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Process Guidance Note 5/2 (12)

Statutory Guidance for Crematoria

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Revision of the Guidance

The electronic version of this publication is updated from time to time with new or amended guidance. The table below is an index to the latest changes (minor amendments are generally not listed).

Date of amendment	Chapter/paragraph where amendment can be found	Nature of amendment
September 2012	Paragraph 4.6	Clarification of text relating to a differential pressure gauge
September 2012	Table 3, Row 9 and Table 4, Row 10:	Corrected text relating to oxygen monitoring provisions at the end of the secondary combustion chamber to read: “measured wet or dry, minimum average 6% and minimum 3%”

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1. Introduction

Legal basis

1.1 This note applies to the whole of the UK. It is issued by the Secretary of State, the Welsh Assembly Government, the Scottish Government and the Department of the Environment in Northern Ireland (DoE NI), to give guidance on the conditions appropriate for the control of emissions into the air from the cremation of human remains. It is published only in electronic form and can be found on the Defra website. It supersedes PG5/2(04) and NIPG5/2 (September 2005) Version 2.

1.2 This guidance document is compliant with the Code of Practice on Guidance on Regulation page 6 of which contain the "golden rules of good guidance". If you feel this guidance breaches the code or you notice any inaccuracies within the guidance, please contact us.

1.3 This is one of a series of statutory notes[1] giving guidance on the Best Available Techniques (BAT)[2]. The notes are all aimed at providing a strong framework for consistent and transparent regulation of installations regulated under the statutory Local Air Pollution Prevention and Control (LAPPC) regime in England and Wales, Scotland and Northern Ireland. The note will be treated as one of the material considerations when determining any appeals against a decision made under this legislation.

1.4 In general terms, what is BAT for one installation in a sector is likely to be BAT for a comparable installation. Consistency is important where circumstances are the same. However, in each case it is, in practice, for regulators (subject to appeal) to decide what is BAT for each individual installation, taking into account variable factors such as the configuration, size and other individual characteristics of the installation, as well as the locality (e.g. proximity to particularly sensitive receptors).

1.5 The note also, where appropriate, gives details of any mandatory requirements affecting air emissions which are in force at the time of publication, such as those contained in Regulations or in Directions from the Government. In the case of this note, at the time of publication this includes:

- Environmental Protection (England) (Crematoria Mercury Emissions Burden Sharing Certificate) Direction 2010 which came into force on 18 March 2010;
- Environmental Protection (Crematoria Mercury Emissions) (Wales) Direction 2010 which came into force on 19 April 2010.

[1] this and other notes in the series are issued as statutory guidance in England and Wales under regulation 64(2) of the Environmental Permitting Regulations. The notes are also issued as guidance in Scotland and statutory guidance in Northern Ireland

[2] further guidance on the meaning of BAT can be found for England and Wales, Scotland, and Northern Ireland.

1.6 In **Section 4** and **Section 5**, arrows are used to indicate the matters which should be considered for inclusion as permit conditions. It is important to note, however, that this should not be taken as a short cut for regulators to a proper determination of BAT or to disregard the explanatory material which accompanies the arrows. In individual cases it may be justified to:

- include additional conditions
- include different conditions
- not include conditions relating to some of the matters indicated.

In addition, conditions will need to be derived from other parts of the note, in particular to specify emission limits, compliance deadlines and mandatory requirements arising from directions or other legislation.

Who is the guidance for?

1.7 This guidance is for:

Regulators

- local authorities in England and Wales, who must have regard to the guidance when determining applications for permits and reviewing extant permits;
- the Scottish Environment Protection Agency (SEPA) in Scotland, and district councils or the Northern Ireland Environment Agency, (NIEA), in Northern Ireland.

Operators who are best advised also to have regard to it when making applications and in the subsequent operation of their installation.

Members of the public who may be interested to know what the Government considers, in accordance with the legislation, amounts to appropriate conditions for controlling air emissions for the generality of installations in this particular industry sector.

Updating the guidance

1.8 The guidance is based on the state of knowledge and understanding, at the time of writing, of what constitutes BAT for this sector. The note may be amended from time to time to keep up with developments in BAT, including improvements in techniques, changes to the economic parameters, and new understanding of environmental impacts and risks. The updated version will replace the previous version on the Defra website and will include an index to the amendments.

1.9 Reasonable steps will be taken to keep the guidance up-to-date to ensure that those who need to know about changes to the guidance are informed of any published revisions. However, because there can be rapid changes to matters referred to in the guidance – for example to legislation – it should not be assumed that the most recent version of this note reflects the very latest legal requirements; these requirements apply.

Consultation

1.10 This note has been produced in consultation with relevant trade bodies, representatives of regulators including members of the Industrial Pollution Liaison Committee, and other potentially interested organisations.

Policy and procedures

1.11 General guidance explaining LAPPC and setting out the policy and procedures is contained in separate documents for England and Wales, Scotland and Northern Ireland.

2. Timetable for compliance and reviews

Existing processes or activities

2.1 This note contains all the provisions from previous editions which have not been amended or removed. For installations in operation at the date this note is published, the regulator should have already issued or varied the permit having regard to the previous editions. If they have not done so, this should now be done.

2.2 Fitting mercury arrestment by end of 2012 is required at 50% of UK cremations and burden sharing is specified for unabated cremations. (Details at **paragraphs 4.28 – 4.33**).

2.3 The new provisions of this note and the dates by which compliance with these provisions is expected are listed in the table below, together with the paragraph number where the provision is to be found. Compliance with the new provisions should normally be achieved by the dates shown. Permits should be varied as necessary, having regard to the changes and the timetable.

Table 1 - Compliance timetable

Guidance	Relevant Paragraph in this Note	Compliance Date
Calibration/configuration of particulate continuous emissions monitors (CEMs).	Paragraphs 4.12 – 4.13	• for CEMS capable of producing qualitative data: at the next reasonable opportunity and annually thereafter; • for CEMs not capable of producing qualitative data, upgrading of instruments within **18 months** of the publication of this note and annual calibration thereafter.
Keeping records of quarterly gas consumption.	Paragraph 4.34	Within **3 months** of the publication of this note.
Simple plan to deal with emergencies that give rise to mass fatalities	Paragraph 5.35	Within 12 months of the publication of this note.
All other provisions		Within 12 months of the publication of this note.

2.4 Replacement plant should normally be designed to meet the appropriate standards specified for new installations/activities. Where mercury plant requires replacement, it should be open to operators to opt instead for burden sharing, provided the regulator is satisfied that appropriate burden sharing arrangements are in place.

2.5 Where provisions in the preceding guidance note have been deleted or relaxed, permits should be varied as necessary as soon as reasonably practicable. **Section 6** provides a summary of all changes.

2.6 For new crematoria, the permit should have regard to the full standards of this guidance from the first day of operation.

2.7 For substantially changed activities, the permit should normally have regard to the full standards of this guidance with respect to the parts of the activity that have been substantially changed and any part of the activity affected by the change, from the first day of operation.

Permit Reviews

2.8 Under LAPPC the legislation requires permits to be reviewed periodically but does not specify a frequency. It is considered for this sector that a frequency of once every eight years ought normally to be sufficient for the purposes of appropriate Regulations[3]. Further guidance on permit reviews is contained in the appropriate Guidance Manual for England and Wales, Scotland and Northern Ireland. Regulators should use any opportunities to determine the variations to permits necessitated by **paragraph 2.2** above in conjunction with these reviews.

2.9 Conditions should also be reviewed where complaint is attributable to the operation of the process and is, in the opinion of the regulator, justified.

[3] For details see England and Wales chapter 26, Scotland, Practical guide section 10, Northern Ireland Part B Guidance page 9, Northern Ireland Part C Guidance chapter 17.

3. Activity description

Regulations

3.1 This note applies to LAPPC installations for cremation of human remains in:

- gas fired and electric fired cremators in new and existing crematoria, with or without mercury abatement;
- standby cremators;
- small-scale cremators.

The activities are listed for regulation as follows.

Table 2 - Regulations listing activities

LAPPC	Activity	England and Wales	Scotland	Northern Ireland
		EPR Schedule 1 reference	PPC Schedule 1 reference	PPC Schedule 1 reference
Part A	n/a	n/a	n/a	n/a
Part B	Cremation of human remains	Section 5.1 Part B	Section 5.1 Part B	n/a
Part C	Cremation of human remains	n/a	n/a	Section 5.1 Part C
The links are to the original version of the Regulations. A consolidated version is **not** available on http://www.legislation.gov.uk/.				

3.2 Cremation is a batch process consisting (excluding pre-heating and shut-down) of:

a. the brief "flash" caused by volatilisation of the veneer on the outside of the coffin;
b. burning of the coffin;
c. after the coffin breaks open, burning of the coffin and cremation of the body;
d. calcination of the remains; and
e. ashing.

3.3 Total cremation times vary considerably, ranging from as little as 50 minutes up to in excess of 2 hours, depending upon body size and cause of death. Indicative timescales involved for processes a – e are typically:

a. 1 minute;
b. 20 minutes;
c. 40 minutes;
d. 30 minutes;
e. 2 minutes although times may vary.

Abatement Plant

3.4 Fitting mercury arrestment by end of 2012 is required such that at least 50% of UK cremations are carried out in plants fitted with abatement.

3.5 Potential pollutants from unabated cremations consist of particulate matter (PM), hydrogen chloride, nitrogen oxides, carbon monoxide, volatile organic compounds (from methane to polyaromatic hydrocarbons (PAH), mercury compounds and polychlorinated dibenzo-p-dioxins and furans (PCDD/F) often simply referred to as dioxins.

