Permit with introductory note

The Environmental Permitting (England and Wales) Regulations 2010

Installation address

North East Lincolnshire Council
Crematorium
Weelsby Avenue
Grimsby
North East Lincolnshire
DN32 7AU

Permit Reference: EP/200200091/V2

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Introductory note

This introductory note does not form a part of the Permit

The following Permit is issued under Regulation 12 of the Environmental Permitting (England and Wales) Regulations 2010 (S.I.2010 No. 3538) ("the EP Regulations") to operate an installation carrying out one or more of the activities listed in Part 2 to Schedule 1 of those Regulations, to the extent authorised by the Permit.

The permit includes conditions that have to be complied with. It should be noted that aspects of the operation of the installation which are not regulated by those conditions shall be subject to best available techniques, used to prevent or, where that is not practicable, reduce emissions from the installation in relation to any aspect of the operation of the installation which is not regulated by any condition within the permit.

Techniques include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

Brief description and installation regulated by this permit

Process for the cremation of human remains, as prescribed by the Environmental Permitting (England and Wales) Regulations 2010.
The coffin enters the primary chamber within which primary combustion takes place. In the secondary chamber, the required temperature of 850c is achieved for the gases where they are held for a minimum of two seconds. The charging system is electrically interlocked to prevent the introduction of a coffin to the primary combustion zone unless the temperature in the secondary combustion chamber exceeds the required 850c for two minutes.
The residence time is determined by direct measurements of the volume rate of the flow gases throughout the cremation cycle. At the cremator exit flue, appropriate corrections are made for changes in temperature and oxygen content.
Cremated remains are removed in an enclosed container so as to prevent dust emissions and treated in the cremulator to produce ashes which are placed in urns or scattered as requested.

Superseded Licences/Consents/Authorisations relating to this installation		
Holder	**Reference Number**	**Date of Issue**
North East Lincolnshire Council	**200200091**	**12th Aug 1997**

Confidentiality

The Permit requires the Operator to provide information to North East Lincolnshire Council. The Council will place the information onto the public registers in accordance with the requirements of the EP Regulations. If the operator considers that any information provided is commercially confidential, it may apply to North East Lincolnshire Council to have such information withheld from the register as provided in the EP Regulations. To enable North East Lincolnshire Council to determine whether the information is commercially confidential, the Operator should clearly identify the information in question and should specify clear and precise reasons.

Variations to the permit

Your Attention is drawn to the Variation Notification Procedure condition in the permit. This Permit may be varied in the future. If at any time the activity or any aspect of the activity regulated by the following conditions changes such that the conditions no longer reflect the activity and require alteration, the Regulator should be contacted.

Surrender of the permit

Where an Operator intends to cease the operation of an installation (in whole or in part) the regulator should be informed in writing, such notification must be made as specified in regulation 24(3) of the EP regulations.

Transfer of the permit or part of the permit

Before the Permit can be wholly or partially transferred to another person, a joint application to transfer the Permit has to be made by both the existing and proposed holders, in accordance with Regulation 21 of the EP Regulations. A transfer will be allowed unless the Authority considers that the proposed holder will not be the person who will have control over the operation of the installation or will not ensure compliance with the conditions of the transferred Permit.

Responsibility under workplace health and safety legislation

This Permit is given in relation to the requirements of the EP regulations. It must not be taken to replace any responsibilities you may have under Workplace Health and Safety legislation.

Appeal against permit conditions

Anyone who is aggrieved by the conditions attached to a Permit can appeal to the Secretary of State for the Environment, Food and Rural Affairs. Appeals must be made in accordance with the requirements of Regulation 31 and Schedule 6 of the EP Regulations.

Appeals should be received by the Secretary of State for Environment, Food and Rural Affairs. The address is as follows:

The Planning Inspectorate
Environmental Team, Major & Specialist Casework
Room 4/04 – Kite Wing
Temple Quay House
2 The Square, Temple Quay
BRISTOL
BS1 6PN
Tel: 0117 372 8726
Fax: 0117 372 8139

Please Note

An appeal brought under Regulation 31 (1) (b) and Schedule 6, in relation to the conditions in a permit will not suspend the effect of the conditions appealed against; the conditions must still be complied with.
In determining an appeal against one or more conditions, the Act allows the Secretary of State in addition to quash any of the conditions not subject to the appeal and to direct the local authority either to vary any of these other conditions.

