authorisation and existing processes from 1 April 1998
Distillate oil	1525	1100
Heavy fuel oil	1525	1185
Gas (dual fuel)	635	425

In areas where air quality standards currently in force or any future statutory standards are being breached or are at serious risk of breach, it may be necessary to set more stringent emission limits than those specified above. In particular, the use of selective catalytic reduction (SCR), selective non, catalytic reduction (SNCR), or similarly effective NO_X abatement techniques should be considered.

7. The emission limits for nitrogen oxides (expressed as NO_2) applicable to the supplementary firing are as follows, and should be used for insertion in the equation in Clause 8 of this Appendix.

Fuel	Emission Limits (mg/MJ)	
	New processes	Existing processes from 1 October 1996
Distillate oil	50	50
Heavy fuel oil	75	100
Gas (dual fuel)	30	30

8. The total nitrogen oxides emission limit for the combined heat and power scheme can then be calculated in terms of mg NO_X per M J of energy input as follows:

Nitrogen oxides emission limit (mg/MJ) =

$$\frac{\text{Allowable nitrogen oxides (from compression ignition engine)} + \text{Allowable nitrogen oxides (from supplementary firing)}}{\text{Maximum continuous rating (MW th) of compression ignition engine} + \text{Maximum continuous rating (MW th) of the supplementary firing}}$$

-where

"allowable nitrogen oxides from the compression ignition engine" = nitrogen oxides emission limit from Clause 6 of this Appendix, multiplied by the maximum continuous rating in MW (th) of the engine

and

"allowable nitrogen oxides from the supplementary firing" = nitrogen oxides emission limit from Clause 7 of this .-appendix, multiplied by the maximum continuous rating in MW (th) of the supplementary firing.

In addition the total particulate matter arising from the combined heat and power scheme should not exceed 150 mg/m^3.

For all liquid fuels. the sulphur content of the fuel should be as specified in Clause 20 in the main body of this Note, for firing both the compression ignition engine and the supplementary burner(s).

Emission Monitoring

9. Clauses 25, 27, 28, 29, 31, 32, 34, 35, 36 in the main body of this Note should be applied for all combined heat and power schemes with or without supplementary firing. Clauses 26, 30 and 33 should not be applied in relation to schemes with supplementary firing.

10. For combined heat and power schemes without supplementary firing, compliance with the emission limits for the compression ignition engine, as detailed in Clause 21 & 22 in the main body of this Note, and corrected, where appropriate, in accordance with Clause 23 above, should be demonstrated in accordance with Clause 26 & 30 above. The reporting requirements of Clauses 33 & 34 should also be met.

Where supplementary firing is utilised, a monitoring and calculation exercise should be undertaken not less frequently than once in each three month period, to establish the nitrogen oxides emission in mg per 1MJ of input energy. In addition, the particulate emission of the combined heat and power scheme should be determined at least once in any 12-month period, where either the compression ignition engine or the supplementary burner(s), or both, are fired on heavy fuel oil (residual oil) and arrestment plant is necessary to meet the particulate emission limit above.

All sampling should be undertaken when both the compression ignition engine and the supplementary firing are operating at a single load point, with the engine at a load point in excess of 70% of its maximum continuous rating, and with the waste heat boiler fired to its maximum continuous rating.

Upgrading of Existing Processes

11. Existing processes should be upgraded to the standards of this Note in accordance with the timetable specified in Clause 14 in the main body of this Note.

APPENDIX 3

TABLE OF DERIVATIONS

This appendix indicates for each clause its derivation (if any) in PG 1 /5(91), as amended by paragraph 42 of UG-1*, and any changes made in comparison with PG1/5(91).

Clause in PG 1 /5(95)	Related clause in PG 1 /5(91)	Comments
1		new guidance
2	1	no change
3	-	new guidance
4	-	new guidance
5	-	new guidance
6	2	amended
7	3	minor change
8	4	part amended
9	4	part no change
10	4	part no change
11	5	minor change
12	6	no change
-	7	original Clause 7 deleted
-	8	original Clauses 8 deleted
13	9	minor change
14	10	amended
-	11	original Clause 11 deleted
15	12	no change
16	13	no change
17	14	amended
18	15	no change
19	16	no change
20	17	amended
21	18	part amended
22	18	part amended
23	19	minor change
24	20	amended
25	21	no change
26	22	amended
27	-	new guidance
28	-	new guidance
29	-	new guidance
30	23	amended
31	24	no change
32	25	no change
33	26	no change
31	27	no change
35	28	no change
36	29	no change
3;	30	no change
38	31	no change
39	32	no change
40	33	no change
-	34	original Clause 34 deleted
41	35	no change
42	36	amended
43	37	no change
44	38	amended
45	39	no change
46	40	no change
47	41	no change
Appndx 1	Appndx 1	amended in line with regulations amendments
Appndx 2	Appndx 2	paragraphs 6, 7, 8 and 10 amended
Appndx 3	-	this appendix