3.6 Flue gases from abated cremations may also include particulate matter from:

- alkali compounds added to the flue gases to control acid gas (e.g. hydrogen chloride) emissions;
- activated carbon powder used to control dioxin and mercury emissions;
- incompletely combusted char and soot particles.

3.7 The arrestment provisions in this note are based on an abatement system of cool, capture, collect. The hot exhaust gases are cooled using, for example water tube coolers. Injecting dry lime or sodium bicarbonate and activated carbon into the gas stream captures pollutants. A dry filter captures the particulate matter and a reduction of between 90 to 98% in mercury concentrations is expected. Alternatives with equal or better performance may be accepted. However, conditions in a permit stating a percentage reduction are not recommended.

4. Emission limits, monitoring and other provisions

4.1 Emissions of the substances listed in Tables 3 & 4 should be controlled.

4.2 The emission limit values and provisions described in this section are achievable using the best available techniques described in Section 5. Monitoring of emissions should be carried out according to the method specified in this section or by an equivalent method agreed by the regulator. Where reference is made to a British, European, or International standard (BS, CEN or ISO) in this section, the standards referred to are correct at the date of publication. (Users of this note should bear in mind that the standards are periodically amended, updated or replaced. The latest information regarding the monitoring standards applicable can be found at the Source Testing Association website. Further information on monitoring can be found in Environment Agency publications M1 and M2.

4.3 All activities should comply with the emission limits and provisions with regard to releases in Tables 3 & 4.

The reference conditions for limits in **Section 4** are: 273.1K, 101.3kPa, 11% oxygen v/v, dry gas unless otherwise stated.

Table 3 - Unabated cremators - emission limits, monitoring and other provisions

Row	Substance	Mass emission limits per cremator (Note 1 & Note 3)	Concentration limits (Note 3)	Type of monitoring	Monitoring frequency
1	Hydrogen chloride (excluding particulate matter)	300g an hour	200 mg/m^3 averaged over an hour	Periodic monitoring	Annual
2	Total particulate matter from cremator **(Note 2)**	• 120g an hour for 95% of cremations; **and** • 240g an hour for all cremations	• 80 mg/m^3 averaged over an hour for 95% of cremations; **and** • 160 mg/m^3 averaged over an hour for all cremations	Qualitative monitoring **(Note 2)** • Provide visual alarms and record levels and alarms **Plus** • Instrument health check - i.e. a service according to manufacturer's instructions **Plus** Periodic monitoring • Use results to set reference levels for continuous emissions monitor (CEM) i.e. configure outputs and set reference levels at which alarms will activate	Continuous **Plus** Annual **Plus** Annual
3	Carbon monoxide	• 150g in the first hour of cremation for 95% of cremations; **and** • 300g in the first hour of cremation for all cremations	• 100 mg/m^3 averaged over the first hour for 95% of cremations; **and** • 200 mg/m^3 averaged over the first hour for all cremations	Qualitative monitoring • Record data at 15 second intervals or less • Provide visual alarms and record alarm events **Plus** Instrument health check - i.e. service according to manufacturer's instructions **Plus** Periodic monitoring • Validation of continuous emissions monitor (CEM) output through comparison with periodic test results	Continuous **Plus** Annual **Plus** Annual
4	Organic compounds (excluding particulate matter) expressed as carbon	30g an hour	20 mg/m^3 averaged over an hour of cremation	Periodic monitoring	Annual

If the combustion provisions in Rows 7 - 9 are *not* met, then the dioxin emission limit and monitoring provision in Row 5 should be applied					
5	PCDD/F	4.5 micrograms as ITEQ per 3 cremations (minimum sampling period 6 hours)	1 nanogram/m^3 as ITEQ	Periodic monitoring • Continuous monitoring of any temperature, oxygen and flow parameters that apply during the dioxin tests should be required by the permit • Interlock to prevent cremator loading unless those parameters are met	Upon commissioning of new or replacement cremators
Concentration limits from cremated remains reduction plant (cremulators) venting externally are given in Row 6					
6	Particulate matter	n/a	50 mg/m^3 with no correction for oxygen concentration or water vapour	Gross filter failure detection (see paragraph 4.6) • Instrument health check - i.e. service according to manufacturer's instructions	Testing at commissioning Service interval as specified by manufacturer
If the combustion provisions in Rows 7 - 9 are *not* met, then the dioxin emission limit and monitoring provision in Row 5 should be applied					
Row	**Parameter**	**Combustion Provision**		**Type of monitoring**	**Monitoring frequency**
7	Temperature	Minimum of 1123K (850ºC)		• Measure at the exit of the secondary combustion zone (measuring point should be at the last measuring thermocouple) • Automatically record temperatures • Visual alarm when temperature falls below 1123K • Record alarm activations • Interlock to prevent cremator loading to operate when temperature and combustion provisions in Rows 7 – 9 are not met	Continuous
8	Residence time	2 seconds residence time (minimum) in the secondary combustion chamber without correction for temperature, oxygen or water vapour		Measurement and calculation of the volume rate of the flue gases throughout the cremation cycle at the cremator exit.	Upon commissioning of new or replacement cremators
9	Oxygen	At the end of the secondary combustion chamber: • measured wet or dry, minimum average 6% and minimum 3%		• Monitor and record of concentration at outlet of secondary combustion zone • Visual alarm and record activations • During discontinuous tests, continuous reference oxygen measurements should be at the same sampling location as the parameters tested	Continuous

Note 1 - the mass of emissions per hour are calculated from the measured values from 2 minutes to 62 minutes after the close of coffin loading.

Note 2 - in this table, the term "qualitative" monitoring refers to those particulate continuous emissions monitors (CEM) where the instrument response should be correlated to the results of multiple isokinetic gravimetric samples according to the standard reference method (SRM) which is typically EN-13284-1. See also **paragraphs 4.4 – 4.11** and **Table 5**.

Note 3 – for unabated cremators, the operator chooses whether the mass or the concentration limits apply and the Regulator should then specify those limits in the permit. When calculating mass emissions, the cremator should multiply the flow rate at that moment by the concentration at that moment.

Table 4 - Abated cremators - emission limits, monitoring and other provisions

Row	Substance	Mass emission limits per cremator	Concentration limits	Type of monitoring	Monitoring frequency
1	Mercury	n/a	50 micrograms/m^3	Periodic monitoring **(Note 1)**	Annual
2	Hydrogen chloride (excluding particulate matter)	n/a	30 mg/m^3 hourly average	Periodic monitoring	Annual
3	Total particulate matter	n/a	20 mg/m^3 hourly average	Filter leak monitor • Provide visual alarms and record levels and alarms • Set reference levels on commissioning (i.e. set levels at which alarms will activate) **Plus** Instrument health check - i.e. service according to manufacturer's instructions **Plus** Periodic monitoring • Set reference levels for continuous emission monitor (CEM) (i.e. set levels at which alarms will activate	Continuous **Plus** Annual **Plus** Every 3 years
For abated crematoria with a "multiple cremators/single abatement plant" configuration, the provisions of Row 4a apply. For abated crematoria with a "single cremator/single abatement plant" configuration, the provisions of either Row 4a **OR** Row 4b can apply but should be specified to the regulator at the earliest opportunity.					
4a	Carbon monoxide	n/a	100 mg/m^3 reported as 2 x 30-minute averages	Qualitative monitoring • Record data at 15 second intervals or less • Provide visual alarms and record alarm events **Plus** Periodic test: • Validation of continuous emissions monitor (CEM) output through comparison with periodic test results	Continuous **Plus** Annual

4b	Carbon monoxide	• 150g in the first hour of cremation for 95% of cremations **and** • 300g in the first hour of cremation for all cremations	n/a	Qualitative monitoring • Record data at 15 second intervals or less • Provide visual alarms and record alarm events **Plus** Instrument health check – i.e. service according to manufacturer's instructions **Plus** Periodic monitoring • Validation of continuous emissions monitor (CEM) output through comparison with periodic test results	Continuous **Plus** Annual **Plus** Annual
5	Organic compounds (excluding particulate matter) expressed as carbon	n/a	20 mg/m^3 averaged over an hour of cremation.	Periodic monitoring	Annual
If combustion provisions in Rows 8 – 10 are *not* met, then the dioxin emission limit and monitoring provision in Row 6 should be applied					
6	PCDD/F (on abated processes, for cremators that don't meet the combustion provisions below)	n/a	0.1 nanogram/m^3 as ITEQ	Periodic monitoring • Continuous monitoring of any temperature, oxygen and flow parameters that apply during the dioxin tests should be required by the permit • Interlock to prevent cremator loading unless those parameters are met	Upon commissioning of new or replacement cremators
Concentration limits from cremated remains reduction plant that vents externally are given in Row 7					
7	Particulate matter	n/a	50 mg/m^3 with no correction for oxygen concentration or water vapour	Gross filter failure detection (see **paragraph 4.6**)	Testing at commissioning

If combustion provisions in Rows 8 – 10 are ***not*** met, then the dioxin emission limit and monitoring provision in Row 6 should be applied				
Row	**Parameter**	**Combustion Provision**	**Type of monitoring**	**Monitoring frequency**
8	Temperature	• Minimum of 800ºC (1073K) in the secondary combustion chamber • Minimum of 850ºC (1123K) in the secondary combustion chamber when operating under emergency conditions without abatement - measuring point should be at the last measuring thermocouple	• Measure at the exit of the secondary combustion zone; measuring point should be at the last measuring thermocouple • Automatically record temperatures; • Visual alarm when temperature falls below 1073K (800ºC); • Record alarm activations • Interlock to prevent cremator loading below 800ºC.	• Continuous
9	Residence time	2 seconds residence time (minimum) in the secondary combustion chamber without correction for temperature, oxygen or water vapour	Measurement and calculation of the volume rate of the flue gases throughout the cremation cycle at the cremator exit.	Upon commissioning of new or replacement cremators
10	Oxygen	At the end of the secondary combustion chamber: • measured wet or dry, minimum average 6% and minimum 3%	• Record of concentration at outlet of secondary combustion zone; • Visual alarm and record alarm activations; • During discontinuous tests, continuous reference oxygen measurements should be at the same sampling location as the parameters tested.	Continuous
Note 1 – the Environment Agency monitoring guidance, M2, advises that "the choice of a suitable averaging period is strongly influenced by the expected short-term variability in emission levels and whether peaks are important". Also "the averaging time for manual techniques is often constrained by the need for a sampling run of appropriate duration … because manual techniques have an associated analytical end-method stage (e.g. weighing of particulate samples) for which a sufficient mass of pollutant must be sampled to achieve an adequate limit of detection (LOD)... ". For these reasons, regulators are advised to ensure that those undertaking monitoring liaise with the relevant analytical laboratory to determine the detection limit of the analytical method in order to obtain an estimate of the expected concentration of the monitored substance in the stack gas and calculate the sampling time required to ensure that the LOD of the sampling method is met. In any case it is not expected that the duration of sampling runs will be less than 30 minutes or longer than 8 hours.				