End of introductory note

Permit issued under the Environmental Permitting (England and Wales) Regulations 2010

Permit: 200200091/V2

North East Lincolnshire Council (the Regulator) in exercise of its powers under Regulation 13(1) of the Environmental Permitting Regulations 2010 (S.I. 2010 No. 3538) hereby permits.

North East Lincolnshire Council ("the operator"),

Whose registered office is

North East Lincolnshire Council
Municipal Offices
Town Hall Square
Grimsby
DN31 1HU

To operate an installation at

Crematorium
Weelsby Avenue
Grimsby
North East Lincolnshire
DN32 0AB

to the extent authorised by and subject to the conditions of this Permit and within the boundary identified in condition C

Signed

Nathan Vear
Head of Neighbourhood Services

Authorised to sign on behalf of
North East Lincolnshire Council

Dated

CONDITIONS:

Extent and limit of the installation

A Variation Notification Procedure

If the operator proposes to make a change in operation of the installation, he must, at least 14 days before making the change, notify the regulator in writing. The notification must contain a description of the proposed change in operation. It is not necessary to make such a notification if an application to vary this permit has been made and the application contains a description of the proposed change. In this condition ‘change of operation’ means a change in the nature or functioning, or an extension, of the installation, which may have consequences for the environment.

B Best Available Technique

The best available techniques shall be used to prevent or, where that is not practicable, reduce emissions from the installation in relation to any aspect of the installation which is not regulated by any other condition in this permit.

C The Permitted Installation

The operator is authorised to carry out the activities and/or associated as specified and within the boundary shown in red on the plan below:-

Description of Authorised Process

Process for the cremation of human remains, as prescribed by the Environmental Permitting (England and Wales) Regulations 2010.
The coffin enters the primary chamber within which primary combustion takes place. In the secondary chamber, the required temperature of 850c is achieved for the gases where they are held for a minimum of two seconds. The charging system is electrically interlocked to prevent the introduction of a coffin to the primary combustion zone unless the

temperature in the secondary combustion chamber exceeds the required 850c for two minutes.
The residence time is determined by direct measurements of the volume rate of the flow gases throughout the cremation cycle. At the cremator exit flue, appropriate corrections are made for changes in temperature and oxygen content.
Cremated remains are removed in an enclosed container so as to prevent dust emissions and treated in the cremulator to produce ashes which are placed in urns or scattered as requested.

5. Emission limits, monitoring and other provisions

5.1 The emission limit values and provisions described in this section are achievable using the best available techniques described in **Section 6.** Monitoring of emissions should be carried out according to the method specified in this section.

The reference conditions for limits in **Table 2** and **Table 3** are:
273K, 101.3kPa, 11% oxygen v/v, dry gas unless otherwise stated.

Table 2: Emission limits, monitoring and other provisions

Row	Substance	Mass limits per cremator	Concentration limits	Type of monitoring	Monitoring frequency (subject to paragraph 5.14, 5.15 and 5.19)
1	Hydrogen chloride (excluding particulate matter)	300g an hour	$200mg/m^3$ averaged over an hour	Extractive test **See Section 9**	Annual
2	Total particulate matter from cremator	120g an hour for 95% of cremations and 240g an hour for all cremations	$80mg/m^3$ averaged over an hour for 95% of cremations and $160mg/m^3$ averaged over an hour for all cremations	Provide visual alarms and record levels and alarms Manual extractive test See **Section 9** (capable of collecting 75% of particulate matter with a diameter of 0.1 micron or less)	Continuous indicative Annual
3	Carbon monoxide	150g in the first hour of cremation for 95% of cremations and 300g in the first hour of cremations for all cremations	$100mg/m^3$ averaged over the first hour for 95% of cremations and $200mg/m^3$ averaged over the first hour for all cremations	Record date at less than 10 second intervals, No more than 3 cremators per analyser, Provide visual alarms and record alarm events See **Section 9**	Continuous indicative Annual test
4	Organic compounds (excl particulate matter)	30g an hour	$20mg/m^3$ averaged over an hour of cremation.	See **Section 9**	Annual test

	expressed as carbon				
5	Particulate matter from cremated remains reduction plant vents externally		$150mg/m^3$ with no correction for oxygen concentration or water vapour	See **Section 9** and paragraph **6.16**	On commissioning

Row	Parameter	Combustion provision	Type of monitoring	Monitoring frequency
6	Temperature	Minimum of 1123K (850^oC) in the secondary combustion chamber	• Measure at the entrance and after the exit from the secondary combustion zone • Automatically record temperatures • Visual alarm when temperature falls below 1123K • Interlock to prevent cremator loading	Continuous Continuous Record alarm activations To operate when temperature and combustion provisions in rows 6, 7 and 8 are not met
7	Residence time	2 second residence time in 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 cremator exit	On commissioning
8	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 alarm activations. During discontinuous tests, continuous reference oxygen measurements should be at the sampling location as the parameters tested.	Continuous Activate alarm when oxygen falls below provision
If the combustion provisions are not met, then the dioxin emission limit and monitoring provision in Row 8 should be applied				
9	PCDD/F On existing processes for cremators that don't meet the combustion provisions	4.5 micrograms as ITEQ per 3 cremations	1ng/m3 as ITEQ	Extractive see **Section 9** Temperature, oxygen and any flow parameters that apply during the dioxin tests, should be required by the

	above			authorisation /permit Interlock to prevent cremator loading unless those parameters are met

For cremators, the operator chooses whether the mass or the concentration limits apply and the regulator should then specify those limits in the permit or authorisation.

When calculating mass emissions, the cremator should multiply the flow rate at that moment by the concentration at that moment.

Carbon monoxide continuous monitors may be replaced by direct continuous monitors for total gaseous combustibles. They should be calibrated by, and read as, carbon monoxide.

At commissioning and substantial changes, shielded thermocouples should be calibrated in the cremator by suction pyrometer or calibrated thermocouple measurements alongside each thermocouple.

5.2 Monitoring, investigations and recording

- 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

5.3 Information required by the regulator

- The operator shall 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.

- The operator shall 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 result of non-continuous emission testing should be forwarded to the regulator within 8 weeks of the completion of the sampling.

- Adverse results from any monitoring activity (both continuous and non-continuous) shall be investigated by the operator as soon as the monitoring data has been obtained / received. The operator should:-

- Identify the cause and take corrective action
- Record as much detail as possible regarding the cause and extent of the problem, and the action taken by the operator to rectify situation.
- Re-test to demonstrate compliance as soon as possible; and
- Notify the regulator

5.4 Visible and odorous emissions

- Emissions from cremations shall be free from visible smoke and in any case should not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742:1969.
- There shall be no offensive odour beyond the process boundary, as perceived by the regulator.
- Visual and olfactory assessments of emissions shall be made frequently and at least once each day whilst the process is in operation. The time, location and result of these assessments should be recorded.
- All releases to air, other than condensed water vapour, shall be free from persistent visible emissions.
- All emissions to air shall be free from droplets.

5.5 Abnormal events

- In the case of abnormal emissions, malfunction or breakdown leading to abnormal emissions the operator shall:
  - 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 shall be informed without delay:
  - If there is an emission that it likely to have an effect on the local community; or
  - In the event of the failure of key arrestment plant, for example flue gas cleaning plant or use of the dump stack; or
  - Continuous monitoring results exceed twice the specified emission limit.