Continuous Monitoring

4.4 Continuous emissions monitors (CEMs) are normally either extractive stack emission monitoring instruments, where a sample of the gas is drawn from the chimney stack or duct, generally through a sample condition line, into the measuring cell; or cross-stack (in situ) emissions monitoring instruments, where measurements of the target species are made directly within the gaseous atmosphere of the stack or duct.

Where a CEM is used for compliance purposes, it must be periodically checked (calibrated) to ensure the readings being reported are correct. This calibration is normally done by carrying out a parallel stand-alone test and comparing the results with those provided by the CEM. Calibration tests can be performed by suitably trained in-house staff, although it is more usual for external contractors to undertake CEMs calibration when periodic testing is being undertaken. It is the responsibility of the operator to ensure calibration tests are performed on a regular basis.

Types of Continuous Monitoring for Particulate Matter

4.5 One of the basic issues in obtaining good results from a particulate CEM is to ensure that the instrument is fit for purpose – it must give a stable, reliable response and be able to operate in the long term without the need for maintenance or cleaning.

4.6 There are four categories of continuous particulate monitoring instruments used to satisfy regulatory requirements:

- **Quantitative instrument** – a particulate CEM which may be used to monitor mg/m^3 continuously. Some instruments are capable of being calibrated to a very high standard, such that the uncertainties associated with the data they produce are very small. They also have sophisticated automatic, self-checking data quality-assurance (QA) features built in. These QA checks are typically for contamination and drifts in the signal.

  Other quantitative particulate CEMs may allow slightly higher uncertainty in the data and have less sophisticated QA self-check features. Alarm levels can be programmed into the instrument that can detect a given percentage (%) of the emission limit value (ELV).

- **Qualitative instrument** - quantitative CEMs may be used in *qualitative* mode, where data is still generated in a mg/m^3 format but there is further uncertainty in the data. Alarm limits may be set that give an approximate % of the ELV.

- **Filter leak detector** – this instrument monitors for changes in the operation of dust arrestment plant (typically a bag filter, measuring trends of plant operation over time). Importantly, the instrument has a QA self-check capability that influences confidence in the data that can be used for simple process control. In terms of alarms, step changes can be seen from analyses for trends over time.
- **Gross filter failure device** – this is a simple instrument that provides an alarm when there is a significant step-change in emissions i.e. rupture of a filter. These instruments tend only to be used on smaller filters since they provide no information to improve plant performance, have no trend output or quality assurance features to provide confidence that they are working correctly.

A differential pressure gauge (a **Bag Blinding Detector**) is also commonly fitted to a bagfilter to detect excessive pressure drop across the bags caused by bag blinding. This allows early detection of reduced filter suction and increased fan energy usage. In unusual circumstances where the pressure drop device is fitted across a secondary filter, the increased emissions from a primary filter can be detected as an increase in pressure on the secondary filter. When used on a primary filter a **Bag Blinding Detector** provides no particle emission detection capability.

Instrument Calibration/Configuration for Particulate CEMs

4.7 Before any calibration or instrument configuration is carried out it is fundamental to carry out checks that ensure the instrument is working properly so that a calibration/configuration test is meaningful and cost-effective. The tests performed to ensure an instrument is prepared for correlation testing against an isokinetic sampling or configuration are referred to as:

- A functionality test of quantitative/qualitative CEMs; **or**
- An instrument health check for filter leak monitors and gross filter failure detectors.

4.8 The calibration procedure applied then depends on the type of monitoring to be performed by the instrument. For the purposes of this PG note, the response from quantitative and qualitative CEMs should be correlated to the results of multiple isokinetic gravimetric samples according to the standard reference method (SRM) which is typically EN-13284-1.

The number of samples taken and the quality of the results defines the type of calibration that is applied to the instrument; typically three or five SRM samples are taken.

4.9 If the instrument is to be used as a filter leak monitor then the instrument output range and alarm levels are configured once it has been established that the bag filter is working to specification. This is typically done via engineering inspection of the bagfilter to confirm operation, or by checking the output from the leak instrument to ensure there are no abnormal dust peaks on bag cleaning when compared to other bag rows being cleaned.

The zero of the instrument should also be checked since the calibration line of the filter response curve often uses the zero condition as a calibration point. It is often difficult to create zero dust conditions at the time of calibration so this is often done by reviewing historical data when the plant is known to be off.

4.10 Those instruments operating in qualitative mode but that have not been calibrated with an isokinetic test, and filter leak monitors that record trends, are considered to be operating as indicative monitors.

4.11 Table 5 summarises the information relating to particulate monitoring CEMs.

4.12 In relation to <u>particulate monitoring on unabated crematoria</u>, there are cases where monthly data is being reported to the regulator based on mg/m^3 but **without** any calibration or configuration taking place when the annual tests are conducted.

4.13 If annual extractive test results are not used to calibrate continuous particulate monitoring instruments:

a. where the instruments are capable of operating in at least a qualitative[4] mode calibration should be undertaken at the next reasonable opportunity (e.g. when the annual periodic testing is undertaken or if the instruments are due to be serviced, whichever is soonest) and annually thereafter;

b. where sub-paragraph a) does not apply, the instruments should be upgraded within 18 months of the publication of this note to enable this to be done with subsequent annual calibration undertaken.

Calibrating particulate instruments should be by use of a 3-point calibration according to the standard reference method (SRM) which is typically EN-13284-1.

[4] the term “qualitative” monitoring refers to those particulate continuous emissions monitors (CEM) where the instrument response should be correlated to the results of multiple isokinetic gravimetric samples according to the standard reference method (SRM) which is typically EN-13284-1. See also paragraphs 4.4 – 4.11 and Table 5.

Table 5 - Options for continuous monitoring of particulate

Type of Monitoring	Information recorded by instrument	What the Alarm Levels can detect	Capability of Instrument	Tests required on initial set up of instrument	Annual tests required	3-yearly tests required
Quantitative **See Note 1**	mg/m^3 over time	%of ELV	Capable of being calibrated for a specific application	Functionality test 3/5 point calibration	Functionality test 3/5 point calibration	Functionality test 3/5 point calibration
Qualitative **See Note 1**	mg/m^3 (approx) over time	Approx % of ELV	Capable of being calibrated for a specific application	Set up and 3 point calibration	Instrument health check	3 point calibration Health check
Filter leak device	Trend of plant operation over time	Change in plant operation causing a defined step change	Filter leak monitor with trend output	Set up and reference	Instrument health check	Instrument health check Set reference
Gross filter failure device	Incidence of gross failure	Catastrophic failure of filter	Instrument designed to detect large increases in emissions	Set up Set alarm	Instrument health check	Health check Set up
Note 1 – instrument response should be correlated to the results of multiple isokinetic gravimetric samples according to the standard reference method (SRM) which is typically EN-13284-1.						

Continuous Emissions Monitoring (all substances)

4.14 Where trigger alarms are set for qualitative instruments or filter leak monitors, an output level should be set which corresponds to around 75% of the emission limit value (ELV). Thus the alarms are activated in response to this significant increase in pollutant loading above the baseline, so that warning of the changed state is given before an unacceptable emission occurs. The regulator may wish to agree the alarm trigger level.

4.15 Where continuous emissions monitoring is required for any substance, it should be carried out as follows:

- All continuous monitoring readings should be on display to appropriately trained operating staff.
- Instruments should be fitted with a visual alarm to warn the operator of arrestment plant failure. Authorities should decide whether additionally to specify an audible alarm, having regard to, amongst other things, the likelihood of the visual alarm not being noticed, and the intrusiveness of any such alarm for those using the crematorium.
- The activation of alarms should be automatically recorded.
- All continuous monitors should be operated, maintained and calibrated (or referenced, in the case of filter leak devices) in accordance with the manufacturers' instructions, which should be made available for inspection by the regulator. The relevant maintenance and calibration (or referencing) should be recorded.
- Emission concentrations may be reported as zero when the plant is off and there is no flow from the stack. If required a competent person should confirm that zero is more appropriate than the measured stack concentration if there is no flow.
- Any CEM used should provide reliable data >95% of the operating time, (i.e. availability >95%). A manual or automatic procedure should be in place to detect instrument malfunction and to monitor instrument availability.

4.16 Exhaust flow rates should be consistent with efficient capture of emissions, good operating practice and meeting the requirements of the legislation relating to the workplace environment.