5.6 Continuous monitoring

Continuous indicative monitoring can be used as a management tool. In conjunction with continuous recording it identifies any trends in emissions; for example, that emissions are gradually increasing, which may indicate a need for maintenance. It can also be used with or without continuous recording to trigger an alarm when there is a sudden increase in emissions; for example, if arrestment plant fails. For a given concentration of particulate the output level varies with the instrument. It should be noted that not all monitors provide a linear response to an increase in particulate matter. The monitor should be set up to provide a baseline output when the plant is known to be operating under the best possible conditions; i.e. such that emissions are fully compliant with the provisions. The instrument manufacturer should be able to set an output level which corresponds to around 95% of the emissions limit, to trigger the alarms. Thus, the alarms are activated in response to this significant increase in particulate loading above the baseline, so that warning of the changed state is given before an unacceptable emissions occurs.

5.7 Where continuous monitoring is required, it shall be carried out as follows:

- All continuous monitoring readings should be on display to appropriately trained operating staff
- Instruments shall be fitted with audible and visual alarms, situated appropriately to warn the operator of arrestment plant failure or malfunction.
- The activation of alarms shall be automatically recorded
- All continuous monitors shall be operated, maintained and calibrated (or referenced) 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.
- All new continuous monitoring equipment shall be designed for less than 5% downtime over any 3-month period.

5.8 For all continuous measurements, the mass emission per hour is calculated from the measured values from 2 minutes after the close of coffin loading door until the removal of calcined remains.

5.9 The operator should decide whether to report for periods of 4 weeks or 1 month.

- For each cremator, for carbon monoxide, and for particulate matter, the operator shall report the following continuous monitoring values to the regulator every 6 months.

- Monthly or four weekly average from the first hour of each cremation

- Values that exceed the 95% limit for each substance in **Table 2** in that period for each cremation

- 60 minute mean emission values that exceed the 100% limit for each substance in **Table 2** in that period for each cremation.

- A list of the highest 60 minute mean emission value for each period

- The 95-percentile value for each period. (The Example report in **Section 10** shows one way to select the 95-percentile value)

- For temperature, oxygen and residence time, 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

    - Secondary chamber exit temperature, 4 weekly / monthly maximum and minimum

    - Oxygen concentration, 4 weekly / monthly minimum

    - Residence time, 4 weekly / monthly minimum

5.10 Where the combustion provisions in **Table 2** Rows 6, 7 and 8 are not met continuously, then more detailed reporting may be needed.

5.11 The results should be presented in a format that enabled the regulator to check compliance for oxygen, temperature, carbon monoxide and particulate matter with **Table 2**.

5.12 In **Section 10**, an Example Report is included, though cremator manufacturers may vary in the format they provide. The example assumes that the cremator complies with the combustion provision, though not all cremators do.

5.13 **Calibration and compliance monitoring**

Calibration of quantitative instruments and compliance monitoring shall meet the following provisions as appropriate:

- No result should exceed the emission concentration limits specified, except where either:

(a) data is obtained over at least 5 sampling hours in increments of 15 minutes or less; or
(b) at least 20 results are obtained where sampling time increments if more than 15 minutes are involved; AND in the case of (a) or (b)
(c) no daily mean of all 15-minute mean emission concentrations should exceed the specified emission concentration limits during normal operation (excluding start-up and shut-down); and
(d) no 15-minute mean emission concentration should exceed twice the specified emission concentration limits during normal operation (excluding start-up and shut-down).

- Non-continuous emissions monitoring of particulate matter should be carried out according to the main procedural requirements of BS ISO 9096:2003, with averages taken over operating periods, excluding start-up and shutdown.

5.14 **Varying monitoring frequency**

Where non-continuous quantitative monitoring is required, the frequency may be varied. Where there is consistence compliance with emission limits, regulators may consider reducing the frequency. When determining “Consistence compliance” factors to consider include:

(a) the variability of monitoring results, for example, results which range from 15-45 mg/m3, against an emission limit of 50mg/m3 might not qualify for a reduction in monitoring.
(b) The margin between the results and the emission limit, for example, results which range from 45 – 50mg/m3 when the limit is 50mg/m3 might not qualify for a reduction in monitoring.

Consistence compliance should be demonstrated using the results from at least

- Three or more monitoring exercises within 2 years; or

- Two or more monitoring exercises in one year supported by continuous monitoring

Any significant process changes, which might have affected the monitored emission, should be taken into account.

5.15 The frequency of testing should be increased, for example, as part of the commissioning of new or substantially changed processes, or where emission levels are near to or approach the emission concentration limits.

5.16 Sampling provisions

Care is needed in the design and location of sampling in order to obtain representative samples. BS ISO 9096 calls for sampling within a straight section of flue, about 7 to 10 diameters in length.

- The operator should ensure that adequate facilities for sampling are provided on vents or ducts.

- Sampling points on new plant should be designed to comply with the British or equivalent standards.

New processes

5.17 At new processes, arrestment plant for mercury and dioxin shall be required.

5.18 For new processes only, **Table 3** contains an additional emission limit and provisions, and provisions that should replace provisions for particulate matter, hydrogen chloride and any dioxin provisions from **Table 2** above.

Table 3: New process additional provisions

	Substance / Parameter	**Mass limits per cremator**	**Concentration limits**	**Type of monitoring**	**Monitoring frequency (subject to paragraphs 5.14, 5.15 and 5.19)**
Additional to **Table 2**	Mercury	150mg for 4 cremations	50 micrograms/m3	Extractive. See **Section 9**	Annual
Replace row 6 in **Table 2**	PCDD/F On new processes[1] for cremators that don't meet the combustion provisions below	0.45 micrograms as ITEQ per 3 cremations	0.1 nanograms/m3 as ITEQ	Extractive. See **Section 9** Temperature, oxygen and any flow parameters that apply during the dioxin tests, should be required by the authorisation / permit	On commissioning and on rebuilding a cremator Continuous
Replaces row 1 in **Table 2**	Hydrogen chloride (excluding particulate matter)	45g an hour	30mg/m3 averaged over an hour.	Extractive test. See **Section 9**	Annual
Replaces row 2 in **Table 2**	Total particulate matter from cremator	30g an hour for 95% of cremations and	20 mg/m3 averaged over an hour for 95% of cremations and	Provide visual alarms and Record levels and alarms Manual extractive test See **Section 9**	Continuous qualitative Annual

		60g an hour for all cremations	40 mg/m3 averaged over an hour for all cremations.	(capable of collecting 75% of particulate matter with a diameter of 0.1micron or less)	
1. i.e. crematoria which are not existing on October 2006					

5.19 At new processes, the frequency of non-continuous monitoring for mercury should not be reduced because the mercury load varies with each cremation.

6. Control Techniques

6.1. Summary of best available techniques

The following table provides a summary of the best available techniques that can be used to control the process in order to meet the emissions limits and provisions in Section 5. 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 4: Summary of Control Techniques

Release Source	Substance	Control Technique
Flue Gas	Odour	Good combustion and secondary combustion zone
	Particulate matter	Good combustion, slow gas velocities and a secondary combustion zone
	Hydrogen chloride	Existing and substantially changed processes – no control, but prevent condensation. New processes – arrestment.
	Nitrogen oxides	No control
	Carbon monoxide	Good combustion and a secondary combustion zone
	Volatile organic compounds	Good combustion and a secondary combustion zone
	Mercury and its compounds	Existing processes - mercury abatement to be installed and fully operational by no later than 31 December 2012 and fitted to the extent necessary to ensure that 50% of all cremations carried out (based on the Federation of British Cremation Authorities' 2003 cremation statistics).
	PAH	Good combustion and a secondary combustion zone
	PCDD/F	Minimise chlorine combusted and particulate matter emitted, good combustion and a secondary combustion zone. Arrestment plant required for new processes only.
Cremated remains size reduction machine	Particulate matter	

Techniques to control emissions from contained sources

6.2 Odour

Odour is prevented by good combustion

6.3 Particulate matter

Particulate matter on flue gases (including smoke) is controlled by good combustion and by gas flows that do not carry particles out of the cremator. Arrestment is not usually needed to meet the emission limit at existing and substantially changed processes. At new processes arrestment is needed.