- The introduction of dilution air to achieve emission concentration limits should not be permitted.

Dilution air may be added for waste gas cooling or improved dispersion where this is shown to be necessary because of the operational requirements of the plant, but this additional air should be discounted when determining the mass concentration of the pollutant in the waste gases.

Varying of monitoring frequency

4.17 Where non-continuous quantitative monitoring is required, the frequency may be varied. Where there is consistent compliance with emission limits, regulators may consider reducing the frequency. However, any significant process changes that might have affected the monitored emission should be taken into account in making the decision.

4.18 When determining "consistent compliance" the following are cases which might not qualify for a reduction in monitoring:

a. variability of results: cases where monitoring results vary widely and include results in the range 30 – 45mg/m^3 (when the emission limit is 50mg/$m^{3)}$;
b. the margin between the results and the emission limit: cases where results over a period are 45mg^3 or more (when the emission limit is 50mg/m^3).

Consistent compliance should be demonstrated using the results from at least:

- three or more monitoring exercises within two years; **or**
- two or more monitoring exercises in one year supported by continuous monitoring.

Where a new or substantially changed process is being commissioned, or where emission levels are near to or approach the emission concentration limits, regulators should consider increasing the frequency of testing.

4.19 Where qualitative instruments operating only in an indicative mode, or filter leak devices recording trends are in use, it is not appropriate that reduced monitoring be applied as the monitoring is required to demonstrate either compliance with emission limits on an ongoing basis or to demonstrate correct functioning of arrestment equipment.

Sampling provisions

4.20 Where monitoring is not in accordance with the main procedural requirements of the relevant standard, deviations should be reported as well as an estimation of any error invoked.

4.21 Whether sampling on a continuous or non-continuous basis care is needed in the design and location of sampling systems in order to obtain representative samples for all release points.

- Sampling points on new plant should be designed to comply with the British or equivalent standards **(paragraph 4.2);**
- The operator should ensure that relevant stacks or ducts are fitted with facilities for sampling which allow compliance with the sampling standards.

Unabated crematoria - preferred sampling location

4.22 In many unabated crematoria in the UK, the cremators were designed to fit into an existing building. Thus, even those built to be compliant with the Environmental Protection Act and since, tend to have very few locations where a sampling point can actually physically be placed. Fewer still have sampling points which are the correct number of flue diameters away from bends and other obstructions.

When sampling for polychlorinated dibenzo dioxins and furans, where it is not possible for the sampling point to be located such that the temperature of the flue gases is below 200°C – that is, outside the temperature range where reformation or *de novo* synthesis takes place - and remains so until discharge to atmosphere, the operator should notify the regulator of the minimum temperature at which the measurement can practically be made, and the reason why this cannot be below 200°C before sampling takes place.

Modifications due to the batch nature of a process

4.23 Unabated cremation is a batch process with the five stages (a-e) described in paragraph 3.2. In order to take into account the batch nature of the process, at least one complete traverse across the flue should be made during each of stages b-d.

Stage ‘a’ has too short a duration for a complete traverse and so sampling in unabated crematoria should not commence until at least **two minutes** after the coffin is charged. Similarly, sampling should stop before ashing; again, it is not practical to traverse during ashing, and the turbulence caused by the open ash door may bias the results.

4.24 Sampling for dioxins and furans should cover the time needed to meet the limit of detection specified by the analytical laboratory (refer to M2). Normally it will need sampling of between 2 and 4 successive cremations to achieve the necessary time period.

Minimum volume of gas sampled

4.25 The volume of gas sampled will depend on the size of the charge, the standard used for the testing, the type of machine (i.e. electric cremators will have a smaller volumetric flow rate) and whether sampling is performed before or after the introduction of dilution air. European standards e.g. BS EN 13284 -1 and BS EN1948, state that the sample time is calculated by the limit of detection of the analysis method employed.

Concurrent oxygen readings

4.26 Oxygen readings will be required, which are concurrent with the monitoring of the other pollutants, in order to make the correction to standard conditions.

4.27 These readings should be made in the same sampling plane in which the other samples are being taken; if not, extra dilution air could be introduced into the flue, changing the oxygen concentration at a point downstream. Care should be taken, however, that any probe used to extract the sample of gas for oxygen analysis does not cause interference to other sampling equipment in the flue, and vice-versa.

Abate mercury emissions and / or burden share

4.28 Crematoria should fit mercury abatement or join a burden sharing arrangement. The following paragraphs set out the details. The paragraphs are extracts from previously-published 'AQ' notes or details of directions or instructions issued, as indicated in the sub-headings.

New crematoria fit mercury abatement (AQ1(05)/paragraph 6 and table 1)

4.29 All new crematoria (as defined in next paragraph) should be fitted with mercury abatement. However, in recognition that new crematoria commonly begin operation at substantially below full capacity, abatement should not be required to be in operation until the sooner of the following two dates:

- the date when it is likely that, within the subsequent 12 months, more than 750 cremations will take place at the crematorium,
- 31 December 2012.

4.30 For the purposes of paragraph 4.29, a new crematorium is a crematorium which was not an existing installation on 1 October 2006.

Existing crematoria fit mercury abatement or burden share AQ1(05) and AQ9(06))

4.31 AQ1(05) specified that a condition should be included in all permits requiring operators to notify the regulator whether they would opt for fitting abatement, or whether they would be sharing the cost of abatement fitted by other crematoria (whether or not owned by the same operator), or whether they would choose a combination of these two approaches. If the operator was to participate in sharing rather than (or in addition to) abating, the notification should include evidence of the sharing arrangements. Where mercury abatement was to be fitted, AQ1(05) specified that a condition should be included in the permit requiring that the abatement was installed and fully operational by no later than 31 December 2012.

In addition, for avoidance of doubt, the guidance stated that if it was to be installed sooner than this date, regulators should expect it to be operated from the earlier date.

4.32 By 31 Dec 2012 existing crematoria should be fitted with mercury abatement to the extent necessary to ensure that 50% of all cremations carried out are subject to abatement. '50%' is based on the Federation of Burial and Cremation Authorities' 2003 cremation statistics, excluding those for stillbirths, perinatal deaths and deaths of infants under 5 years.The total number of cremations in 2003 according to these statistics was 430,006. The total number of cremations involving stillbirths, perinatal deaths, and deaths of infants under 5 years in 2003 was 12,532. Therefore, the national 50% figure is 208,737. 5

Directed conditions (2008 and 2012 directions/instructions)

4.33 Regulators in England and Wales were directed in 2008 to include a condition in every crematorium permit requiring operators to submit written confirmation of whether it intended to fit abatement equipment or not, and various subsidiary information. Regulators in England and Wales were directed in 2010, and regulators in Scotland instructed, that every crematorium permit must have the following condition inserted:

- The operator shall send the regulator, by no later than 1 June 2010 and 1 April in each year thereafter, a certificate from the Crematoria Abatement of Mercury Emissions Organisation (CAMEO) or appropriate evidence from a comparable audited burden sharing arrangement or scheme which specifies:-

a. the total number of cremations in the past 12 months/calendar year;

b. the number of cremations undertaken in cremators fitted with operational mercury abatement equipment in the previous 12 months; **or**

c. the number of cremations undertaken in the previous 12 months and the proportion of those subject to burden sharing arrangements under which money is paid for the benefit of abated crematoria; **or**

d. in cases where mercury abatement is fitted but fewer than 50% of cremations at the installation were undertaken in cremators fitted with it in the previous 12 months, the relevant information in both b) and c).

[5] At the time of publication of PG5/2(12) the sector had made representations proposing a revision to the method of calculating the baseline. This note will be revised if any changes are made as a result, and all stakeholders will be advised.

Gas usage, carbon dioxide emissions and carbon footprint

4.34 The use of fuels leads to emissions of carbon dioxide (CO2) and small quantities of other greenhouse gases. A carbon footprint is the total greenhouse gas (GHG) emissions caused directly and indirectly by an individual, organisation, event or product, and is expressed as a carbon dioxide equivalent (CO2e).

For crematoria, carbon dioxide emissions from gas usage are the main greenhouse gas component of their carbon footprint. Crematoria operators may wish to note that the development of an energy reduction strategy will have the benefits of saving money and reducing the operator's carbon footprint. Simple recording of gas consumption (e.g. comparison of quarterly gas bills) is a first step in managing energy use and therefore CO_2 emissions and operators should be expected to do this as a condition of their permit. Additionally, operators are advised to consider for their own purposes fitting gas meters to individual cremators, as a more accurate way of monitoring gas use and identifying areas where gas use can be reduced and cost savings made.

Greenhouse gas conversion factors are used to calculate the amount of greenhouse gas emissions caused by energy use. They are measured in units of "kg carbon dioxide equivalent". In order to convert 'energy consumed in kWh' to 'kg of carbon dioxide equivalent', the energy use should be multiplied by a conversion factor.

Defra's website contains conversion factors for 2011. The conversion factor for natural gas at the time of publication of this note was 0.1836, but this figure should be checked by the operator using published figures when calculating carbon dioxide equivalent emissions.

- Within 3 months of the publication of this note, operators should begin to keep simple records of quarterly gas consumption for inspection by the regulator. Consumption should be converted into CO_2 equivalent emissions using the following conversion equation:

  Gas usage (kWh) x conversion factor = kgCO_2e

Monitoring, investigating and reporting

4.35 The operator should monitor emissions, make tests and inspections of the activity. The need for and scope of testing, (including the frequency and time of sampling), will depend on local circumstances.

- The operator should keep records of inspections, tests and monitoring, including all non-continuous monitoring, inspections and visual assessments. The records should be:
  - kept on site
  - kept by the operator for at least two years; and
  - made available for the regulator to examine
- If any records are kept off-site they should be made available for inspection within one working week of any request by the regulator.