6.4 Hydrogen chloride

Hydrogen chloride mostly arises from the salt content of the bodies and is not arrested at existing and substantially changed processes but dispensed. Chlorine is avoided in coffins, shrouds, clothing and other materials burnt. Condensation is prevented by dilution and preheating stacks. At new processes hydrogen chlorine is arrested.

6.5 Nitrogen Oxides

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 BATNEEC/BAT. Cardboard caskets also contain nitrogen in the wet strength additives. Thermal Nox is minimal due to the secondary chamber temperature and because combustion is staged over primary and secondary chambers.

6.6 Carbon monoxide

Carbon monoxide is a pollutant but is also an indicator if incomplete combustion that emits unburnt hydrocarbons, PAH and PCDD/F, which are much more difficult to monitor. Arrestment if carbon monoxide is not BANTNEEC/BAT but good combustion minimises emissions. Carbon monoxide emissions after the first 60 minutes should to be minimal.

6.7 Volatile organic compounds

Volatile organic compounds are also controlled by good combustion.

6.8 Mercury

At the time of writing, mercury emissions from existing and substantially changed crematoria, principally from dental fillings, are being considered. At new processes for crematoria, mercury arrestment is required.

6.9 Dioxins

Good combustion and low particulate matter emissions minimise the emission of PCDD/F (polychlorinised dibenzo-p-dioxins and polychlorinated dibernzofurans, often referred to as 'dioxins and furans', or even just as 'dioxin'). At new processes, dioxin arrestment is required.

6.10 Coffin materials and cremator design

The emission limits and provisions specified in Section 5 above may be achieved by careful use of materials in coffin construction and furnishing and by cremator design and operation (including arrestment at new processes). The range of materials used for coffin or casket construction has increased recently and now includes cardboard, wickerwork (made from willow) as well as wood composite board and solid wood. Shrouds are also available and often use natural fibres such as cotton and linen. A body in a shroud may be supported on a stiff baseboard. Materials to be avoided in a coffin or casket construction, furnishings and body preparation/embalming include chlorinates, metals (except steel screws and staples), wax and more than a thin layer or water based lacquer on wood.

- PVC and melamine should not be used in coffin or furnishings
- Cardboard coffins should not contain chlorine in the wet-strength agent (e.g. not used 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, fumes or other substances during charging
- The charging system should be interlocked to prevent the introduction of a coffin to the primary combustions zone unless the secondary combustion zone temperature exceeds that specified for good combustion in the authorisation / 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

6.11 **Good combustion**

As one of the means of achieving good combustion, all new cremators should be designed so that there is adequate secondary air in the primary combustion zone to ensure good turbulence.

6.12 The secondary combustion zone starts after the last injection of combustion air. Air injected at support burners in the secondary chamber is ignored, as long as there is no more than about 6% excess air 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 rebricking a cremator, the convolutions of the secondary combustion chamber should be maintained and the volume of the chamber recalculated and restated.

6.13 Residence time in the secondary combustion zone should be demonstrated at commissioning. Residence time may be determined from the volume of the secondary combustion chamber and either:-

- Direct measurement of flow rate; and/or

- Calculate the residence time continuously throughout cremations using measured combustion gas flows.

6.14 **Cremated remains**

For all chambers

- The remains in the cremator should only be moved when calcination is completed

- The removal of ash and no-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.

6.15 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.

- Arrestment to meet the particulate matter limit in **Table 2**; and

- Testing should be needed at commissioning only

- Subsequent performance can be demonstrated indicatively, for example by the use of a pressure drop indicator on the bag filter.

New processes

6.16 For crematoria at new processes, mercury and PCCD/F arrestment plant should be required. The mercury load in human remains varies significantly, and so testing during cremations with no mercury load would not demonstrate compliance adequately. The previsions are based on an arrestment system of cool, capture and collect. The hot exhaust gases are cooled using for example, water tube coolers. Injecting dry lime, activated carbon and sodium sulphide into the gas stream captured pollutants. A dry filter captures the particulate matter and a reduction of between 90 – 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.