Information required by the regulator

4.36 The regulator needs to be informed of monitoring to be carried out and the results. The results should include process conditions at the time of monitoring.

- The operator should notify the regulator at least 7 days before any periodic monitoring exercise to determine compliance with emission limit values. The operator should state the provisional time and date of monitoring, pollutants to be tested and the methods to be used.
- The results of non-continuous emission testing should be forwarded to the regulator within 8 weeks of completion of the sampling.
- Adverse results from **any** monitoring activity (both continuous and non-continuous) should be investigated by the operator as soon as the monitoring data has been obtained. The operator should:
  - identify the cause and take corrective action;
  - clearly record as much detail as possible regarding the cause and extent of the problem, and the remedial action taken;
  - re-test to demonstrate compliance as soon as possible; and inform the regulator of the steps taken and the re-test results.

4.37 The operator should report monitoring data as follows:

- Every 6 months a report should be submitted containing the following continuous monitoring data for carbon monoxide and, in respect of unabated cremators, particulate matter. The data should be submitted covering each period of either four weeks or a calendar month:
  - Values that exceed the 95% limit for carbon monoxide (and particulate matter if appropriate) in that period;
  - 60-minute mean emission values that exceed the 100% limit for carbon monoxide (and particulate matter, if appropriate) in that period;
  - A list of the highest 60-minute mean emission value for each period;
  - The 95th-percentile value for each period.
- For temperature and oxygen, the operator should report the following continuous monitoring values to the regulator every 6 months:
  - secondary chamber entrance temperature, 4-weekly/monthly maximum and minimum (of 5-minute averages);
  - secondary chamber exit temperature, 4-weekly/monthly maximum and minimum (of 5-minute averages);
  - oxygen concentration, 4-weekly/monthly minimum (of 5-minute averages).
- Where any values have been exceeded in any 4-weekly/monthly or 6-monthly reporting period, records should be kept that identify the number of times that the limit was exceeded during the reporting period, the levels of the exceedance, and the time, date and cremation reference. This data should be kept available.

4.38 Where the combustion provisions in Table 3 or 4, as appropriate are not met continuously, more detailed reporting may be needed.

4.39 The report specified in paragraph 4.37 should be presented in a format that enables the regulator to check compliance.

Visible and Odorous Emissions

4.40 The aim should be to prevent any visible airborne and odorous emissions from any part of the process, as perceived by the regulator. This aim includes all sites regardless of location.

4.41 Emissions from cremations should in normal operation be free from visible smoke:

- All other releases to air, other than condensed water vapour, should be free from persistent visible emissions.
- All emissions to air should be free from droplets.

Where there are problems that, in the opinion of the regulator, may be attributable to the installation, such as local complaints of visual emissions or where dust from the installation is being transported off the site, the operator should inspect in order to find out which operation(s) is the cause.

If this inspection does not lead to correction of the problem then the operator should inform the regulator in order to determine whether ambient air monitoring is necessary. Ambient monitoring may be either by a British Standard method or by a method agreed with the regulator.

Whilst problems are ongoing, visual and olfactory boundary checks should also be made once per day when an installation is being operated. The time, location and result of these checks, along with weather conditions such as indicative wind direction and strength, should be recorded. Once the source of the emission is known, corrective action should be taken without delay and where appropriate the regulator may want to vary the permit in order to add a condition requiring the particular measure(s) to be undertaken.

Abnormal Events

4.42 The operator should respond to problems which may have an adverse effect on emissions to air.

- In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions the operator should:
  - investigate and undertake remedial action immediately
  - adjust the process or activity to minimise those emissions; **and**
  - promptly record the events and actions taken

- The regulator should be informed without delay, whether or not there is related monitoring showing an adverse result:
  - if there is an emission that is likely to have an effect on the local community; **or**
  - in the event of the failure of key arrestment plant, for example, bag filtration plant or scrubber units; **or**
  - in the event of the use of the bypass or emergency relief vent.
- The operator should provide a list of key arrestment plant and should have a written procedure for dealing with its failure, in order to minimise any adverse effects.

5. Control techniques

Summary of best available techniques

5.1 The following table provides a summary of the best available techniques that can be used to control the process in order to meet the emission limits and provisions in **Section 4**. Provided that it is demonstrated to the satisfaction of the regulator that an equivalent level of control will be achieved, then other techniques may be used.

Table 6 - Summary of control techniques

Release source	Substance	Control techniques
Flue gas	Nitrogen oxides	No control
	Odour	Good combustion and a secondary combustion zone
	Carbon monoxide	Good combustion and a secondary combustion zone
	Volatile organic compounds	Good combustion and a secondary combustion zone
	PAH	Good combustion and a secondary combustion zone
	Mercury and its compounds	Abatement, or contribute via burden sharing scheme
	Particulate matter	Good combustion, slow gas velocities and a secondary combustion zone. Abatement further minimises emissions*
	Hydrogen chloride	Minimise halogens combusted, avoid excessive temperature in primary chamber. Abatement further minimises emissions*
	PCDD/F	Minimise chlorine combusted and particulate matter emitted, good combustion and a secondary combustion zone, Abatement further minimises emissions*
	Carbon dioxide	Measure gas consumption, good cremator design
Cremated remains size reduction machine	Particulate matter	Filter on machine or external dispersion and filter if needed.
Spent gas-cleaning materials	Particulate matter, mercury	Keep containers tightly lidded
* if fitted for mercury abatement purposes		

Techniques to control emissions from contained sources

Particulate matter (PM)

5.2 Particulate matter in unabated cremators is controlled by good combustion and by gas flows that do not carry particles out of the cremator. Mercury abatement further lessens emissions of particulate matter.

Hydrogen chloride

5.3 Hydrogen chloride mostly arises from the salt content of bodies. Chlorine should be avoided by careful control of coffin materials, contents, shrouds, clothing and items other than the body itself. Condensation is prevented by dilution and preheating stacks.

Mercury abatement further lessens emissions of hydrogen chloride.

Mercury

5.4 Mercury is highly volatile and therefore almost exclusively passes into the flue-gas stream. Mercury is only partially removed with particulate matter. The rest remains in the flue gases as volatile compounds.

Where activated carbon is used as part of the abatement technique, operators should be aware of potential health and safety risks arising from spontaneous combustion.

Volatile organic compounds

5.5 Volatile organic compounds are controlled by good combustion.

Dioxins

5.6 Good combustion and low particulate matter emissions minimise the emission of PCDD/F (polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans often referred to as 'dioxins and furans' or even just 'dioxins'). Mercury abatement further lessens emissions of dioxins.

Nitrogen oxides

5.7 Nitrogen oxides arising from coffins might be lessened by switching from coffins made using board made from wood and nitrogen-containing resins. However plain wood is considered too expensive to be required as BAT. Cardboard caskets also contain nitrogen in the wet strength additives. Nitrogen is always present in the body. Thermal NOx is minimal due to the secondary chamber temperature and because combustion is staged over primary and secondary chambers.

Carbon monoxide

5.8 Carbon monoxide is a pollutant but is also the prime indicator of incomplete combustion that would emit un-burnt hydrocarbons, PAH and PCDD/F, which are much more difficult to monitor. Abatement of carbon monoxide is not BAT but good combustion minimises emissions.

Carbon dioxide

5.9 Carbon dioxide emissions are minimised by cremator design and operation. Simple recording of gas consumption and conversion into CO_2 equivalent emissions enables monitoring of emissions. Although not BAT, gas meters allow measurement of gas consumption, and comparison with other sites, including the potential for cost savings. Advances in combustion control, allied with short period carbon monoxide monitoring to monitor good combustion, may allow significant reduction in carbon dioxide emissions for next generation cremator designs.

Odour

5.10 Odour is prevented by good combustion

Release of Pollutants – normal and emergency operating conditions

Unabated crematoria

5.11 In existing, unabated crematoria, the chimney will have been designed at a sufficient height to achieve adequate dispersal of pollutants during normal operation. The main chimneys also act as emergency vents in the case of plant or power failure.

Existing, abated crematoria

5.12 For existing crematoria that are fitted with abatement, the existing chimney (originally designed for dispersion of unabated emissions) should suffice as the emissions release point during normal operation.

5.13 In the event of a failure of the abatement equipment, unabated gases follow one of two routes for release to atmosphere depending on the design of the plant:

1. Unabated gases can “bypass” the abatement plant and be ducted to the original, main chimney, therefore being dispersed at the optimum height.
2. Unabated gases can “bypass” to an alternative emergency release vent (ERV) designed at the optimum height for the dispersal of unabated emissions.

New crematoria

5.14 For **new** crematoria (required to fit abatement) the chimney height is calculated at a suitable height for the release of abated gases during normal operation and may be **shorter** than the optimum height for **unabated** gases.

5.15 The process will be designed that will allow the emergency release of unabated gases in the event of a breakdown of the abatement equipment.

It is not considered BAT to require that either the main chimney or any additional emergency release vent, be built at a height calculated to be sufficient for the release of unabated gases.

Failure of Abatement Plant - existing, abated crematoria and new processes

5.16 Where there is more than one gas cleaning system and one system fails, that system should not be used until it is repaired.

5.17 Where there is only one gas cleaning system then cremations should be allowed to continue for up to 48 hours to provide an opportunity for the necessary repairs to be completed. The regulator should be notified immediately (preferably by fax/email).

5.18 Emergency relief vents (ERV) or bypass systems should **not** normally be used when cremation is underway. Occasions when the ERV/bypass is used during a cremation should be notified to the regulator. Use of the ERV/bypass during cremation more than once a year should be investigated and remedial action taken.