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

6.18 Where there is more than one gas cleaning system and one system fails, that system should not be used until it is repaired. Where there is only one gas cleaning system then cremations should continue, the regulator should be notified immediately (preferably by fax or email) and repairs are expected within 24 – 48 hours. Dump stacks should not normally be used when cremations is underway. Occasions when dump stack is used during a cremation should be notified to the regulator. Use of the dump stack during cremation more than once a year should be investigated and remedial action taken.

- In the event of arrestment plant failure or use of a dump stack during cremation,

  - The failure, its cause and cure should be entered in the log; and

  - The regulator should be notified immediately (preferably fax or email)

- Emergency process vents or arrestment equipment by passes Dump stacks) should only be used:

  - When the heat removal plant has failed and the arrestment plant would be damaged; or

- During warm-up and shutdown, provided that compliance is demonstrated with the carbon monoxide limit

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

  (waste materials collected from inside the arrestment plant will need to be disposed of in the same way as waste sorbent).

  (see also paragraph 6.27 about dispersion from dump stacks)

Standby cremators

6.19 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.

6.20 Such plant should be permitted if it meets all the following criteria

- Capable or operating without causing a nuisance (as in the Environmental Protection Act 1990 Part III); and

- During any period of eight hours the aggregate of the periods of emission of dark smoke should not exceed five minutes; and

- No single emission of dark smoke should exceed two minutes; and

- No black smoke should be emitted

6.21 The following bullets and also the management paragraphs 6.30 – 6.33 should also be complied with:

- The standby cremator should be clearly identified.

- Standby plant should operate for no more than 100hours 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 if 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 monitor of operating).

- Remedial action should be taken 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 and 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

6.22 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 with a maximum length or primary chamber of 1,000mm.

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

6.24 The following paragraphs, or parts of paragraphs, should apply to small-scale cremators;

- Paragraph 5.4 but with visual and odour assessment once during each cremation

- Paragraphs 5.5, 6.4, 6.10, 6.25-6.33

- The reference to "coffins" in paragraph 6.4 includes packaging for stillbirth, neonatal and foetal remains.

Air Quality

6.25 **Ambient Air Quality Management**

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 Part B process itself is a significant contributor to the problem, it may be

necessary to impose tighter emission limits. If the air quality 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 Part B 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. More guidance on this is provided in paragraph 360 of the Air Quality Strategy which gives the following advice:

“The approach from local authorities to tackling air quality should be an integrated one, involving all strands of local authority activity which impact on air quality and underpinned by a series of principles in which local authorities should aim to secure improvements in the most cost-effective manner, with regard to local environmental needs while avoiding unnecessary regulation. Their approach should seek an appropriate balance between controls on emissions from domestic, industrial and transport sources and draw on a combination and interaction of public, private and voluntary effort.”

6.26 **Dispersion and dilution**

Pollutants that are emitted via a stack require sufficient dispersion and dilution in the atmosphere to ensure that they ground at concentrations that are harmless. This is the basis upon which stack heights are calculated using 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. It is necessary that the assessment also take into account the relevant air quality standards that apply for the emitted pollutants. 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. D1 relies upon the unimpeded vertical emission of the pollutant being addressed. A cone can increase the efflux velocity of emissions to achieve greater dispersion and dilution. A cap or other restriction over the stack impedes the vertical emission and hinder dispersion. For this reason where dispersion is required such flow impeders should not be used. A cone may sometimes be useful to increase the efflux velocity.

6.27

In order to maintain maximum advantage from thermal buoyancy and momentum, emissions should take place from the minimum practicable number of stacks. Each cremator should have its own flue in a multi-flue stack. For crematoria with arrestment plant, each arrestment plant can have one flue plus a dump stack. As the dump stack is used about once a year or less, the dump stack height can be the same as the arrested stack height.

An operator may choose to meet tighter emission limits in order to reduce the required main stack height, but the dump stack height may not be reduced.

6.28 **Stacks**

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. Stacks and ductwork should be leakproof.

6.29

The dispersion from all stacks and vents can be impaired by low exit velocity at the point of discharge, or deflection of the discharge. Unacceptable emissions of droplets could possibly occur from wet arrestment plant where the linear velocity within the associated ductwork exceeds 9 m/sec. The use of mist eliminators reduces the potential for droplet emissions.

- Where a linear velocity of 9 m/sec is exceeded in the ductwork of existing wet arrestment plant, it should be reduced to the extent that is practicable to ensure that droplet fallout does not occur.

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

- Exhaust gases discharged through a stack or vent should be designed to achieve an exit velocity of 15 m/sec during peak operating conditions to achieve adequate dispersion.

- Stacks or vents should not be fitted with any restriction at the final opening such as a plate,cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.

Management

6.30 **Management Techniques**

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

- it is good practice to ensure that spares and consumables are available at short notice in order to rectify breakdowns 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

Spares and consumables - in particular, those 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.

6.31 **Appropriate Management Systems**

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 processes 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.

Regulators should use their discretion, in consultation with individual operators, in agreeing the appropriate level of environmental management. Simple systems which ensure that LAPC considerations are taken account of in the day-to-day running of a process may well suffice, especially for small and medium-sized enterprises. While authorities may wish to encourage wider adoption of EMS, it is outside the legal scope of an LAPC authorisation/LAPPC permit to require an EMS for purposes other than LAPC/LA-PPC compliance. For further information/advice on EMS refer to EMS Additional Information in Section 8.

6.32 **Training**

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 British Cremation Authorities.

Training of all staff with responsibility for operating the process should include:

- awareness of their responsibilities under the permit, and in particular maintenance of monitoring equipment
- minimising emissions on start up and shut down
- action to minimise emissions during abnormal conditions

The operator should maintain a statement of training requirements for each operational post and keep a record of the training received by each person whose actions may have an impact on the environment. These documents should be made available to the regulator on request.

6.33 **Maintenance**

Effective preventative maintenance should be employed on all aspects of the process including all plant, buildings and the equipment concerned with the control of emissions to air. Cleaning of cremator ducts and flueways is considered part of preventative maintenance eg raking out twice a year. Additional advice on good maintenance practice is being prepared and is likely to be issued as an AQ note shortly. In particular:

- A written maintenance programme should be provided to the regulator with respect to pollution control equipment, including control instrumentation and the cremator secondary chamber, and ducts and flues;
- A record of such maintenance should be made available for inspection.
- Cleaning schedules should be available on site to the regulator.

7. Summary of Changes

Reasons for the main changes are summarised below.

Table 5: Summary of Changes

Change	Reason	Comment
Emission limits, monitoring and other provisions		
Mercury and dioxin arrestment for new processes for crematoria	To reduce the mercury and dioxin emitted	Arrestment plant is being considered separately for existing and substantially changed processes
Criteria for reliability of monitoring plant	To increase consistency of monitoring	

Provision for temperature and retention time differently expressed	Increased understanding of process	
Monitoring methods updated and results expressed using 95% confidence limits	The published methods have been revised	For each pollutant, three samples needed instead of two, but revised methods are quicker to use than old methods.
Primary monitoring methods changed from US to current British/European methods	UK monitoring houses are increasingly using BS/EN methods, which have been recently revised	
Control techniques		
Additional advice on coffin construction and content	To reduce pollutants emitted	Reflects new and improved cremation practices

7.1 Mercury abatement shall be fitted and fully operational by no later than 31 December 2012. The arrestment shall be installed to the extent necessary to ensure that 50% of all cremations carried out (based on the Federation of British Cremation Authorities' 2003 cremation statistics).

7.2 The operator shall send the regulator, by no later than 1 June 2010 and 1 April in each year thereafter, a certificate from the CAMEO organisation* 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;

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%[1] 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).

- Crematoria Abatement of Mercury Emissions Organisation

Note [1]
It is an offence to contravene a condition contained in an environmental permit. In accordance with the Environmental Permitting Regulations, such offences are punishable in the Magistrates' court by a maximum fine of 50,000 and/or up to 12 months' imprisonment and in the Crown Court by a maximum unlimited fine and/or up to five years' imprisonment.

END OF PERMIT-