- In the event of the use of a ERV/bypass during cremation:
  - the failure, its cause and cure should be entered in the log; **and**
  - the regulator should be notified immediately (preferably by fax or e-mail).
- ERV/bypass should only be used:
  - when the heat removal plant has failed and the abatement plant would be damaged; **or**
  - during warm-up and shutdown, provided that compliance be demonstrated with the carbon monoxide limit.

Waste Materials

5.19 Waste materials collected from inside the abatement plant will need to be disposed of in accordance with waste legislation.

- Dusty materials, dusty wastes and wastes containing mercury should be kept tightly contained.

Coffin materials and cremator design

5.20 The emission limits and provisions specified in section 4 above may be achieved by careful use of materials in coffin construction and furnishing and by cremator design and operation (including abatement at new processes). The range of materials used for coffin or casket construction now includes cardboard, wickerwork (made from willow) as well as wood composite board and solid wood. Shrouds are also available and may use natural fibres such as cotton, linen or wool. Materials to be avoided in coffin or casket construction, furnishings and body preparation/embalming include halogenates, metals (except steel screws and staples), wax and more than a thin layer of water based lacquer on wood.

- PVC and melamine should not be used in coffin construction or furnishings;
- Cardboard coffins should not contain chlorine in the wet-strength agent. (e.g. not using polyamidoamine-epichlorhydrin based resin (PAA-E));

- Packaging for stillbirth, neonatal and foetal remains should not include any chlorinated plastics:
- Coffins containing lead or zinc should not be cremated;
- The cremator should be designed and operated in order to prevent the discharge of smoke or fumes during charging;
- The charging system should be interlocked to prevent the introduction of a coffin to the primary combustion zone unless the secondary combustion zone temperature exceeds that specified for good combustion in the permit;
- The cremator and all ductwork should be made and maintained gas tight if under positive pressure to prevent the escape of gases from the ductwork or cremator to the air.

Good combustion

5.21 The secondary combustion zone starts after the last injection of combustion air. Air injected at support burners in the secondary combustion chamber is ignored, as long as there is no more than about 6% excess oxygen for the fuel burnt.

- All cremators should be designed to ensure complete combustion and should be fitted with a secondary combustion zone;
- The manufacturer should state the volume of the secondary combustion zone;
- When re-bricking a cremator, the convolutions of the secondary combustion chamber should be maintained and the volume of the chamber recalculated and restated.

It is technically feasible for oxygen levels to be less than 6% but any minimum oxygen levels proposed by operators should be fully justified to the regulator and backed up with monitoring data to show that compliance with emission limit values for **all** pollutants listed in **Tables 3 & 4** is fully met.

5.22 Residence time in the secondary combustion zone should be demonstrated at commissioning or by calculation.

Re-lining or re-bricking of a cremator is likely to improve emission control rather than have a significant negative effect on human beings or the environment, and therefore this activity alone is unlikely to justify classification as a substantial change such that residence time requires demonstrating again.

Cremated remains

5.23 For all cremators, the remains in the cremator should only be moved when calcination is completed.

- The removal of ash and non-combustible residues from the cremator should be undertaken carefully so as to prevent dust emissions via the flue;
- Cremated remains should be moved and stored in a covered container.

5.24 Many cremated remains treatment plants have an internal filter and discharge inside the building and for them an emission limit and testing are unlikely to be needed.

- Cremated remains treatment plant venting externally should be abated to meet the particulate matter limit in either **Table 3** or **Table 4.**

Standby cremators

5.25 Some crematoria may wish to retain a stand-by cremator for use in the event of breakdown of the main cremator or other occasional need for additional cremator capacity.

5.26 Such plant should be permitted if it can operate in compliance with all the following criteria:

- without causing a nuisance (as in the Environmental Protection Act 1990 Part III);
- with the aggregate periods of emission of dark smoke not exceeding 5 minutes during any period of eight hours;
- with no single emission of dark smoke exceeding two minutes; **and**
- without any emission of black smoke.

5.27 The following conditions and also the management **paragraphs 5.46 - 5.48** should also be complied with:

- The standby cremator should be clearly identified.
- Standby plant should operate for no more than 100 hours in any 12-month period.
- All periods of operation and the reason for standby plant operation should be recorded in the log.
- The local enforcing authority should be notified by telephone, in advance if possible, of the operation of standby plant.
- Visual and olfactory assessments of emissions should be made at the start and at least once during each cremation cycle in standby plant, the location and result of the assessment should be recorded in the log. (The frequency of assessments can be reduced if a continuous particulate matter monitor is operating.)
- Remedial action should be taken immediately in the case of abnormal emissions.
- PVC and melamine should not be used in coffin construction and furnishings
- Cardboard coffins should not contain chlorine in the wet-strength agent (i.e. not using polyamidoamine-epichlorhydrin based resin (PAA-E)).
- Packaging for stillbirth, neonatal and foetal remains should not include any chlorinated plastics.
- Coffins containing lead or zinc should not be cremated.
- The remains in the cremator should only be moved when calcination is completed.

Small-scale cremators

5.28 Small-scale cremators may be developed in order to cremate stillbirth, neonatal and foetal remains. Not all the standards for full-scale cremators are appropriate for such small-scale cremators because of the relatively small mass of pollutants emitted. For these purposes "small--scale cremators" should be taken to mean cremators with a maximum door opening of 300 x 300 mm and with a maximum length of primary chamber of 1,000 mm.

5.29 When stillbirth, neonatal or foetal remains are cremated in full-scale cremators, the guidance for those cremators should apply.

5.30 The following paragraphs, or parts of paragraphs, should apply to small-scale cremators:

i. **Paragraphs 4.40 – 4.41** but with visual and odour assessment once during each cremation,

ii. **Paragraphs 4.42, 5.3, 5.20, 5.39 – 5.53**

iii. The reference to "coffins" in **paragraph 5.3** includes packaging for stillbirth, neonatal and foetal remains.

Cremation standards in the event of mass fatalities

Originally published as AQ19(07).

5.31 **Paragraphs 5.31 to 5.38** are issued as a precautionary measure in the event of a national emergency giving rise to mass fatalities. Defra and the Welsh Government intend to alert regulators at the time when an emergency situation exists which triggers the guidance. There will be a similar alert when the situation is at an end after which the guidance will no longer apply.

5.32 In the event of mass fatalities, such as could arise from pandemic flu, crematoria may need to operate for sustained periods. This means that there is a greater prospect of breakdown of equipment, including equipment for reducing air emissions. There could also be implications for staffing of crematoria.

Current guidance

5.33 This paragraph reminds regulators and operators that it is good practice to ensure that:

- spares and consumables are available at short notice;
- to have an audited list of essential items;
- those spares and consumables subject to continual wear should be held on site or should be available at short notice from guaranteed local suppliers so that plant breakdowns can be rectified rapidly;
- staff at all levels need the necessary training and instruction in their duties relating to the control of the process and emissions to air and refer to the Crematorium Technicians Training Scheme or to the Training and Examination Scheme for Cremation Technicians.

5.34 Regulators and crematoria operators should bear in mind that:

a) larger quantities of spares and consumables may be needed in the event of an emergency causing mass fatalities;

b) an emergency causing mass fatalities may have implications for the number of trained staff that can be called upon.

5.35 In order to minimise the potential for breakdowns during such an emergency, it is important that all crematoria plan for such an eventuality, taking account of a) and b).

- A simple plan should be drawn up for dealing with emergencies which give rise to mass fatalities, which should mainly address the holding of additional spares and consumables and the training of suitable numbers of staff.

5.36 If this is done, there might nonetheless be either a breakdown of equipment affecting air emissions or a shortage of staff trained on the air pollution aspects of operating the crematorium. There might also be a heightened demand which warrants operating any standby cremator for longer than the 100 hours specified in **paragraph 5.27.** In such circumstances, and in the public interest, regulators should take a balanced view to enforcement action in the event of a breach of permit conditions.

5.37 If best endeavours have been taken to reduce the likelihood of a breakdown or staff shortage, it may well be appropriate to allow a crematorium to continue to operate while breaching permit conditions without any enforcement action being taken.[6] One consideration may be whether the area in question is designated a local Air Quality Management Area for any of the pollutants emitted from the crematorium. Steps should be taken to rectify the breaches where practicable and as soon as is feasible. Defra and WAG would not expect these allowances to be continued beyond the duration of the emergency.

5.38 This guidance is without prejudice to any restrictions or requirements there may be under health and safety legislation.

[6] As regards the possibility of mass fatalities arising from pandemic flu, the Food Standards Agency and the World Health Organisation take the view that H5N1 virus in uncooked poultry when cooked to 70ºC negates the risk.

Air Quality

Dispersion & Dilution

5.39 Pollutants that are emitted via a stack require sufficient dispersion and dilution in the atmosphere to ensure that they ground at concentrations that are deemed harmless. This is the basis upon which stack heights are calculated using HMIP Technical Guidance Note (Dispersion) D1. The stack height so obtained is adjusted to take into account local meteorological data, local topography, nearby emissions and the influence of plant structure.

5.40 The calculation procedure of D1 is usually used to calculate the required stack height but alternative dispersion models may be used in agreement with the regulator. An operator may choose to meet tighter emission limits in order to reduce the required stack height.

5.41 Where an emission consists purely of air and particulate matter, (i.e. no products of combustion or any other gaseous pollutants are emitted) the above provisions relating to stack height calculation for the purpose of dispersion and dilution should not normally be applied. Revised stack height calculations should not be required as a result of publication of this revision of the PG note, unless it is considered necessary because of a breach or serious risk of breach of an EC Directive limit value or because it is clear from the detailed review and assessment work that the permitted process itself is a significant contributor to the problem.

5.42 In order to maintain maximum advantage from thermal buoyancy and momentum, emissions should take place from the minimum practicable number of chimneys. Each cremator should have its own flue in a multi-flue stack. For crematoria with abatement plant, each abatement plant can have one flue plus an emergency release vent (ERV). As the ERV should only be used infrequently, the ERV stack height can be the same as the abated stack height (see **paragraphs 5.12 – 5.15**). An operator may choose to meet tighter emission limits in order to reduce the required main stack height, but the ERV stack height may not be reduced.

Ambient air quality management

5.43 In areas where air quality standards or objectives are being breached or are in serious risk of breach and it is clear from the detailed review and assessment work under Local Air Quality Management that the permitted process itself is a significant contributor to the problem, it may be necessary to impose tighter emission limits. If the standard that is in danger of being exceeded is not an EC Directive requirement, then industry is not expected to go beyond BAT to meet it. Decisions should be taken in the context of a local authority's Local Air Quality Management action plan. For example, where a permitted process is only responsible to a very small extent for an air quality problem, the authority should not unduly penalise the operator of the process by requiring disproportionate emissions reductions.

Paragraph 59 of the Air Quality Strategy 2007 [Volume 1] gives the following advice: *"...In drawing up action plans, local authority environmental health/pollution teams are expected to engage local authority officers across different departments, particularly, land-use and transport planners to ensure the actions are supported by all parts of the authority. In addition, engagement with the wider panorama of relevant stakeholders, including the public, is required to ensure action plans are fit-for-purpose in addressing air quality issues. It is vital that all those organisations, groups and individuals that have an impact upon local air quality, buy-in and work towards objectives of an adopted action plan."*

Stacks, vents and process exhausts

5.44 Liquid condensation on internal surfaces of stacks and exhaust ducts might lead to corrosion and ductwork failure or to droplet emission. Adequate insulation will minimise the cooling of waste gases and prevent liquid condensation by keeping the temperature of the exhaust gases above the dewpoint. A leak in a stack/vent and the associated ductwork, or a build up of material on the internal surfaces may effect dispersion:

- Flues and ductwork should be cleaned to prevent accumulation of materials, as part of the routine maintenance programme.

5.45 When dispersion of pollutants discharged from the stack (or vent) is necessary, the target exit velocity should be 15m/sec during peak operating conditions to achieve adequate dispersal.

In order to ensure dispersion is not impaired by either low exit velocity at the point of discharge, or deflection of the discharge, a cap, or other restriction, should not be used at the stack exit. However, a cone may sometimes be useful to increase the exit velocity to achieve greater dispersion.

Management

Management techniques

5.46 Important elements for effective control of emissions include:

- proper management, supervision and training for process operations;
- proper use of equipment;
- effective preventative maintenance on all plant and equipment concerned with the control of emissions to the air; and
- ensuring that spares and consumables - in particular, those subject to continual wear – are held on site, or available at short notice from guaranteed local suppliers, so that plant breakdowns can be rectified rapidly. This is important with respect to arrestment plant and other necessary environmental controls. It is useful to have an audited list of essential items.

Appropriate management systems

5.47 Effective management is central to environmental performance; it is an important component of BAT and of achieving compliance with permit conditions. It requires a commitment to establishing objectives, setting targets, measuring progress and revising the objectives according to results. This includes managing risks under normal operating conditions and in accidents and emergencies. It is therefore desirable that installations put in place some form of structured environmental management approach, whether by adopting published standards (ISO 14001 or the EU Eco Management and Audit Scheme [EMAS]) or by setting up an environmental management system (EMS) tailored to the nature and size of the particular process. Operators may also find that an EMS will help identify business savings.

5.48 Regulators should use their discretion, in consultation with individual operators, in agreeing the appropriate level of environmental management. Simple systems which ensure that LAPPC considerations are taken account of in the day-to-day running of a process may well suffice, especially for small and medium-sized enterprises. Authorities are urged to encourage wider adoption of EMS by operators, but it is outside the legal scope of an LAPPC permit to require an EMS for purposes other than LAPPC compliance. For further information/advice on EMS refer to the appropriate chapter of the appropriate Guidance Manual for England and Wales, Scotland and Northern Ireland.

Training

5.49 Staff at all levels need the necessary training and instruction in their duties relating to control of the process and emissions to air. In order to minimise risk of emissions, particular emphasis should be given to control procedures during start-up, shut down and abnormal conditions.

Training may often sensibly be addressed in the EMS referred to above. The Crematorium Technicians Training Scheme operated by the Institute of Cemetery and Crematorium Management should be adequate for this purpose, as should the Training and Examination Scheme for Crematorium Technicians which is run by the Federation of Burial and Cremation Authorities.

- All staff whose functions could impact on air emissions from the activity should receive appropriate training on those functions. This should include:
  - awareness of their responsibilities under the permit;
  - steps that are necessary to minimise emissions during start up and shut down;
  - actions to take when there are abnormal conditions, or accidents or spillages that could, if not controlled, result in emissions;

- The operator should maintain a statement of training requirements for each post with the above-mentioned functions and keep a record of the training received by each person. These documents should be made available to the regulator on request.

Maintenance

5.50 Effective preventative maintenance plays a key part in achieving compliance with emission limits and other provisions. All aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air should be properly maintained. In particular:

- The operator should have the following available for inspection by the regulator:
  - A written maintenance programme for all pollution control equipment; **and**
  - A record of maintenance that has been undertaken.

Cremator maintenance

5.51 A well-maintained cremator should have:

- Written maintenance and cleaning programmes available to the regulator with respect to pollution control equipment, including control instrumentation and the cremator secondary chamber, and ducts and flues, and if fitted, abatement plant;

5.52 Cleaning of cremator ducts and flueways is considered part of preventative maintenance e.g. raking out twice a year:

5.53 Maintenance of an existing crematorium will need to include at least the following: (See also **Appendix 1**).

- inspecting, repairing and replacing brick, flue, control software and hardware, monitoring equipment etc;
- regular maintenance and inspection by service engineer;
- operator maintenance - daily, weekly, monthly, by number of cremations.

6. Summary of changes

The main changes to this note, with the reasons for the change, are summarised below in **Table 7**. Minor changes that will not impact on the permit conditions e.g. slight alterations to the Process Description have not been recorded.

Table 7 - Summary of changes

Section / Paragraph / Row	Change	Reason	Comment
1. Introduction			
	Simplification of text	Make note clearer	
	Addition of links	Change to electronic format	Removes need for extensive footnotes/references
2. Timetable for compliance and reviews			
	Simplification of text	Make note clearer	
	Addition of links	Change to electronic format	Removes need for extensive footnotes/references
Paragraph 2.4	Text added to allow for operators to reconsider burden sharing as an option when replacement mercury plant is required.	Gives flexibility to the operator when considering how best to meet compliance for mercury emissions.	
3. Activity Description			
	Additional descriptive text – abatement plant and emergency releases	Make note clearer	
4. Emission limits, monitoring and other provisions			
Table 3 & Table 4	ELVs/provisions for unabated and abated crematoria	Clarify different monitoring provisions for unabated and abated processes	
Table 4 - Note 1	Text to summarise the importance of operators, monioring organsiations and analytical laboratories liasing to agree appropriate methods for mercury monitoring.	Clarification of the need to determine number and duration of sampling times for mercury testing on a site-specific and process-specific basis.	
Paragraphs 4.4 – 4.11 & Table 5	New paragraphs on continuous monitoring instruments for particulate matter and calibration/configuration of CEMs, summarised in Table 5	Clarify types of CEMs and differences between types, plus clarification of terms in Table 5. Also clarifies that calibration must be undertaken for all CEMs.	
Paragraphs 4.12 – 4.13	New paragraphs directing regulators to understand how data is used on site, particularly whether annual tests are used to calibrate/configure CEMs and to upgrade calibration requirements, instruments or both, to be able to provide at least qualitative data.	Gather verifiable, qualitative data for compliance purposes	

Paragraphs 4.20 – 4.27	Sampling provisions for unabated crematoria, previously in Section 9 of PG5/2(04)	Make note clearer	
Paragraphs 4.28 – 4.33	New paragraphs describing abatement/burden sharing arrangements.	Make note clearer	
Paragraph 4.34	Revised text to describe an approach to managing gas usage, carbon dioxide emissions and carbon footprint	Gather data to inform on CO_2 emissions.	Data allows for management control of gas use which in turn allows management of CO_2 emissions and increased efficiency.
5. Control techniques			
Paragraphs 5.2 – 5.10	Revised text for control techniques of emissions from contained sources	Make note clearer	
Paragraphs 5.11 – 5.18	Revised text and conditions relating to emergency releases of pollutants from abated and unabated crematoria	Make note clearer	
Paragraph 6.10 in PG5/2(04)	Deleted sentence - A body in a shroud may be supported on a stiff baseboard.	Such practice has signficant H&S concerns for the industry	
Para 5.21	Additional text to allow operators to run at less than 6% excess oxygen levels provided full justification is provided to the regulator to demonstrate that compliance is not compromised.	Allows for increased efficiency in gas use	
Paragraphs 5.31– 5.38	Guidance on cremation standards in the event of mass fatalities (previously published as AQ19(07). Additional requirement for operator to draw up a simple plan to deal with emergencies that give rise to mass fatalities.	Consolidate AQ notes into PG note	
Paragraphs 5.39 – 5.45	Clarification of air quality guidance including exhaust velocity requirements	Make note clearer	
Paragraphs 5.50 – 5.53	Additional text for cremator maintenance	Make note clearer	
Appendix 1	Guidance on Well-maintained cremators (previously published as AQ12(05)	Consolidate AQ notes into PG note	
Appendix 2	Supplementary Guidance on burden-sharing, previously published as AQ24(05)	Consolidate AQ notes into PG note	

7. Further information

Sustainable consumption and production (SCP)

Both business and the environment can benefit from adopting sustainable consumption and production practices. Estimates of potential business savings include:

- £6.4 billion a year UK business savings from resource efficiency measures that cost little or nothing
- 2% of annual profit lost through inefficient management of energy, water and waste
- 4% of turnover is spent on waste.

When making arrangement to comply with permit conditions, operators are strongly advised to use the opportunity to look into what other steps they may be able to take, for example, having regard to the efficient use of auxiliary fuels, such as gas and electricity. Regulators may be wiling to provide assistance and ideas, although cannot be expected to act as unpaid consultants.

Health and safety

Operators of installations must protect people at work as well as the environment:

- requirements of a permit should not put at risk the health, safety or welfare of people at work or those who may be harmed by the work activity;
- equally, the permit must not contain conditions whose only purpose is to secure the health of people at work. That is the job of the health and safety enforcing authorities.

Where emission limits quoted in this guidance conflict with health and safety limits, the tighter limit should prevail because:

- emission limits under the relevant environmental legislation relate to the concentration of pollutant released into the air from prescribed activities;
- exposure limits under health and safety legislation relate to the concentration of pollutant in the air breathed by workers;
- these limits may differ since they are set according to different criteria. It will normally be quite appropriate to have different standards for the same pollutant, but in some cases they may be in conflict (for example, where air discharged from a process is breathed by workers). In such cases, the tighter limit should be applied to prevent a relaxation of control.

Further advice on responding to incidents

The UK Environment Agencies have published guidance on producing an incident response plan to deal with environmental incidents. Only those aspects relating to air emissions can be subject to regulation via a Part B (Part C in NI) permit, but regulators may nonetheless wish to informally draw the attention of all appropriate operators to the guidance.

It is not envisaged that regulators will often want to include conditions, in addition to those advised in this PG note, specifying particular incident response arrangements aimed at minimising air emissions. Regulators should decide this on a case-by-case basis. In accordance with BAT, any such conditions should be proportionate to the risk, including the potential for harm from air emissions if an incident were to occur. Account should therefore be taken of matters such as the amount and type of materials held on site which might be affected by an incident, the likelihood of an incident occurring, the sensitivity of the location of the installation, and the cost of producing any plans and taking any additional measures.

Appendix 1

Compliance

Much of this Appendix was originally issued as AQ12(05), which has now been rescinded. It is intended to assist regulators as they inspect cremators and check compliance with permit conditions and guidance in such areas as:

- maintenance for abatement plant and continuous monitors;
- notifications of emergency bypass/emergency relief valves;
- arrangement for storage of dusty wastes.

In some cases it will be appropriate for regulators to consider all of the following when they inspect. In other cases, they will want to prioritise or focus on particular issues.

Maintenance arrangements

Contract

- is there an external contract for maintenance and servicing? Who with: manufacturers, combustion engineers?
- is it structured? Does it cover preventative, and responsive work? Does it set response times?
- if not, what are the arrangements, who carries them out, how qualified (qualifications/experience) are they to deal with the 'usual' problems? unusual problems? how long does it take to fix problems? How does the paperwork support the arrangements?

Paperwork

- are there structured inspections by the service engineer? with paperwork to set expectations? and documented faults and remedies? and advice on operator maintenance standards?

Check to see if a cremator is "well maintained"

Regulators may find the following points useful to raise when they inspect cremators, and where appropriate to inspect themselves. The questions should help to elicit information from the operator, and service engineer if present, about how the cremator operates when it is fully compliant. (Inspections when the engineer is present can be informative.)

Answers will give an indication of whether the cremators have problems and how the operator/ engineer adjust operations as and when problems arise.

a) Do the operatives note the CO, particulate and oxygen readings on the emissions monitoring system when the cremator is in pre-heat (i.e. just burners running)?
b) Do the operatives observe the primary burner flame (with the loading door shut) so they can spot if the flame significantly changes?
c) Where are the analyser manufacturer's instructions and what do they say about calibration and its frequency? When were the analysers calibrated last? are all the analysers working correctly?
d) How does the control system correct for any excursion in primary chamber behaviour? Eg low oxygen, high CO. Do the primary burners and primary air respond to low oxygen or high CO or both (eg do they turn off?)
e) How the control system deals with different weights of a cremation?
f) What is the largest size, weight of cremation accepted, and how are they managed - manual or automatic? Loaded into a colder primary chamber?
g) Is the sealing and paintwork in general checked regularly for "smoke" marks, which are likely to be a sign of pressurisation? These marks will give clues to cleanliness of combustion.
h) Similarly, is the area around the loading door checked regularly for scorch or smoke stains?
i) Are the ductworks checked regularly for any signs of leaks (as far as is accessible)?
j) The regulator might watch the stack at the loading of a coffin to see if there is any smoke?
k) The regulator might watch the stack at 10 to 20 minutes into cremation, (coffin collapses) - is there smoke at the stack and check for smell around the grounds and in the cremator room?

Alarms and Notifications

Regulators should, as a matter of course, check all forms of data logger when they visit to see whether there were any emission limit exceedances or uses of the emergency relief vent (ERV) which have not been reported. It can also be useful to check other onsite records to see if there have been any events that are useful as indicators for potentially adverse impacts in the future. For example:

- low level alarm histories for CEMs;
- records of boiler temperatures consistently above the expected levels;
- records relating to the dosing equipment that may indicate malfunction e.g. consistent quantities of reagent loaded or blockages that have occurred

.

Some data loggers require manual acknowledgement of an alarm, others may de-activate when the fault is rectified. A site may have additional paper systems in place to record deviations as the operator undertakes daily tasks. It is useful to look at the times recorded for alarm events/deviations and when they were acknowledged and corrective actions put in place.

- does the site review alarms/deviations on a regular basis?
- are some corrective actions repeatedly required? What is the mechanism onsite to check that corrective actions are effective in preventing the adverse effect?

Dustiness

How much dust is there in the ducts and flues? How long since they were cleaned out? How are they cleaned out? The text below contains a very simple guide to describing dustiness and its variations, but is only one possible approach.

The following is a simple, rule-of-thumb “dustiness” guide to describing dustiness and its variations. *(Health and safety note: remember to ascertain safety before opening ducts and flues. Gas temperature, pressure, constituents of any outflows or duct contents are important, as are surface temperatures, sharp edges etc. The operator and/or manufacturer/service engineers will probably have already assessed risk for such operations*.)

- colour;
- thickness of deposit might be gauged:
  - dust shows on dry fingertip [dust free latex glove? rub gently]
  - thick enough to write in with a finger [how lit: from room, by torch?]
  - finger drawn through dust makes a furrow
  - thick enough to measure with a ruler
- extent of deposition in square ducts, in corners, patches on the base:
  - less than a beer mat
  - more than a beer mat
  - most of the surface
- in round ducts:
  - continuous
  - long patches
  - short patches.

Appendix 2

Supplementary guidance on burden sharing

This is an update of additional guidance note AQ24(05) on burden sharing options, omitting text about material with deadlines that have passed or which is otherwise out of date.

Background

Burden sharing options

Defra was aware in 2005 that different operators were choosing different burden sharing options to achieve the specified 50% national mercury reduction. The following points were intended to clarify for regulators and operators the considerations likely to be material in deciding whether to fit abatement equipment or contribute to the cost:

a) it is believed that a small number of local authorities have decided to fit mercury abatement in order to safeguard the local environment and not participate in burden sharing. For the reasons given in two consultation papers issued in 2003 and 2004 it remains Defra and WAG's view that the environmental impact from mercury emitted from crematoria is through long-range transportation before its deposition, take-up by fish, and consumption as food. Therefore, the focus should not be on local environmental protection. It is for this reason that Defra and WAG have set a national reduction figure, not limits for each individual crematorium.

b) the 50% reduction figure was determined after extensive consultation to reflect an appropriate balance between costs to crematoria operators (and any consequential increase in cremation fees passed on to the public) and environmental benefits. Neither Defra nor WAG are promoting a reduction in excess of this amount through burden sharing, or because some authorities have decided to fit abatement irrespective of burden sharing.

c) Defra and WAG (now Welsh Government) are aware that the following burden sharing methods have been adopted:

   i) a good many operators have concluded that the best way is to join the CAMEO scheme, which is arranging burden sharing at the national level and provides an umbrella organisation for both running the system and reporting to Defra and WAG. CAMEO has issued guidance on the criteria for deciding whether cremation authorities are to fit abatement or contribute towards the cost and will approve and register all burden sharing arrangements, with CAMEO members all being free to choose their burden sharing partners, should they wish (these arrangements will still require registration and approval with CAMEO).

CAMEO issued advice on an environmental surcharge for its members to levy in addition to the normal cremation fee from January 2007, which is considered by the scheme to be the most effective way to collect funding for authorities fitting abatement equipment in line with the phasing programme. For details of the CAMEO approach, contact The Secretary, The Federation of Burial and Cremation Authorities, 41 Salisbury Road, Carshalton, Surrey SM5 3HA, fbcasec@btconnect.com or via the CAMEO website www.cameoonline.org.uk/ where contact details can be found.

ii) some operators have chosen to fit abatement to a proportion of the cremators at their crematorium/ crematoria;

iii) some operators have made local agreements with nearby operators or other crematoria within the same authority or company to share costs and abatement.

Both ii) and iii) could be undertaken within the CAMEO scheme, with CAMEO verifying the arrangements and monitoring the data.